Swami RamanandTeerthMarathwadaUniversity, Nanded.

Total Credits of Computer Science and Engineering

SE CSE SEM III	**15 + 5 = 20**
SE CSE SEM IV	**15 + 6 = 21**
TE CSE SEM V	**15 + 6 = 21**
TE CSE SEM VI	**15 + 7 = 22**
BE CSE SEM VII	**15 + 9 = 24**
BE CSE SEM VII	**15 + 9 = 24**

Total Credits = 132 + 41FE = 173

Swami RamanandTeerthMarathwadaUniversity,Nanded

Teaching and Evaluation Scheme for

Second Year Program in Computer Science & Engineering and Information Technology

Semester -III

Effective from 2016-2017

Course Code	Course Name	Teaching Scheme			Credit Structure		
		L	T	P	T	P	Total
CI201	Engineering Mathematics - III	03	01	--	03	--	03
CI202	Discrete Mathematics	03	01	-	03	-	03
CI203	Data Structures	04	-	04	03	02	05
CI204	Digital Systems	04	-	02	03	01	04
CI205	Engineering Economics	03	-	-	03	-	03
CI206	Programming Lab-I	02	-	02	-	02	02
CI207	Professional Communication Skills	02 AUDIT	-	02	-	-	-
Total		21	02	10	15	05	20

Total Credits: 20

Total Contact Hours/Week: 33

Note:Prefix "CI" Courses will be common for both CSE and IT Dept.

Evaluation Scheme					
Theory Credit Course		Theory Audit Course		Practical / Workshop	
ME	ESE	ME	ESE	Continuous Evaluation	ESE
20 M	80 M	10 M	40 M	30 M	70 M
Minimum for Passing in Theory, Audit and Practical / Workshop : 40% Each,ME – Minor Examination , ESE – End Semester Examination and CE - Continuous Evaluation					

Swami RamanandTeerthMarathwadaUniversity, Nanded.

Teaching and Evaluation Scheme for

Second Year Program in Computer Science & Engineering and Information Technology

Semester- IV

Effective from 2016-2017

Course Code	Course Name	Teaching Scheme			Credit Structure		
		L	T	P	T	P	Total
CI208	Microprocessors & Microcontrollers	04	-	02	03	01	04
CI209	Computer Algorithms	04	-	-	03	-	03
CI210	SystemProgramming	04	-	-	03	-	03
CI211	Object Oriented Programming with C++	03	01	02	03	01	04
CI212	Numerical Methods& Scientific Computing	03	01	02	03	01	04
CI213	Programming Lab – II	-	-	02	-	01	01
CI214	Mini Project - I	-	-	02	-	02	02
Total		18	02	10	15	06	21

Total Credits: 21

Total Contact Hours/Week: 30

Note:

- Prefix “CI” Courses will be common for both CSE and IT Dept.

Evaluation Scheme					
Theory Credit Course		Theory Audit Course		Practical / Workshop	
ME	ESE	ME	ESE	Continuous Evaluation	ESE
20 M	80 M	10 M	40 M	30 M	70 M
Minimum for Passing in Theory, Audit and Practical / Workshop : 40% Each, ME – Minor Examination, ESE – End Semester Examination and CE - Continuous Evaluation					

Note: There should be Minor-I and Minor-II tests conducted on Unit No. :- 1,2 and Unit No. :-3,4 respectively. Finally average of two tests should be considered.

Swami RamanandTeerthMarathwada University,Nanded.

Teaching and Evaluation Scheme for

Third Year Program in Computer Science & Engineering

Semester - V

Effective from 2016-2017

Course Code	Course Name	Teaching Scheme			Credits		
		L	T	P	T	P	Total
CS301	Operating Systems	04	-	02	03	01	04
CS302	Automata Theory	03	01	-	03	-	03
CS303	Database Management Systems	04		02	03	01	04
CS304	Computer Organization and Architecture	04	-	-	03	-	03
CS30*	Elective - I	03	01	-	03	-	03
CS309	Programming Lab- III			04	-	02	02
CS310	Computer Hardware and Maintenance	-	-	02	-	02	02
Total		18	02	10	15	06	21

CS30*	Elective– I
CS305	Information Theory and Coding
CS306	JAVA Programming
CS307	Number Theory
CS308	Probability, Statistics and Combinatorics

Total Credits: 21

Total Contact Hours/Week: 30

Evaluation Scheme					
Theory Credit Course		Theory Audit Course		Practical / Workshop	
ME	ESE	ME	ESE	Continuous Evaluation	ESE
20 M	80 M	10 M	40 M	30 M	70 M
Minimum for Passing in Theory, Audit and Practical / Workshop : 40 % Each, ME – Minor Examination , ESE – End Semester Examination and CE - Continuous Evaluation					

Swami RamanandTeerthMarathwadaUniversity,Nanded

Teaching and Evaluation Scheme for

Third Year Program in Computer Science & Engineering

Semester – VI

Effective from 2016-2017

Course Code	Course Name	Teaching Scheme			Credits		
		L	T	P	T	P	Total
CS311	Software Engineering	03	-		03		03
CS312	Compiler Design	03	01	-	03	-	03
CS313	Data Communication	04	-	02	03	01	04
CS314	UNIX Operating System	03	-	02	03	01	04
CS31*	Elective - II	03	01	02	03	01	04
CS319	Professional Aptitude and Logical Reasoning	02 AUDIT	-	-	-	-	-
CS320	Programming Lab-IV	03	-	02	-	02	02
CS321	Programming Lab-V	-	-	02	-	01	01
CS322	Seminar					01	01
Total		21	02	10	15	07	22

CS31*	Elective- II
CS315	Digital Signal Processing
CS316	Python Programming
CS317	Linear Algebra
CS318	Computer Simulation and Modeling

Total Credits: 22

Total Contact Hours/Week: 33

Evaluation Scheme					
Theory Credit Course		**Theory Audit Course**		**Practical / Workshop**	
ME	ESE	ME	ESE	Continuous Evaluation	ESE
20 M	80 M	10 M	40 M	30 M	70 M
Minimum for Passing in Theory, Audit and Practical / Workshop : 40 % Each, ME – Minor Examination , ESE – End Semester Examination and CE - Continuous Evaluation					

Note: There should be Minor-I and Minor-II tests conducted on Unit No. :- 1,2 and Unit No. :-3,4 respectively. Finally average of two tests should be considered.

Swami RamanandTeerthMarathwada University, Nanded.

Teaching and Evaluation Scheme for

Final Year Program in Computer Science & Engineering
Semester- VII

Effective from 2017-2018

Course Code	Course	Teaching Scheme			Credits		
		L	T	P	T	P	Total
CS401	Computer Networks	04	-	02	04	01	05
CS402	Advanced Database Management Systems	04	-	02	04	01	05
CS40*	Elective –III	04	-	02	04	01	05
CS4**	Elective –IV	03	-	-	03	-	03
CS411	Behavioral Science	02 AUDIT	-	-	-	-	-
CS412	Programming Lab - VI	02	-	02	-	02	02
CS413	Project – A	-	-	04	-	03	03
CS414	Industrial Training/Internship/Reputed Certified Course/MiniProject - II	-	-	-	-	01	01
Total		19	-	12	15	09	24

Total Credits: 24

Total Contact Hours/Week: 31

Code	CS40* Elective –III		Code	CS4** Elective -IV
CS403	Data Mining		**CS407**	Software Testing and Quality Assurance
CS404	Embedded System		**CS408**	Multimedia System
CS405	Computer Graphics		**CS409**	E-commerce
CS406	Image Processing		**CS410**	Information Processing &Retrieval

Evaluation Scheme					
Theory Credit Course		Theory Audit Course		Practical / Workshop	
ME	ESE	ME	ESE	Continuous Evaluation	ESE
20 M	80 M	10 M	40 M	30 M	70 M
Minimum for Passing in Theory, Audit and Practical / Workshop : 40 % Each, ME – Minor Examination , ESE – End Semester Examination and CE - Continuous Evaluation					

Swami RamanandTeerthMarathwada University, Nanded.

Teaching and Evaluation Scheme for

Final Year Program in Computer Science & Engineering

Semester - VIII

Effective from 2017-2018

Course Code	Course	Teaching Scheme			Credits		
		L	T	P	T	P	Total
CS415	Mobile Computing	04	-	02	04	01	05
CS416	Cryptography and Network Security	04	-	02	04	01	05
CS41*	Elective - V	04	-	02	04	01	05
CS42*	Elective - VI	04	-	-	03	-	03
CS412	Open Source Technology Lab	02	-	02	-	02	02
CS413	Project - B	-	-	04	-	04	04
Total		18		12	15	09	24

Code	CS41* Elective - V
CS 417	Big Data Analytics
CS 418	Distributed Systems
CS 419	Computer Vision
CS 420	Cloud Computing

Code	CS42* Elective - VI
CS 421	Cyber Security
CS 422	Machine Learning
CS 423	Human Computer Interaction
CS 424	Business Intelligence

Total Credits: 24

Total Contact Hours/Week: 30

Evaluation Scheme					
Theory Credit Course		Theory Audit Course		Practical / Workshop	
ME	ESE	ME	ESE	Continuous Evaluation	ESE
20 M	80 M	10 M	40 M	30 M	70 M
Minimum for Passing in Theory, Audit and Practical / Workshop : 40 % Each, ME – Minor Examination , ESE – End Semester Examination and CE - Continuous Evaluation					

Note: There should be Minor-I and Minor-II tests conducted on Unit No. :- 1,2 and Unit No. :-3,4 respectively. Finally average of two should be considered.

Swami RamanandTeerthMarathwada University, Nanded.

Final Year U.G. Program in Computer Science & Engineering
SEMESTER VII

Effective from 2017-18

CS401: COMPUTER NETWORKS

	Teaching Scheme		**L:4 T: 0**
Evaluation Scheme	**ME**	**ESE**	**Minimum Passing Marks**
	20 Marks	**80 Marks**	**40%**

Course Objectives:

1. To understand basics of computer networks and TCP/IP protocols
2. To understand addressing and process to process communication protocols.
3. To analyze the topological and routing strategies of a network.
4. To study various application layer protocols such as DNS, DHCP,HTTP
5. To get acquainted with Network layer security.

Course Contents:

Unit-I: (7 Hrs)
Introduction and Underlying Technologies: Introduction, The OSI Model and TCP/IP Protocol Suite, Underlying Technologies. Network Layer: Introduction to Network Layer, IPv4 and IPv6Addresses, Delivery and Forwarding of IP Packets.

Unit –II: (8 Hrs)
Internet Protocol Version 4 (IPv4):IP Datagram, Fragmentation, Options.IPv6.Address Resolution Protocol (ARP):Address Mapping, ARP packet, Proxy ARP. Internet Control Message Protocol Version 4 (ICMPv4): Messages, Debugging tools.

Unit –III: (7 Hrs)
Unicast Routing Protocols: Intra and Inter Domain Routing,Distance Vector Routing,RIP,Link Status Routing, OSPF, Path Vector Routing and BGP.Multicasting and Multicast Routing Protocols: Multicast address, IGMP.

Unit -IV: (8 Hrs)
Transport Layer: Services, Protocols, UDP, UDP Services, Applications, TCP: TCP Services,Features, Segment,TCP connection, State Transition Diagram, Flow Control, Error Control, Congestion Control, Options and Timers.

Unit-V: (7Hrs)

Application Layer: Client-Server and Peer-to-Peer paradigm.Application Layer Protocols: DHCP,DNS, TELNET/SSH, FTP.

Unit-VI: (7Hrs)

Application Layer Protocols: HTTP, HTTPs, SMTP, POP,IMAP,MIME,S/MIME.Network Layer Security: IPsec, AH,ESP, and VPN.

CourseOutcomes:

At the end of course students will

1. Learn various concepts of computer networks and TCP/IP protocols.
2. Be able to evaluate the topological and routing strategies for a network.
3. Be familiar with the different application layer protocols.

Text Books:

1. *"TCP/IP Protocol Suite",*Behrouz A. Forouzan(4th Edition, McGraw-Hill) ISBN 978-0-07-337604-2,3
2. "*Computer Networks*", Andrew S. Tanenbaum, David J. Wetherall. -- 5th ed, Publishing as Prentice Hall PTR Upper Saddle River, New Jersey 07458, ISBN: 978-0-13-212695-3

Reference Books:

1. "*Computer Networks: A System Approach*", Larry L. Peterson & Bruce S. Davie 5th Edition, Morgan Kaufmann Publishers, Elsevier Science ,ISBN: 9780123850591
2. *"Computer Networks and Internet* ", Douglas E. Comer (Fifth Edition), Pearson Education Ltd. ISBN 10: 0-13-606127-3, ISBN 13: 978-0-13-606127-4

Swami RamanandTeerthMarathwada University, Nanded.

Final Year U.G. Program in Computer Science & Engineering

Effective from 2017-18

COMPUTER NETWORKS LAB

Teaching Scheme **P:2**

Evaluation Scheme	**CE**	**ESE**	**Minimum Passing Marks**
	30	**70**	**40%**

Course Objectives:

1. To get acquainted with some commonly used networking commands and TCP/IP diagnostic tools such as *tcpdump* and *wireshark.*
2. To understand the concept of layering/encapsulation by looking at Link, IP and TCP headers.
3. To understand the operation of various mechanisms/protocols that operates at network layer IP fragmentation, DHCP, ICMP and to learn socket programming.

Suggested List of Assignments:

1. Study of networking/linux commands:
   *tcpdump, wireshark, ping, arp, route, ifconfig, host, /etc/hostname; /etc/hosts; /etc/network/interfaces; /etc/resolv.conf;/etc/protocols; /etc/services*etc.
2. Encapsulation and De-multiplexing using tcpdump and wireshark.
3. ARP protocol
   a. Observe ARP Packets in your LAN using tcpdump and wireshark.
   b. Observe Gratuitous ARP packets.
   c. Study *arping*utility.
4. Write a program to determine Address Classes of an IP address. /Write a program for Addresses subnetting in IP address / Write a program for Variable length subnet masking.
5. Socket programming using UDP
6. Socket programming using TCP
7. IP fragmentation.
   a. Send a UDP packet using socket programming of size less than MTU and observe the IP packet (not fragmented).
   b. Send a UDP packet using socket programming of size greater than MTU and observe the fragmented IP packets using *tcpdump* and *wireshark*.
8. ICMP protocol

    a. Use various networking utility such as *traceroute*, *ping* etc to generate the ICMP packets.
9. Observe minimum three types of ICMP packets (Type 0,3 &8) using *tcpdump* and *wireshark*. Configuration of
    a. ARP server
    b. DHCP server
    c. Proxy server
    d. DNS server
    e. Web server
10. Application layer protocols
    a. HTTP, HTTP/GET
    b. SSH/telnet using *tcpdump* and *wireshark*..

CourseOutcomes:

At the end of course students will

1. Be able to analyze various networking protocols using packet sniffers (*tcpdump* and *wireshark.*)
2. Learn socket programming in C and Java.
3. Be familiar with all network debugging utilities

References

1. TCPdump: http://danielmiessler.com/study/tcpdump/

Swami Ramanand Teerth Marathwada University, Nanded.

Final Year U.G. Program in Computer Science & Engineering

Effective from 2017-18

CS402: ADVANCED DATABASE MANAGEMENT SYSTEMS

	Teaching Scheme		**L: 4 T: 0**
Evaluation Scheme	**ME**	**ESE**	**Minimum Passing Marks**
	20 Marks	**80 Marks**	**40%**

Course Objectives:

1. To study fundamental transaction processing, concurrency and recovery control issues associated with database management systems.
2. To develop understanding of database system theory in order to apply that knowledge to any particular database implementation
3. To learn various database architecture
4. To study performance tuning and application migration.

Course Contents:

Unit - I: Transactions (6 Hrs)

Transaction concept, A simple transaction model, Storage structure, Transaction atomicity and durability, Serializability, Transaction isolation and atomicity, Transaction isolation levels, Transaction as SQL statements.

Unit – II: Concurrency Control (7 Hrs)

Lock-based protocols, Deadlock handling, Multiple granularity, Timestamp-based protocols, Validation-based protocols, Multiversion schemes, Snapshot isolation, Insert operations, Delete operations and predicate reads, Weak levels of consistency in practice, Concurrency in index structures.

Unit – III: Recovery System (7 Hrs)

Failure classification, Storage, Recovery and atomicity, Recovery Algorithm, buffer management, Failure with loss of nonvolatile storage, early lock release and logical undo operations, ARIES, Remote backup systems.

Unit – IV: Database-System Architectures (8 Hrs)

Centralized and client–server architectures, Server system architectures, Parallel systems, Distributed systems,

Parallel Databases: Introduction, I/O parallelism, Interquery parallelism, Intraquery parallelism, Intraoperation parallelism, Interoperation parallelism, Query Optimization, Design of parallel systems, Parallelism on multicore processors.

Unit – V: Distributed Databases: (7 Hrs)

Homogeneous and heterogeneous databases, Distributed data storage, Distributed transactions, Commit protocols, Concurrency control in distributed databases, Availability, Distributed query processing, Heterogeneous distributed databases, Cloud-based databases, Directory systems.

Unit – VI: Advanced Topics in Databases: (5 Hrs)

Performance tuning, Time in databases, Spatial and geographic data, Multimedia databases, Mobility and personal databases, E-Commerce, Main-memory databases

Course Outcomes:

At the end of the course students will

1. Understand how transaction processes and how to implement and control concurrency in transaction processing.
2. Understand the data recovery after failure.
3. Be able to apply tuning to get better performance and migration of database

Text Books:

1. *"Database System Concepts"*, A. Silberschatz, H. Korth, S. Sudarshan, 6th Edition, McGraw Hill Publishers, 2002, ISBN: 978-93-3290-138-4
2. *"Fundamentals of Database Systems"*, Elmasri R., Navathe S.,4th Edition, Pearson Education, 2003, ISBN: 8129702282

Reference Books:

1. *"Database Management Systems"*, Ramkrishna R., Gehrke J., 3rd Edition, McGraw-Hill 2003, ISBN 0-07- 123151 –X

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Final Year U.G. Program in Computer Science & Engineering

Effective from 2017-18

ADVANCED DATABASE MANAGEMENT SYSTEMS LAB

Teaching Scheme **P:2**

Evaluation Scheme	**Continuous Evaluation**	**ESE**	**Minimum Passing Marks**
	30 Marks	**70 Marks**	**40%**

Term Work:

1. Instructor will frame experiments based on the suggested experiments usingRDBMS/C/C++/Java/.net as given below. Instructors are expected toincorporate variations in list.
2. Students will submit Term Work in the form of a journal that will include at least 8 – 10 experiments from the list given below.
3. Practical examination will consist of performance and viva-voice examinationbased on the term work.

The assessment will be based on the following –

1. Performance in the practical examination
2. Record of programs submitted by the candidate.
3. Setting goals higher than expected from problem statement.
4. Innovation & Creativity.
5. Team building skills
6. Technical writing skills

Suggested List of Assignments

1. Write a program to simulate lock-based concurrency control protocol.
2. Backup and recovery of data in Oracle.
3. Design a distributed database using horizontal fragmentation.
4. Design a distributed database using vertical fragmentation.
5. Write a program to wait-for-graph algorithm.
6. Write a program to create logs of the database activities.
7. Study of grid implementation in Oracle / DB2 / MySQL / MS SQL Servers.
8. Study of multi-tier architecture of Oracle / DB2 / MySQL / MS SQL Servers.
9. Write an SQL to store and retrieve multimedia objects (Image, Audio or Video) In Oracle / DB2 / MySQL / MS SQL Databases
10. Write a PL/SQL block to calculate the grade of minimum 10 students.
11. Write a PL/SQL block to implement all types of cursors.
12. Write a PL/SQL stored procedure and function.
13. Write a database Trigger (Row level and Statement level).

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Final Year U.G. Program in Computer Science & Engineering

Effective from 2017-18

CS403: Elective –III: DATA MINING

	Teaching Scheme		**L:4 T:0**
Evaluation Scheme	**ME**	**ESE**	**Minimum Passing Marks**
	20 Marks	**80Marks**	**40%**

Course Objectives:

1. To understand the process of data mining and the key steps involved well enough to lead/manage a real-life data mining project.
2. Know the basics of data warehousing and how it facilitates data mining.
3. To understand fundamental issues in statistical data analysis that cut across all procedures, such as generalization to other data, basic tradeoffs, and validity of models.
4. To develop further interest in research and design of new Data Mining techniques.

Course Contents:

Unit –I: Data Warehouse and OLAP Technology (06 Hrs)

What is data warehouse? : Difference between operational database systems & Data warehouses?, Why have a separate data warehouse?.A multidimensional data model: From table spreadsheets to data cubes, Stars, Snowflakes and fact constellations: Schemas for multidimensional databases, Examples for defining star, Snowflakes and fact constellation schemas.

Unit – II: Measures (08 Hrs)

Categorization and computation, Concept hierarchies, OLAP operations in the multidimensional data model, Astarnet query model for querying multidimensional database.Data warehouse architecture: Steps for the design and construction of data warehouses, A three-tier data warehouse architecture, Data warehouse back-End tools and utilities, metadata repository, Types of OLAP servers: ROLAP vs MOLAP vs HOLAP.

Unit – III: Data Mining (06 Hrs)

What is data mining?, On what kind of data?, Relational databases, Data warehouses, Transactional databases, Advanced data and information systems and advanced applications,

Data mining functionalities- What kinds of patterns can be mined?, Are all of the patterns interesting?, Classification of data mining systems, Data mining task primitives, Major issues in data mining.

Unit – IV: Mining Frequent Patterns, Associations and Correlations (08 Hrs)
Basic concepts and road map: Market basket analysis, Frequent itemsets, Closed itemsets and association rules, Frequent pattern mining, Efficient and scalable frequent itemset mining methods: The apriori algorithm, Generating association rules from frequent itemsets, Improving the efficiency of apriori, Mining frequent itemsets without candidate generation: FP-growth, Mining various kinds of association rules: Mining multilevel association rules, Mining multidimensional association from relational databases and data warehouses.

Unit – V: Classification and Prediction (08 Hrs)
What is classification? What is prediction?, Issues regarding classification and prediction: preparing the data for classification and prediction, Comparing classification and prediction methods, Classification by decision tree induction. Rule based classification: using IF-THEN rules for classification, Rule extraction from a decision tree. Classification by back propagation: A multilayer feed-forward neural network, Defining a network topology, Back propagation. Lazy learners: k- Nearest-Neighbor classifiers. Other classification methods: fuzzy set approaches. Prediction: linear regression, Non-linear Regression. Accuracy and error measures: classifier accuracy measures.

Unit – VI: Cluster Analysis (04 Hrs)
What is cluster analysis? Classical partitioning methods: k-Means and k-Medoids. Outlier Analysis: Statistical distribution-based outlier detection, Distance- based outlier detection, Density-based local outlier detection, Deviation-based outlier detection.

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

1. Interpret the contribution of data warehousing and data mining to the decision support level of organizations.
2. Evaluate different models used for OLAP and data pre-processing.
3. Categorize and carefully differentiate between situations for applying different data mining techniques: mining frequent pattern, association, correlation, classification, prediction, and cluster analysis.
4. Design and implement systems for data mining and evaluate the performance of different data mining algorithms.

Text Books:

1. *"Data mining Concepts and Techniques"*Jiawei Han and MichelineKamber 2nd Edition, Kaufman,2006. ISBN: 978-81-312-0535-8.

Reference Books:

1. *"Machine Learning",*T. Mitchell., McGraw-Hill., 1997. ISBN 0070428077
2. *"Principles of Data mining"*, Hand, Smyth, Mannila, MIT press, ISBN: 026208290x
3. *"Database Systems Concepts*", Abraham Silberschatz, Henry F. Korth, S. Sudarshan, 5th Edition, McGraw-Hill, 2005. ISBN: 9780073523323

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Final Year U.G. Program in Computer Science & Engineering

Effective from 2017-18

DATA MINING LAB

Teaching Scheme **P:2**

Evaluation Scheme	**CE**	**ESE**	**Minimum Passing Marks**
	30 Marks	**70 Marks**	**40%**

Term Work:

1. Instructor will frame programming assignments based on the suggested list of assignments using ORACLE (SQL) and Java language.
2. Instructor is expected to incorporate variations in the list.
3. Students will submit term work in the form of a journal that will include at least 8 to10 practical assignments. Each programming assignment will consists of pseudo algorithm, program listing with proper documentation and printout of the output.
4. Practical examination will consist of performance and viva-voice examination based on the term work.

The assessment will be based on the following –

1. Performance in the practical examination.
2. Record of programs submitted by the candidate.
3. Setting goals higher than expected from problem statement.
4. Innovation & Creativity.
5. Team building skills.
6. Technical writing skills.

Suggested List of Practicals:

1. Implement SQL Query for Star Schema andDesign data warehouse for Student Attendance analysis.
2. Implement SQL Query for Snowflakes Schema andDesign data warehouse for Electronic sales analysis.
3. Implement OLAP operation like slice, dice, roll-up, drill-down on Student Attendance Data Warehouse.
4. Implement classification using K nearest neighbor classification.
5. Implement decision tree based algorithm for classification.
6. Implement K-means algorithm for clustering.
7. Implement K-Medoids algorithm for clustering.

8. Implement Apriori algorithm for association rule.
9. Implementation a program for Linear Regression.
10. Implementation a program for Neural Network.
11. Introduction to the Weka machine learning toolkit.

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Final Year U.G. Program in Computer Science & Engineering

Effective from 2017-18

CS404: ELECTIVE – III: EMBEDDED SYSTEMS

Teaching Scheme		**L:4 T: 0**	
Evaluation Scheme	**ME**	**ESE**	**Minimum Passing Marks**
	20 Marks	**80 Marks**	**40%**

Course Objectives:

1. Understanding embedded system, processor & distributed embedded systems architecture.
2. The goal of this course is to learn ARM7TDMI processor and its internal functioning.
3. Provide an in-depth understanding of the system control and peripherals communication.
4. To get familiar with attractive features of raspberry pi.

Course Contents:

Unit-I: (6 Hrs)

Introduction: Embedded system overview, Design challenge, Processor technology, IC technology, Design technology, Custom single processor technology, Hardware- combinational logic, Sequential logic, Custom single purpose processor design, RT-level custom single purpose processor design, Optimizing custom single purpose processors.

Unit-II: (6 Hrs)

General purpose processor Software: Basic architecture, Operation, Programmers view, Development environment, Application specific instruction set processor, Selecting a microprocessor, General purpose processor design. Introduction, ARM7TDMI-S processor, Block diagram, Memory mapping, Memory accelerator module.

Unit-III: (8 Hrs)

System control:-Pin description, Register description, Crystal oscillator, External interrupt inputs, Other system controls, Memory mapping control, Phase locked loop,Power control, Reset,APB divider, Wakeup timer. GPIO: - GPIO register map, Timer - TIMER/COUNTER0 and TIMER/COUNTER1 register map, Example timer operation, Architecture.

Unit-IV: (8 Hrs)

UART: UART0/1 - UART0/1 register map, UART0/1 baud rate, UART0/1 auto-baud,UART0/1 block diagram. Serial peripheral interface:SPI data transfers, SPI pin description, SPI register

map, SPI block diagram. I2C-bus interface: I2C bus configuration, I2C operating modes, I2C Bus serial interface block diagram, Summary of I2C registers.

Unit-V: (6 Hrs)

Introduction, Process scheduling, Examples of RTOS.Microprocessor and microcontrollerbased system design, typical design examples, system design and simulation usingsimulation software such as Proteus VSM.

Unit-VI: (6 Hrs)

Digital Camera Example Introduction, Introduction to a Simple Digital Camera;User's Perspective, Designer's perspective requirements specification nonfunctional requirements, Informal functional specification, Refinedfunctional specification, Design

CourseOutcomes:

At the end of the course students are expected to

1. Understand the embedded system with processors and IC technologies.
2. Understand the processor ARM7TDMI, its registers and their internal functions.
3. Good understanding and issues to be handled using any processor, software tools chain for embedded software solution development.

Text Books:

1. *"Embedded System* Design- *A Unified system Hardwar/Software Introduction"*, Frank Vahid (3rd Edition, John Wiley India) ISBN 978-81-265-0837-2.
2. LPC 214x User manual (UM10139) www.nxp.com.
3. *"ARM System Developer's Guide – Designing and Optimizing System Software"*, Andrew N. Sloss, Dominic Symes and Chris Wright (ELSEVIER)ISBN: 1-55860-874-5.

Reference Books:

1. LPC 17xx User manual (UM10360) :- www.nxp.com
2. ARM architecture reference manual : - www.arm.com
3. *"An Engineer's Introduction to the LPC2100 series"* Trevor Martin (Hitex (UK) Ltd.)
4. "*ARM System-on-Chip Architecture*" Steve Furber (2nd Edition, Addison-Wesley Professional)ISBN-13: 9780201403527

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Final Year U.G. Program in Computer Science & Engineering

Effective from 2017-18

EMBEDDED SYSTEMS LAB

Teaching Scheme **P: 2**

Evaluation Scheme	CE	ESE	Minimum Passing Marks
	30 Marks	70 Marks	40%

Term Work:

1. Instructor will frame assignments based on the suggested list.
2. Instructor is expected to incorporate variations in list.
3. Students will submit term work in the form of a journal that will include at least 10 practical assignments.

The assessment will be based on the following

1. Performance in the practical examination.
2. Record of programs submitted by the candidate.
3. Innovation & Creativity.
4. Team building skills.
5. Technical writing skills.

Suggested list of Experiments/Programs.

Any 8 programs in embedded C based on ARM7 family members such as LPC21xx using Keil and development board.

1. 8 Bit LED and Switch Interface.
2. 7 Segment display interface.
3. Time delay program using built in Timer / Counter feature.
4. Displaying a message in a 2 line x 16 Characters LCD display.
5. I2C Interface – 7 Segment display / EPROM.
6. Interface with UART.
7. Interface with SPI.
8. Serial communication.
9. Interface with LED control ON_OFF.
10. Interface with passive infrared sensor.
11. Interface with temperature sensor.
12. Interface with push button / Interface push button to make sound box.
13. Interface a circuit to measure CPU usage with RGB LEDs.
14. Interface a circuit to make motion sensor alarm.

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CS405: Elective-III: COMPUTER GRAPHICS

Teaching Scheme L: 4 T: 0

Evaluation Scheme	**ME**	**ESE**	**Minimum Passing Marks**
	20 Marks	**80 Marks**	**40%**

Course Objectives:

1. The main objective is to introduce to the students to the graphics mode with the help of basic algorithms.
2. The objective of the course is to equip students with fundamental knowledge and basic technical competence in the field of computer graphics.
3. Provide an understanding of how a computer draws the fundamental graphics primitives.

Course Contents:

Unit -I: Introduction (06 Hrs)

Overview of computer graphics, Graphics displays, Output devices and physical interactive devices, Graphical user interfaces, Graphics image file formats.

Unit -II: Raster scan graphics (08 Hrs)

Line drawing algorithms, DDA, Bresenham's algorithm, Circle generations, Scan conversion-generation of displays, Image compression, Displaying lines, Characters and polygons, Polygon filling algorithms, Fundamentals of antialiasing, Halftoning

Unit -III: Transformations (06 Hrs)

2-D Transformations, Linear transformations, Other transformations, Combined transformation, Coordinate systems, 3-D transformations, Rotation, Scaling and translation, Reflection about any arbitrary axis.

Unit -IV: Windowing and clipping (08 Hrs)

Viewing transformations, Parallel projections, Perspective projection, Perspective transform, Two dimensional clipping, Simple visibility algorithm, Polygon clipping, 3-Dimensional clipping.

Unit -V: Hidden surface elimination (06 Hrs)

Floating horizon, Back face removal algorithms, Z-Buffer algorithm, Painters algorithm, Warnock algorithm, BSP tree methods.

Unit -VI: Rendering and curve design (06 Hrs)

Introduction, Illumination models, Transparency, Shadows, Phongs and gouraud shading.Properties of curves, Bezier and b-splines.

Course Outcomes:

At the end of the course students will

1. Understand the basic concepts of computer graphics.
2. Be able to perform processing of basic shapes by various processing algorithms.
3. Acquire knowledge about two and three dimensional transformations.

Text Books

1. *"Procedural elements for computer graphics"*, David F. Rogers (2nd Edition , Tata McGraw Hill) ISBN: : 0-07-047371-4.

Reference Books

1. *"Computer Graphics: Principles and Practice in C"*, Foley,Vandam,feinerhughes (2rd Edition, Person Education) ISBN: 978-81-317-0505-6.
2. *"Principles of Interactive computer graphics"*, Newman sproull (2rdEdition, Tata McGraw Hill) ISBN: 0-07-463293-0.
3. *"Computer Graphics: Using OpenGL"*, F. Hill, (2nd Edition, Pearson Education) ISBN: 81 – 297 – 0181 – 2

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COMPUTER GRAPHICS LAB

Teaching Scheme **P: 2**

Evaluation Scheme	CE	ESE	Minimum Passing Marks
	30 Marks	70 Marks	40%

Term Work:

1. Instructor will frame programming assignments based on the suggested list of assignments using C/OpenGL.
2. Instructor is expected to incorporate variations in list.
3. Students will submit term work in the form of a journal that will include at least 8-10 practical assignments.
4. Practical examination will consist of performance and viva-voce examination based on the term work.

The assessment will be based on the following

1. Performance in the practical examination.
2. Record of programs submitted by the candidate.
3. Innovation & Creativity.
4. Team building skills.
5. Technical writing skills.

Suggested list of assignment:

1. Implementation of Bresenhams Algorithm – Line, Circle, Ellipse.
2. Two Dimensional transformations - Translation, Rotation, Scaling.
3. Two Dimensional transformations - Reflection, Shear.
4. Composite 2D Transformations
5. Cohen Sutherland 2D clipping and Windowing
6. Three dimensional transformations - Translation, Rotation, Scaling
7. Composite 3D transformations
8. Compression Algorithms - To implement text and image compression algorithms.

9. 2D Animation – To create Interactive animation using any animation software.
10. Image Editing and Manipulation - Basic Operations on image using any image editing software, Creating gif animated images, Image optimization.
11. Any one Line clipping algorithm cohen-sutherland / liangbarsky.
12. Polygon Clipping algorithm sutherlandhodgeman.
13. Character Generation.

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CS406: IMAGE PROCESSING

Teaching Scheme **L: 4 T: 0**

Evaluation Scheme	ME	ESE	Minimum Passing Marks
	20 Marks	80 Marks	40%

Course Objectives:

1. To learn the fundamental concepts of digital image processing.
2. To study basic image processing operations.
3. To understandimage analysis algorithms that are widely used in digital image processing.
4. To expose students to current applications ofdigital image processing.

Course Contents:

Unit- I: Digital Image Fundamentals (8 Hrs)
Digital image representation, Elements of digital image processing systems, Elements of visual perception, Image sampling and quantization, Basic relationship between pixels, Introduction to OpenCV tool to Open and display Images using Python, MATLAB or Eclipse C/CPP.

Unit-II: Image Transforms (7 Hrs)
Discrete Fourier transform, Properties of 2D DFT, FFT, Walsh transform, Discrete cosine transform

Unit-III: Image Enhancement Techniques (8 Hrs)
Spatial Domain Techniques, Point processing, Neighborhood processing, Spatial domain filtering, Zooming, Enhancement based on histogram modeling, Frequency domain filtering, Image smoothing and Image sharpening using frequency domain filters.

Unit -IV:Image Compression (8 Hrs)
Fundamentals, Types of redundancies, Lossy and Lossless compression, Dictionary based coding, Run-length coding, LZW coding, Huffman coding, Arithmetic coding, Lossy predictive coding, Transform coding, Image compression model.

UNIT-V: Color image processing (6 Hrs)
Color fundamentals, Color models, Color transformation, Smoothing and Sharpening.

UNIT-VI: Image Segmentation and Representation: (8 Hrs)
Point, Line and Edge detection, Finding gradients using masks, Thresholding based image segmentation, global and local thresholding, Region based segmentation.

Course Outcomes:

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

1. Describe different modalities and current techniques in image acquisition
2. Use the mathematical principles of digital image enhancement
3. To understand various image processing techniques.
4. To write image processing programs using open source tools.

Text Books:

1. *"Digital Image Processing",*R. C. Gonzalez and Richard E Woods, 3rd Edition, Pearson Education. ISBN: 978-81-317-1934-3, 2008.
2. *"Digital Image Processing"*, Dhananjay K. Theckedath, Techmax Publication, ISBN: 978-81-8492-663-7.

Reference Books:

1. *"Digital Image Processing"*, S Jayaraman, S Esakkirajan, T Veerakumar, Tata McGraw Hill Publication, ISBN: 9780070144798
2. *"Digital Image Processing Using Matlab",* R.C. Gonzalez and R.E. Woods, Pearson Education, ISBN: 978-8177588989.
3. *"Fundamentals of Digital Image Processing",* A.K. Jain, Prentice Hall India, K.R. Castleman, " Digital Image Processing", Pearson education, 2007, ISBN: 81-317-1286.

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IMAGE PROCESSING LAB

Teaching Scheme P: 2

Evaluation Scheme	Continuous Evaluation	ESE	Minimum Passing Marks
	30 Marks	70 Marks	40%

Term Work:

1. Instructor will frame programming assignments based on the suggested list of assignments using Python / MATLAB
2. Instructor is expected to incorporate variations in list.
3. Students will submit term work in the form of a journal that will include at least 08 practical assignments.
4. Practical examination will consist of performance and viva-voce examination based on the term work.

The assessment will be based on the following:

1. Performance in the practical examination.
2. Record of programs submitted by the candidate.
3. Setting goals higher than expected from the problem statement.
4. Innovation & creativity.
5. Team building skills.
6. Technical writing skills.

Suggested list of assignment

1. Point processing in spatial domain
    a. Negation of an image
    b. Thresholding of an image
    c. Contrast Stretching of an image
2. Program to implement Bit Plane Slicing
3. Program to implement Histogram Equalization
4. To write a Program for Histogram Specification
5. Zooming an image by interpolation and replication

6. Filtering in spatial domain
    a. Low Pass Filtering
    b. High Pass Filtering
    c. Median filtering
7. Edge Detection using derivative filter mask
    a. Prewitt
    b. Sobel
    c. Laplacian
8. Data compression using Huffman coding
9. Filtering in frequency domain
    a. Low pass filter
    b. High pass filter
10. Program for color model conversion

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CS407: ELECTIVE IV: SOFTWARE TESTING AND QUALITY ASSURANCE

Teaching Scheme **L: 4**

Evaluation Scheme	**ME**	**ESE**	**Minimum Passing Marks**
	20 Marks	**80 Marks**	**40%**

Course Objectives:

1. To present the concepts, techniques and metrics for quality assurance in software development.
2. To develop a good understanding of issues, techniques and tools for software testing.
3. To develop analyzing techniques through automation testing tool.

Course Contents:

Unit-I: Introduction (06 Hrs)

Software testing background: Infamous software error Case studies, Software bug, The cost of bugs, The software development process: Product components, Software project staff, Software development lifecycle models, The realities of software testing: Testing axioms, Software testing as a disciplined technical profession, Software testing terms and definitions.

Unit-II: Testing fundamentals (08 Hrs)

Examining the specification: Getting started, Performing a high-level review of the specification, Low-level specification test techniques, Testing the software with blinders: Dynamic black-box testing, Equivalence partitioning, Data testing, State testing, Examining the code: Static white-box testing, Formal reviews, Coding standards and guidelines, Generic code review, Testing the software with x-ray glasses: Dynamic white-box testing, Testing the pieces, Data coverage, Code coverage.

Unit-III: Methods of testing (06 Hrs)

Configuration testing: Overview, Approaching the task, Design the test cases, Execute the tests Identifying hardware standards, Compatibility testing: Platform and application versions, Standards and guidelines, Data sharing compatibility, Foreign-language testing: Translation issues, Localization issues, Configuration and compatibility issues, Usability testing: User interface testing, Testing for the disabled.

Unit-IV: Automated testing and test tools (08 Hrs)

Testing the documentation: Types of software documentation, The importance of documentation testing, The realities of documentation testing, Web site testing: Web page fundamentals, Black-box testing, Gray-box testing, White-box testing, Configuration and compatibility testing,Usability testing, Introducing automation, Automated testing and test tools: Test tools, Software test automation, Random testing, Realities of using test tools and automation, Bug bashes and beta testing: Test sharing, Beta testing, Outsourcing your testing.

Unit-V: Test planning and effort (06 Hrs)

Planning your test effort: The goal of test planning, Test planning topics writing and tracking test cases: The goals of test case planning, Test case planning overview, Test case organization and tracking, Reporting what you find: Isolating and reproducing bugs, A bug's life cycle, Bug-tracking systems, Measuring your success: Using the information in the bug tracking database, Metrics that you'll use in your daily testing, Common project-level metrics.

Unit-VI: Software quality assurance (06 Hrs)

Quality concepts-What is quality? Software quality, Achieving software quality, Software quality assurance-background issues, Elements of software quality assurance, SQA processes and product characteristics, SQA tasks, Goals and metrics, Formal approaches to SQA, Statistical SQA, Software reliability,Testing and quality assurance in the workplace: Software testing, Quality assurance, Other names for software testing groups, Test management and organizational structures, Capability maturity model (CMM) ISO 9000.

Course Outcomes:

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

1. Formulate problem by following Software Testing Life Cycle
2. Design Manual Test cases for Software Project.
3. Follow the process related activity and testing techniques to work as team member.

Text Books:

1. "*Software Testing*", 2nd Ron Patton, Published by SAMS, ISBN-13: 9780672327988 ISBN-10: 0672327988.
2. *"Software Engineering: A Practitioner's Approach"*, Roger S Pressman, 7th Edition, Publisher McGraw Hill,ISBN: 9789339212087.

Reference Books:

1. "*Software Testing Principle and Practices*", Ramesh Desikan, GopalaswamyRamesh, Pearson Education, ISBN: 978-81-7758-121-8
2. "*Software Testing Principles and Practices*",NareshChauhan, Publisher Oxford University Press-New Delhi, ISBN: 0-19-806184-6
3. "*Software Testing Tools",*Dr. K.V.K.K. Prasad, Dreamtech Publications ISBN: 10:81-7722-532-4.

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CS408: ELECTIVE IV: MULTIMEDIA SYSTEMS

Teaching Scheme **L: 4 T: 0**

Evaluation Scheme	**ME**	**ESE**	**Minimum Passing Marks**
	20 Marks	**80 Marks**	**40%**

Course Objectives:

1. To understand technical aspect of Multimedia Systems.
2. To understand and evaluate the process of development of Multimedia Systems.
3. To understand the framework and standards available for different Multimedia applications.

Course Contents:

Unit-I: Introduction to multimedia (06 Hrs)

What is multimedia, Properties of multimedia systems: Independency, computer support, communication systems, Global structure, Data Streams: Traditional and Continuous, Multimedia system Architecture: IMA, workstation, network architecture, Evolving Technologies.

Unit-II: Audio/Sound and speech (08 Hrs)

Basic sound concepts: Computer representation sound, Audio file formats, MIDI: basic concepts, MIDI devices, MIDI messages, SMPTE timing standards, MIDI Software, WAV, AVI , MPEG audio. Audio compression: Compression in audio PCM, DM, DPCM, ADPCM, Speech generation, analysis, transmission.

Unit-III: Images, video and animation (06 Hrs)

Digital image representation, image format, Graphics format, Computer image processing: Synthesis, Analysis, Transmission. Video signal representation, Video format.Conventional systems, Enhanced definition systems, High definition systems, Computer-based animation.

Unit-IV: Data compression and operating systems (08 Hrs)

Storage space, coding requirements, Source, Entropy and hybrid coding, JPEG and standards, H.261, MPEG and standards, DVI, Introduction, Real time, Resource management, Process management, File systems: Traditional and multimedia. System architecture, H.264.

Unit-V: Optical storage and database systems (06 Hrs)
Optical storage media: CD, CDROM, Multimedia database management system, Characteristics of an MDBMS, Data analysis, Data structure: Raw data, Registering data, Descriptive data, Operation on data, Integration in a database model.

Unit-VI: Multimedia networks, communication systems and applications (06 Hrs)
Networks, Application sub-systems, Transport sub-systems, Quality of service and resource management, Multimedia applications,Virtual reality: Concept, VR devices and VR applications.

Course Outcomes:

At the end of the course students will

1. Be able to understand the relevance and underlying infrastructure of multimedia systems.
2. Be capable to apply their multimedia knowledge to understand the current requirements of multimedia products.

Text Books

1. *"Multimedia: Computing, Communications and Applications"*, Steinmetz Ralf andNahrstedtKlara , Pearson Education, ISBN: 978-81-7758-441-7.

Reference Books

1. *"Multimedia System design"*, Prabhat K. Andheigh, KiranThakrar, PHI Publication, ISBN: 81-203-2177-4.
2. *"Fundamentals of Multimedia"*, Ze-Nian Li &Mark.S.Drew, Pearson Education, ISBN - 978-81-203-2817-4.

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CS409: ELECTIVE IV: E-COMMERCE

Teaching Scheme L:4 T:0

Evaluation Scheme	**ME**	**ESE**	**Minimum Passing Marks**
	20 Marks	**80 Marks**	**40%**

Course Objectives:

1. To understand What E-Commerce is.
2. To study application of E-Commerce.
3. To learn business models and governance structures in E Governance.
4. To study the effects of Information Technology on E Governance.
5. To learn mobile commerce technologies and to apply the same on E-Markets.

Course Contents:

Unit-I: Introduction to e-Commerce (8 Hrs)
Framework3, Architecture, Benefits and Impact of e-Commerce, The Anatomy of e-Commerce applications, e-Commerce Consumer applications, e-Commerce Organisation Applications. Internet Protocol Suite: Layers and networking, Internet Protocol suite, Desktop TCP/IP, Mobile TCP/IP, Multicast IP.

Unit–II: E-commerce Models and World Wide Web (6 Hrs)
ArchitecturalFramework for Electronic commerce, WWW as architecture, Web background: hypertext publishing, technology behind the web, security and the web.

Unit–III: e-Advertising & Marketing (6 Hrs)
The new age of information-based Marketing, Advertising on the Internet, Charting the On-Line Marketing process, Market Research.

Unit-IV: Electronic Payment Systems (8 Hrs)
Types of Electronic Payment Systems, Digital Token- based electronic payment systems, smart cards and electronic payment systems, credit card based Electronic payment systems, risk and electronic payment systems, designing electronic payment system.

Unit-V: Electronic Data Exchange (6 Hrs)

EDI- Definitions & Applications in business, EDI: Legal, Security, and Privacy issues, EDI and Electronic commerce.EDI Implementation**:** Standardization and EDI, EDI Software implementation, EDI Envelope for message transport, Internet based EDI.

Unit-VI: E-Security (6 Hrs)

Securing the business on internet-security policy, Procedures and practices, Transaction security, Cryptology, Digital signatures, Security protocols for web commerce.

Text Books:

1. *"Frontiers of E-commerce"*, Kalakota&WinstonPearson Education, Mumbai, 2002ISBN-10: 0201845202,ISBN-13: 978-0201845204.

References:

1. *"E-Commerce- Strategy technologies and Applications"*, David Whiteley, Tata Mac-Graw Hill, New Delhi, 2000. ISBN 10: 0007097662, ISBN 13: 9780007097661.

2. *"E-Commerce, the Cutting Edge of Business"*, Kamalesh K Bajaj &Debjani Nag Tata McGraw-Hill, New Delhi, 2002. ISBN: 9780070585560, 0070585563

Course Outcomes:

At the end of this course, students will be able to

1. Describe E-Procurements and E-Business Networks.
2. Define E-Commerce services for consumers and businesses.
3. Understand E & M Governance standards and service development technology in M-Commerce.

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CS410: ELECTICE IV: INFORMATION PROCESSING AND RETRIEVAL

	Teaching Scheme	**L:4**	**T: 0**
Evaluation Scheme	**ME**	**ESE**	**Minimum Passing Marks**
	20 Marks	**80 Marks**	**40%**

Course Objectives:

1. To understand the basics of information processing and retrieval techniques.
2. To understand different modeling and indexing techniques
3. To know how to evaluate Information retrieval.
4. To know about text clustering.

Course Contents:

Unit-I: Introduction (8 Hrs)

Basics of information retrieval and introduction to search engines; Boolean retrieval-: Boolean queries, Building simple indexes, Processing boolean queries. Term Vocabulary and Posting Lists-Choosing document units, Selection of terms, Stop word elimination, Stemming and lemmatization, Skip lists, Positional postings and Phrase queries; Dictionaries and tolerant retrieval: Data structures for dictionaries, Wildcard queries, Permuterm and K-gram indexes, Spelling correction, Phonetic correction.

Unit-II: Index construction (6 Hrs)

Single pass scheme, Distributed indexing, Map reduce, Dynamic indexing; Index compression - Statistical properties of terms, Zipf's law, Heap's law, Dictionary compression, Postings file compression, Variable byte codes, Gamma codes.

Unit-III: Vector space model (8 Hrs)

Parametric and zone indexes, Learning weights, Term frequency and weighting, Tf-idf weighting, Vector space model for scoring, variant tf-idf functions. Computing scores in a complete search system- Efficient scoring and ranking, Inexact retrieval, Champion lists, Impact ordering, Cluster pruning, Tiered indexes, Query term proximity, Vector space scoring and query operations;

Unit-IV: Evaluation in information retrieval (6 Hrs)

Standard test collections, unranked retrieval sets, Ranked retrieval results, Assessing relevance, User utility, Precision and recall**,R**el**e**vanc**e** fe**e**db**a**ck, Rocchio algorithm, Probabilistic relevance feedback, Evaluation of relevance feedback.

Unit-V: Probabilistic information retrieval (6 Hrs)

Review of basic probability theory, Probability ranking principle, Binary independence model, Probability estimates, probabilistic approaches to relevance feedback. Text classification-Rocchio classifier, KNearest neighbor classifier, Linear and nonlinear classifiers, Bias-variance tradeoff, Naïve Bayes and Support Vector machine based classifiers.

Unit-VI: Text clustering (6 Hrs)

Clustering in information retrieval, Evaluation of clustering, KMeans and Hierarchical clustering. Introduction to linear algebra, Latent semantic indexing.

Text Books:

1. *"An Introduction to Information Retrieval"*, C. D. Manning, P. Raghavan, and H. Schutze, ,CambridgeUniversity press, 2009.ISBN-10: 1107666392, ISBN-13: 978-1107666399.

Reference Books:

1. *"Modern Information Retrieval"*, R. Baeza-Yates and B. Ribeiro-Neto, Pearson Education, 1999.ISBN-10: 020139829X, ISBN-13: 978-0201398298.

Course Outcomes:

At the end of this course, students will be able to:

1. Identify the problems related to information processing.
2. Solve the problems related to information retrieval using different models.
3. Implement text clustering with multiple methods.

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CS411:BEHAVIOURAL SCIENCE (AUDIT COURSE)

Teaching Scheme **L: 2 T:0**

Evaluation Scheme	**ES**	**Minimum Passing Marks**
	50Marks	**40%**

Course Objectives:

1. Develop him/her as Team leader
2. Improve the interpersonal relationship skills
3. Learn Problem solving and decision making skills
4. Discuss a particular topic in group and face the interview.
5. Build the team and develop the team spirit among the team members.

Course Contents:

Unit-I: Leadership **(03Hrs)**

Management education-History, Development, Importance, Areas of specialization, need and importance of behavioral science, Meaning and Types of leaders, Qualities of leader, Examples leadership-definition, importance, Leadership in various organizations,Leadership styles-task- people matrix. Persuasive, Authoritative, Democratic, Delegative leadership styles.Maturity of followers, situational leadership.

Unit-II: Motivation and counseling **(04 Hrs)**

Meaning, Importance of motivation, Types of motivation-intrinsic, Extrinsic, Examples, Maslow's motivation theory-pyramid of needs,individual and industrial, applications, Tips for motivation.

Unit-III: Team building **(03Hrs)**

Teams-needs, Definition, Difference between groups and team, Characteristics of a good team, Steps in teamformation- forming, Norming, storming, performing, adjourning, Roles of team members, Characteristics of a good team member, Types of teams-work, mgmt, cross functional, quality circle, self-managed team

Unit-IV: Conflict resolution **(03 Hrs)**

Definition, Types (Interpersonal, Intrapersonal, groups), Indicators of conflicts, Sources of conflicts – ego, Poorly defined authority and responsibility, Power, Interests, Greed, Difference in value systems, Complex work situations, Skills for conflicts resolution, Steps in conflicts managements- Mapping of conflicts, Negotiation- steps in negotiation,Styles of conflicts management- collaborating, Competing, Cooperating, Avoiding, Compromising.

Unit-V: Decision making (03 Hrs)

Importance of decision making, Definition characteristics of good decision, Characteristics of good decision, Types of decisions- programmed, Non programmed, Strategic, Tactical, Impulsive**,** Groups decision making, Steps of decision making.

Unit-VI: Group Discussion and Interview Techniques (04 Hrs)

Job search opportunities, Development of resume and cover letter- essentials of a goods resume, Contents of resume, Layout of resume, Cover letter, Groups discussions- objectives, Do's and don'ts for effective participation, Evaluation parameters, Suggested topics, Psychometric tests- Aptitude test, Guidelines for preparations for aptitude test, Personality test, Personal interview- guidelines for preparing for job interviews, Common questions.

List of Assignments:

1. Case study: Employee motivation and leadership.
2. To build a tower from a given material as a team activity
3. To prepare jigsaw puzzles (common shapes) from the given jigsaw pieces as a team.
4. Case study on conflicts resolution
5. Assess your style of conflicts resolution
6. Decision making activity :of selection of the best suitable company
7. Participate in a guided group discussion
8. Assessment of self-aptitude in numerical computation, estimation, data interpretation, mechanical, spatial and abstract reasoning
9. Assessment of self- aptitude in verbal ability and data checking.
10. Development of resume and covering letter

Reference Books:

1. *"Principles of Managements and organizational behavior"*, Dr. Kumkum MukherjeeTata McGraw Hill Education Pvt Ltd ISBN: 978-0070085657.
2. *"Soft skills for managers"*, Dr. T. KalyanaChakravarti**,** Dr. T. LathaChakravati, ISBN: 978-8177225686.
3. *"Personality development and soft skills"*, PriyadarshiniPatnaik, Foundation Books, ISBN: 978-0198066217

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CS412: Programming Lab-VI

	Teaching Scheme	**L:2**	**P:2**
Evaluation Scheme	**Continuous Evaluation 30 Marks**	**ESE 70 Marks**	**Minimum Passing Marks 40%**

Course Objectives:

1. To study the window and web based application development using .net framework.
2. Understanding the integration of database.
3. To learn CLR environment for project development.

Course Contents:

Unit-I:Introduction to HTML (3Hrs)

What is HTML?, HTML documents, Basic structure of an HTML document, Mark up tags, Heading-paragraphs, Line breaks, HTML tags, Working with text, Working with lists, Tables and frames, Working with hyperlinks, Images and multimedia, Working with forms and controls.

Unit-II: Javascript (3Hrs)

Introduction to client side scripting, Syntax basics, Operators, Comparisons, Statements, Loops, Events, Objects, User defined functions, Validations using object functions, Validations using regular expressions, JS document object model, Popovers, Windows.

Unit-III: C# and object oriented C# (3Hrs)

Introducing to C#, Understanding .NET framework, Overview of C#, Variables, Data types, Operators, Expressions, Branching, Looping, Methods, Type casting, Constant, Arrays, String, Enumerations, Object oriented c#: Class, Objects, Inheritance, Polymorphism, Interface, Abstract class, Operator overloading, Delegates, Events, Errors and exception, Threading.

Unit-IV: Window based applications (3Hrs)

Building windows application, Window forms with events and controls, Menu creation, inheriting window forms, SDI and MDI application, Dialog box(Modal and Modeless), Accessing data with ADO.NET, SQL server with ADO.NET, Handling exceptions, Validating controls.

Unit-V: Web based applications (3Hrs)

Programming web application with web forms, ASP.NET introduction, Working with standard controls, Using validation controls, Working with rich and navigational controls, Designing website with master page, XML and .NET, Session management techniques, Web.config.

Unit-VI: **ASP.NET with database and CLR (4Hrs)**

Overview of Data Access, SQLdatasource control, Working with list and GridView control,Using DetailsView and FormView controls, Assemblies, Attributes, Viewing metadata, Type discovery, Marshaling.

Term Work:

1. Instructor should frame assignments/programs based on the suggested list of assignments as given below. Instructors are expected to incorporate variations in list.
2. Students should submit Term Work in the form of a journal that will include at least 10 assignments/programs or a mini-project using above technologies.
3. Each programming assignment will consists of pseudo-algorithm, program listing with proper documentation and printout of the output.
4. Practical Examination will consist of Performance and Viva-voice Examination based on the term work.

The assessment will be based on the following:

1. Performance in the practical examination
2. Record of programs submitted by the candidate.
3. Setting goals higher than expected from problem statement
4. Innovation and Creativity.
5. Team building skills
6. Technical writing skills

Suggested list of assignments:

1. Create a simple Time Table program in C#.net.
2. Create a C# application for adding nodes to a tree view.
3. Adding a Web Browser to a Windows Form in C# .NET.
4. Create a C#. Net application for manipulating files.
5. Implement the feature of Drawing Polygons in C# .NET.
6. Create a SQL Server Express database and Connect to it.
7. Create a .Net application for Getting the values on the another form.
8. Working with datasets and data adapters in C# .NET
9. Write the Steps for configure IIS with Asp.Net
10. Write an Asp.Net Program to print a Message on web form.
11. Write an Asp.Net Program to Create Simple Web Application using two or more web form.
12. Write an Asp.Net Program to set a link for new Page.

13. Write an Asp.Net Program to Delete Items from Dropdown list and List box.
14. Write an Asp.Net Program to set Image on Image Control according to selection of image name from dropdown list.
15. Write an Asp.Net Program to demonstrate use of Master Page using Themes.
16. Write an Asp.Net Program to perform Insert and update operation in Database.
17. Write an Asp.Net program to perform Search and Delete operation in Database.
18. Write an Asp.net program to display the records from database using Data Reader Object.
19. Write an Asp.Net Program to demonstrate the various methods of Dataset Object.
20. Write an Asp.Net Program to demonstrate Login Page using Database.

Course Outcomes:

At the end of the course students will

1. Analyze the basic structure of a C# application.
2. Be able to develop Window based live applications on .NET.
3. Understand process of executing a web application on a webserver.
4. Be able to design and develop Web based applications on .NET.
5. Understand the syntax and functions available to deal with file processing for files.

Text Books:

1. *"HTML: The Complete Reference"*, Thomas A. Powell, Osborne/McGraw-Hil, ISBN: 978-0072119770.
2. *"C#: The Complete Reference"*, Herbert Schildt, Osborne/McGraw-Hil, ISBN: 978-0072134858
3. *"ASP.NET: The Complete Reference"*, Matthew Macdonald, McGraw Hill, ISBN: 978-0070495364

Reference Books:

1. *"Programming C#",*J. Liberty, O'Reilly, ISBN: 0596004893.
2. *"JavaScript: The Good Parts",*Douglas Crockford, O'Reilly, ISBN: 9782744055973.
   "Microsoft® .NET: Architecting Applications for the Enterprise", Microsoft Press;1st edition, ISBN: 978-0735626096.

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Final Year U.G. Program in Computer Science & Engineering

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CS413: PROJECT- A

Teaching Scheme		**P: 4**	
Evaluation Scheme	**CE**	**ESE**	**Minimum Passing Marks**
	50 Marks	**50 Marks**	**40%**

Evaluation criteria

The continuous evaluation of term work shall be of 50 Marks. The 45 Marks shall be distributed over 03 internal assessments / reviews during the semester by a review committee. The remaining 05 Marks shall be awarded for attendance. The Head of the department shall constitute the review committee. The student shall make a presentation on the progress made before the committee. The 50 Marks of the practical will be awarded based on the performance in the practical examination conducted by the University at the end of the semester.

General suggestions and expectations / guidelines

1. Two different projects can be done in Semester VII and Semester VIII **OR** a single project can be continued in two semesters depending on the scope of the project and approval from the Head of Department.
2. Project work must be carried out by the group of **at most two** students and in special case three (subject to approval by HOD) , who will jointly work and implement the project. **The work must be original**.
3. To proceed with the project work it is very important to select a right topic. The Project can be undertaken on any subject addressing Computer Science and Engineering / any subject studied in previous semesters. Research and development projects on problems of practical and theoretical interest should be encouraged.
4. The project shall be any one of the following:
    - Creation of software, hardware or middleware related to Computer Science technologies
    - Fabrication of devices, preferably those devices energized from converging technologies .
    - Creation of experimental setup and experimentation based on technological literature in the public domain .
5. Students should submit the Project Topic along with Project Abstract and Team Members' details for the approval. Project Topic Must be approved by the HOD and Project Coordinator.

6. The project work can be undertaken in a research institute or organization / company / any business establishment after taking prior approval of the HOD.
7. Before Implementation students must submit the project documentation in the form of SRS (i.e. System Specification Requirements) that includes:

- System Details
- Data Model (If Back End is used) /ER Diagrams /DFD and UML diagrams.
- Module Description
- Module allocation to every team member

8. Even though the project is a Group Activity, it still needs contribution of every team member as an individual; hence each team member must equally contribute in implementation of the project.
9. The Project Report format will be decided by the Project Coordinator and same should be followed by the students.
10. Student must submit Project report at least 2 weeks before the end of semester.
11. If a project is found to be Purchased/Downloaded/Copied, it will be rejected at any stage and the team will be penalized or declared failed as decided by the examiners.
12. Students can continue with same Project Topic for VIII Semester with the prior approval. HOD will approve the same depending upon the scope of the project.
13. If a **one semester project** is undertaken then:

(a) For Project I : The group should complete the Project-I in Semester VII only and prepare a project report in **Spiral Bound** which contains the following details:- Abstract, Project overview, Problem Statement, Requirement Analysis, Project design, Implementation Details, Technologies used, Results, Conclusion and References.

(b) For Project II : The group will submit the name of the New Project with a synopsis of the proposed work of not more than 03 to 08 pages. The group will submit a final **Hardbound** project report at the end of VIII semester as per specified format.

14. If a **two semester project** is undertaken then:

For Project I : The group will submit the name of the project with a synopsis of the proposed work of not more than 03 to 08 pages. The group should complete detail system analysis and design, data flow design, data structure layout, file design, Procurement of Hardware and/or software requirements, and partial implementation of the project in Semester VII. The group should prepare a **Spiral Bound** project report containing the work carried out in Semester VII and implementation plan for Semester VIII at the end of the Semester VII as a part of the term work submission.

For Project II : The group will continue to work on the project selected during the Semester VII and submit a final **Hardbound** project report at the end of Semester VIII containing complete implementation of the project with results, conclusion and future work as per specified format.

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CS414: INDUSTRIAL TRAINING/ INTERNSHIP/ REPUTED CERTIFIED COURSE /MINI PROJECT-II

Teaching Scheme: 4/6 Week Internship/Training in summer vacation

Evaluation Scheme	Continuous Evaluation 50 Marks	Minimum Passing Marks 40%

Course Objectives:

The internship will provide students with the opportunity to:

1. Gain practical experience within the business environment.
2. Acquire knowledge of the industry in which the internship is done.
3. Apply knowledge and skills learned in the classroom in a work setting.
4. Develop a greater understanding about career options while more clearly defining personal career goals.
5. Experience the activities and functions of business professionals.
6. Develop and refine oral and written communication skills.
7. Identify areas for future knowledge and skill development.
8. To get an exposure of working of an organization
9. To relate theoretical concepts and organizational functioning
10. To learn real life application of Management
11. Should study the industry profile, background, Vision, Mission, Quality policy, Product/service profile
12. Detailed study of various departments and the product life cycle

Course Description:

An internship experience provides the student with an opportunity to explore career interests while applying knowledge and skills learned in the classroom. The experience also helps students gain a clearer sense of what they still need to learn and provides an opportunity to build professional networks. Every student should undergo industrial training or technical training for a period of one month during summer vacation. In case the students do not get an opportunity for training as mentioned he/she can do certified course or a mini-project in summer vacation in the institute. He/she has to prepare and submit report which will be evaluated through the seminar given by student in the first term of the final year. Industrial Training refers to work experience

done during the program of study that is relevant to professional development prior to graduation. The fundamental objective of Industrial Training is to prepare students for future employment in their chosen engineering discipline. Industrial Training enhances the academic material studied at University by allowing students to practice what they have learned and to develop key professional attributes.

Evaluation scheme:

Parameters	**Weightage**
Selection in Industry for internship through recruitment drive	10%
Organizational Feedback /Certificate	20%
Internship Experience Report, Resume	30%
Internship Verification /Evaluations	20%
Presentation/Final Class	20%

Course Contents/Expectations:
To receive credit for the internship, students are required to join the software industry and complete all assignments and turn them in by the deadline, and present yourself in a professional manner at all times. Students are responsible for all materials and announcements related to the course. Additionally, students are representing themselves, as an engineering college interns at the organization. Students are expected to:

1. Arrive at work as scheduled, ready to work, and stay for the agreed upon time
2. Present yourself in a professional manner at all times, including being appropriately dressed for your workplace
3. Communicate any concerns with your supervisor and the internship coordinator in a timely manner and respectfully
4. Demonstrate enthusiasm and interest in what you are doing; ask questions and take initiative as appropriate
5. Complete and submit assigned tasks by designated timelines. Meet all deadlines
6. Participate in assigned meetings at work and with the internship coordinator when you return to college
7. Keep track of and accurately report internship hours worked.

List of certified courses:

- IOT
- COURSE CGI (COMPUTER GENERATED IMAGINERY)
- WORKSHOP IN BIG DATA-CO
- COURSE IN SAP BUSINESS
- COURSE IN MACHINE LEARNING (INTERMEDIATE)
- ADVANCED STUDY PROGRAM IN WEB DESIGN
- TOP GRADE TRAINING CYCLE IN WEB APPLICATION DEVELOPMENT
- COURSE IN GRAPHIC DESIGN ESSENTIALS (ADOBE PHOTOSHOP)
- ADVANCED DIPLOMA IN ANIMATION FOR GAME, FILM, & VISUAL EFFECTS

- PROGRAMMING IN JAVA
- CISCO CERTIFIED NETWORK ASSOCIATE (CCNA)
- CISCO CERTIFIED NETWORK PROFESSIONAL ROUTING AND SWITCHING (CCNP)
- CISCO CERTIFIED NETWORK ASSOCIATE SECURITY CREDENTIAL (CCNA)
- MICROSOFT CERTIFIED SOLUTIONS DEVELOPER FOR WEB APPLICATIONS (MCSD)
- MICROSOFT CERTIFIED SOLUTIONS ASSOCIATE WINDOWS SERVER 2012 (MCSA)
- CERTIFIED INFORMATION SECURITY MANAGER (CISM)
- PROJECT MANAGEMENT PROFESSIONAL (PMP)
- CERTIFIED INFORMATION SYSTEMS SECURITY PROFESSIONAL (CISSP)
- SOFTWARE DEVELOPMENT ASSOCIATE CERTIFICATION (SDA)

- MCITP
  - Microsoft Certified IT Professional
- MCTS
  - Microsoft Certified Technology Specialist (MCTS)

- MCPD
  - Microsoft Certified Professional Developer (MCPD)
- CCNA
  - Cisco Certified Network Associate (CCNA)
- PMP
  - Project Management Professional (PMP)
- MCSE/MCSA
  - Microsoft Certified Systems Engineer (MCSE) and Microsoft Certified Systems Administrator (MCSA)
- CISSP
  - Certified Information Systems Security Professional (CISSP)
- Linux+

Mini-Project-II:

General suggestions and expectations:

- The project shall be developed in suitable programming language
- The students may choose the theory concepts they studied in different subjects as project topic.
- Interdisciplinary project proposals and innovative projects are encouraged and more appreciable.
- The project topic can be suggested by the staff member or it can be proposed by the students.

- The project topic shall be approved by the internship coordinator.

The internship coordinator are advised to give projects and suggest project titles focusing more on the current field of research and ensure the level of innovation.

- A project team shall contain a maximum of 1 member.
- The project work should be properly distributed among the team members.
- Students should submit the project documentation at the beginning of the semester consisting of:
  - Title
  - Abstract
  - Modules Split-up
  - Deliverables for each review
  - Data Model (If Any)
  - Details of Team Members
  - Reviews for the project work will be conducted at regular intervals by the panel of examiners formed by the Head of the Department.
  - The student failing to attend the project review will be subject to strict action as decidedby the Head of the Department.
  - Throughout the semester at any point of time if students are found to be involved in any of the following:
    - Using project codes available on the Internet
    - Using project codes developed by someone else
    - Using project work which is already submitted in other institute or university
    - Such students shall be declared failed or penalized as decided by the Examiners.
    - The students must arrange regular meetings with the guide and present progress of project work.
    - A Spiral bound Project report to be prepared as per the guidelines and format given by the Department
    - The guides are advised to check for the formatting of the presentation and project report.
    - Students must submit a report well before the end of the semester.

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Semester – VIII

CS416: MOBILE COMPUTING

Teaching Scheme		**L: 4 T: 0**	
Evaluation Scheme	**ME** 20 Marks	**ESE** 80 Marks	**Minimum Passing Marks** 40%

Course Objectives

1. To understand characteristics of local and wide area wireless technologies such IEEE 802.11, Bluetooth, 802.11 and GSM.
2. To understand network and transport protocols for wireless networks, including mobile IP and variants of TCP
3. To know the basics of WAP and WML

Course Contents:

Unit–I: Introduction to mobile communication (06 Hrs)

Need and Applications of wireless communication, Frequencies for radio transmission, Mobile and wireless devices, Mobile OS- PalmOs, Win CE, Android.

Unit–II: Wireless communication fundamentals (08 Hrs)

Multiplexing – Space division, Frequency division, Time division and code division. Spread spectrum-DSSS and FHSS, Cellular systems, Motivation for a specialized MAC: Hidden and Exposed terminals, Near and far terminals, SDMA, FDMA, TDMA, CSMA - collision avoidance – polling, CDMA, Comparison of S/T/F/CDMA.

Unit–III: Telecommunication systems (08 Hrs)

GSM: Mobile services, System architecture, Radio interface, Protocols, Localization and Calling, Handover, Security; DECT: System architecture, Protocol architecture;

Unit–IV: Wireless LAN (08 Hrs)

Infrared vs. Radio transmission, Infrastructure and Ad hoc networks, IEEE 802.11: system architecture, Protocol architecture, Physical layer, Medium access control layer, MAC management; Bluetooth: User scenarios, Architecture, Radio Layer, Baseband layer, Link manager protocol.

Unit-V: Mobile Network Layer and Transport Layer (08Hrs)

Mobile IP: Goals, Assumptions and requirements, Entities and terminology, IP packet delivery, Agent advertisement and discovery, Registration, Tunneling and encapsulation, Optimizations,Reverse tunneling, Ipv6, Dynamic host configuration protocol, Ad hoc networks: Routing, Transport layer : Traditional TCP: Congestion control, Slow start, Fast retransmit/fast recovery, Implications on mobility; Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission/time-out freezing, Selective retransmission, Transaction oriented TCP.

Unit-VI: Trends in Mobile Computing (07Hrs)

WAParchitecture, WAP Application environment, Wireless markup language, Wimax-Features and applications, 3G and 4G Basics, Wireless sensor networks-applications, Design issues and architecture, RFID.

Course Outcomes:

At the end of the course the students will be able

1. Understand the infrastructure to develop mobile communication system (cellular theory) and the characteristics of different multiple access techniques in mobile communication.
2. Analyze the different inter-networking challenges and solutions in wireless mobile network.
3. The ability to develop applications that are mobile-device specific and demonstrate current practice in mobile communication context.

Text Books

1. "*Mobile Communications",*Jochen Schiller, Pearson Ed. Ltd., 2nd Edition, ISBN: 978-81-317-2426-2.
2. "*Mobile Computing–Technology, Applications and Service Creation*", Asoke K. Talukdar and Roopa R Yavagal, Tata McGraw Hill, ISBN: 0-07-058807.

Reference Books:

1. *"Mobile Computing-Theory and practice"*, KumkumGarg, Pearson Ed. Ltd, ISBN: 978-81-317-3166-6.
2.*"Fundamentals of Wimax-Understanding Broadband Wireless Networking",* Andrews J. G., A. Ghosh, RiasMuhammed, Pearson Ed. Ltd, ISBN: 978-81-317-2635-8.
3. *"Wireless Communication and Networks",* William Stallings, Pearson Ed. Ltd., Second Edition, ISBN: 978-81-317-2093-6.
4. *"Principles of Wireless Networks"*, KavehPahlavan, PrasanthKrishnamoorthy, PHI/Pearson Education, 2003, ISBN: 9780130930033.

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MOBILE COMPUTING LAB

Teaching Scheme P: 2

Evaluation Scheme	Continuous Evaluation	ESE	Minimum Passing Marks
	30 Marks	70 Marks	40%

Term Work:

1. Instructor will frame programming assignments based on the suggested list of assignments using Android.
2. Instructor is expected to incorporate variations in list.
3. Students will submit term work in the form of a journal that will include at least 08 practical assignments.
4. Practical examination will consist of performance and viva-voce examination based on the term work.

The assessment will be based on the following:

1. Performance in the practical examination.
2. Record of programs submitted by the candidate.
3. Setting goals higher than expected from the problem statement.
4. Innovation & creativity.
5. Team building skills.
6. Technical writing skills.

Suggested list of assignment

1. Write a simple program for displaying “Hello, World” on your mobile screen using J2ME Wireless Toolkit/Android
2. Write a program for sending SMS to your friend by using your mobile phone. Use J2ME Wireless Toolkit/Android to develop your application.
3. Develop a simple calculator for your mobile by using Android Development Toolkit.
4. Design and Program Income Tax and Loan EMI Calculator for Mobile Phones.
5. Write a simple program to take a snapshot by using the Camera in your mobile.
6. Write a program for writing and formatting of text in WML.
7. Write a program for navigation between cards and deck.
8. Write a program for displaying of Image using WML.
9. Write a program for table properties of WML.
10. Write a program for acquiring user inputs in WML.

11. Write a program for WML scripts basics.
12. Write a program for If – else structure of WML script.
13. Assignment on latest Open Source Operating Systems for Mobile.
14. Implementation of Mobile Network using Network Simulator NS2/Qualnet or any other simulator for wireless networks
15. Mobile protocol study using omnet++
16. Setup & Configuration of Wireless Access Point (AP)

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Final Year U.G. Program in Computer Science & Engineering

Effective from 2017-18

CS417: CRYPTOGRAPHY & NETWORK SECURITY

	Teaching Scheme		**L:4 T:0**
Evaluation Scheme	**ME**	**ESE**	**Minimum Passing Marks**
	20 Marks	**80 Marks**	**40%**

Course Objectives:

1. To understand concepts of various cryptography and network security techniques.
2. To evaluate the securityof communication systems, networks and protocols.
3. To identify a variety of generic security threats and vulnerabilities.

Course Contents:

Unit-I: (6 Hrs)

Security attacks, Services & mechanisms, Model for network security, Symmetric cipher model, Substitution techniques - Caeser cipher, Monoalphabetic cipher, Playfair& Hill cipher, Polyalphbetic cipher, Transposition techniques.

Unit-II: (8 Hrs)

Modular arithmetic, Euclidean algorithm, Finite fields, Polynomial arithmetic. Block ciphers: DES, Triple DES, AES, Block cipher modes of operation. Stream cipher - RC 4, Pseudorandom number generation.

Unit-III: (6 Hrs)

Prime numbers, Fermat's theorem, Euler's theorem, Discrete logarithms, Principles of public key cryptography, RSA algorithm, Diffie-Hellman key exchange algorithm, ElGamal cryptographic algorithm, Elliptic curve cryptography.

Unit-IV: (6 Hrs)

Applications of hash functions, Requirements & security of hash functions, SHA-512, Message authentication requirements, Message authentication functions, Requirements & security of MACs, HMAC, CMAC, Digital Signatures, DSS ,ElGamal digital signature.

Unit-V: **(8 Hrs)**

Symmetric key distribution, Public key distribution, X.509 certificates, Public-key infrastructure, Remote user authentication, Kerberos, Federated identity management, Personal identity verification.

Unit-VI: **(6 Hrs)**

E-mail Security: PGP, DKIM. Web security: SSL, TLS, Secure shell. System security: Malicious softwares, Countermeasures, Distributed denial of service attacks, Firewalls.

Outcomes:

At the end of the course students will be able to:

1. Implement various concepts of cryptography and network security.
2. Analyze the security requirements of communication systems & networks.
3. Design cryptographic protocols to secure a system, networks or application.

Text Books:

1. "*Cryptography and Network Security: Principles and Practice*", William Stallings, 6th Edition, Pearson Education. (ISBN-10: 9332518777, ISBN-13: 978-9332518773)
2. "*Cryptography and Network Security*", Behrouz A. Forouzan , 2nd Edition, Tata McGraw-Hill. 2007, (ISBN-10: 007070208X, ISBN-13: 9780070702080)

Reference Books:

1. "*Applied Cryptography*", Bruce Schneier , 2ndEdition, Wiley & Sons. 2002, (ISBN-10: 0471117099, ISBN-13: 978-0471117094)
2. "*Cryptography and Network Security*", Bernard. Menezes, CENGAGE Learning, (ISBN-10:8131513491, ISBN-13: 978-8131513491)
3. "*Network Security: Private communication in Public World*" Kaufman C., Perlman R. and Speciner M, 2ndEdition, Prentice-Hall, 2002, (ISBN-10: 9332578214, ISBN-13: 978-9332578210)

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Final Year U.G. Program in Computer Science & Engineering and Information Technology

Effective from 2017-18

CRYPTOGRAPHY & NETWORK SECURITY LAB

Teaching Scheme		**P: 2**	
Evaluation Scheme	**Continuous Evaluation**	**ESE**	**Minimum Passing Marks**
	30 Marks	**70 Marks**	**40%**

Term Work:

1. Instructor will frame programming assignments based on the suggested list of assignments using C/C++/Java language.
2. Instructor is expected to incorporate variations in the list.
3. Students will submit term work in the form of a journal that will include at least 8 to 10 programming assignments. Each programming assignment will consists of pseudo-algorithm, program listing with proper documentation and print out of the output.
4. Practical examination will consist of performance and viva-voice examination based on the term work.

The assessment will be based on the following:

1. Performance in the practical examination.
2. Record of programs submitted by the candidate.
3. Setting goals higher than expected from the problem statement.
4. Innovation & creativity.
5. Team building skills.
6. Technical writing skills.

The suggested list of programming assignments:

1. Write a program to implement Caesar cipher.
2. Write a program to implement mono-alphabetic cipher.
3. Write a program to implement Hill cipher.
4. Write a program to implement Playfair cipher.
5. Write a program to implement transposition cipher.
6. Write a program to find multiplicative inverse modulo m using Euclidean algorithm.

7. Write a program to find primitive roots of a number.
8. Write a program to calculate discrete logarithms of a given number.
9. Write a program to implement RSA encryption algorithm.
10. Write a program to implement El-Gamal encryption algorithm.
11. Write a program to implement Diffie-Hellman Key exchange algorithm.
12. *Write a program to demonstrate working of DES, AES & SHA-512
13. Study of digital certificate management in web browsers.
14. Prepare survey of Verisign certificate processing.

* Students are expected to demonstrate working of above mentioned various algorithms by using inbuilt library functions preferably in Java.

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Final Year U.G. Program in Computer Science & Engineering

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CS417: Elective- V: BIG DATA ANALYTICS

Teaching Scheme			**L:4 T:0**
Evaluation Scheme	**ME**	**ESE**	**Minimum Passing Marks**
	20 Marks	**80 Marks**	**40%**

Course Objectives:

1. To learn Big Data use cases and solutions.
2. To learn to build and maintain reliable, scalable distributed systems with Apache Hadoop.
3. To apply Hadoop ecosystem components.

Course Contents:

Unit-I: Introduction to Big data (8 Hrs)

Introduction – distributed file system – Big data and its importance, Four Vs, Drivers for Big data, Big data analytics, Big data applications. Algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce.

Unit-II: Introduction to HADOOP (6 Hrs)

Big Data – Apache hadoop&hadoop ecosystem – moving data in and out of hadoop – understanding inputs and outputs of mapReduce - data serialization.

Unit-III: HADOOP Architecture (6 Hrs)

Hadoop architecture, Hadoop storage: HDFS, Common hadoop Shell commands , Anatomy of file write and read., Name node, Secondary namenode, and Datanode, HadoopMapreduce paradigm, Map and Reduce tasks, Job, Task trackers - Cluster setup – SSH &Hadoopconfiguration – HDFS Administering –monitoring &maintenance.

Unit-IV: HADOOP ecosystem and YARN (6 Hrs)

Hadoop ecosystem components - Schedulers - Fair and capacity, Hadoop 2.0 new features- NameNode high availability, HDFS federation, MRv2, YARN, Running MRv1 in YARN.

Unit-V: HDFS, Hive AND HiveQL, HBase (8 Hrs)

HDFS-Overview, Installation and shell, Java API,Hive architecture and installation, Comparison with traditional database, HiveQL - querying data - Sorting and aggregating, Map reduce scripts, Joins &subqueries, HBase concepts- Advanced usage, Schema design, Advance indexing - PIG, zookeeper - how it helps in monitoring a cluster, HBase uses zookeeper and how to build applications with zookeeper.

Unit-VI: Database for the Modern Web (6 Hrs)

Introduction to mongoDB key features, Core server tools, MongoDB through the JavaScript's shell, Creating and querying through Indexes, Document-oriented, principles of schema design, Constructing queries on databases, collections and documents ,MongoDBquery language

Course Outcomes:

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

1. Model and implement efficient big data solutions for various application areas using appropriately selected algorithms and data structures.
2. Apply the novel architectures and platforms introduced for Big data, in particular Hadoop and MapReduce.

Text Books:

1. "*Professional Hadoop Solutions",* Boris lublinsky, Kevin T. Smith, Alexey Yakubovich, Wiley, ISBN: 9788126551071, 2015.*"*
2. *"Understanding Big data",* Chris Eaton, Dirk Deroos et al., McGraw Hill, 2012, ISBN: 978-0071790536.
3. *"HADOOP: The definitive Guide"*, Tom White, O Reilly 2012, ISBN: 978-9350237564

Reference Books:

1. *"BIG Data and Analytics",* SimaAcharya, SubhashiniChhellappan,Wiley publication, ISBN: 978-8126554782.
2. "*MongoDB in Action",*Kyle Banker, Peter Bakkum and Shaun Verch, 2nd edition Dream tech Press, ISBN: 978-9351199359.

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Final Year U.G. Program in Computer Science & Engineering

Effective from 2017-18

BIG DATA ANALYTICS LAB

Teaching Scheme P: 2

Evaluation Scheme	Continuous Evaluation	ESE	Minimum Passing Marks
	30 Marks	70 Marks	40%

Term Work:

1. Instructor is expected to incorporate variations in list.
2. Students will submit term work in the form of a journal that will include at least 5-6 practical assignments.
3. Practical examination will consist of performance and viva-voce examination based on the term work.

The assessment will be based on the following:

1. Performance in the practical examination.
2. Record of programs submitted by the candidate.
3. Setting goals higher than expected from the problem statement.
4. Innovation & creativity.
5. Team building skills.
6. Technical writing skills.

Suggested list of assignments

1. To understand the overall programming architecture using Map Reduce API
2. Store the basic information about students such as roll no, name, date of birthand address ofstudent using various collection types such as List, Set and Map
3. Basic CRUD operations in MongoDB
4. Retrieve various types of documents from students collection
5. To find documents from Students collection
6. Develop Map Reduce Work Application
7. The HDFS tables and loading them in Hive and learn joining of tablesCreating in Hive

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Final Year U.G. Program in Computer Science & Engineering

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CS418: ELECTIVE-V: DISTRIBUTED SYSTEM

Teaching Scheme L:4 T:0

Evaluation Scheme	ME	ESE	Minimum Passing Marks
	20 Marks	80 Marks	40%

Course Objectives:

1. This course provides an introduction to the fundamentals of distributed computer systems, assuming the availability of facilities for data transmission.
2. To learn the principles, architectures, algorithms and programming models used in distributed systems.
3. The structure of distributed systems using multiple levels of software is emphasized. Specific topics include: distributed algorithms, distributed file systems, distributed databases, security and protection distributed services such as the world-wide web.

Course Contents:

Unit-I: Introduction (08 Hrs)

Definition, Goals, Hardware and software concepts, Client server models.Communications:Layered protocols, Remote procedure call, Remote object invocation, Message oriented communications, Stream oriented communications.

Unit-II: Processes (08 Hrs)

Threads, Clients, Servers, Code Migrations, Software Agents.Naming:Naming entities, Locating mobile entities, Removing unreferenced entities.

Unit-III: Synchronization (04Hrs)

Clock synchronizations, Logical clocks, Global states, Election algorithms, Mutual exclusion, Distributed transactions.

Unit - IV: Consistency and replications (08Hrs)

Introductions, Data centric consistency models, Client centric consistency model, Distribution protocols, Consistency protocols. Fault tolerance:Introduction, Process resilience, Reliable client-server communication, Distributed commit, Recovery.

Unit - V: Distributed object based systems (08 Hrs)

CORBA, Distributed COM, GLOBE and their comparisons.Distributed file systems: Sun network file system, the coda file systems, other file systems and their comparisons.

Unit - VI:Distributed document based systems: (04Hrs)

The World Wide Web: Communications, Processes, Synchronization, Caching and replications Fault tolerance. Lotus notes and its comparison.

Course Outcomes:

At the end of the course students will be able to

1. Understand key features of the Distributed Systems such as Communications, Processes, Synchronization, Fault Tolerance, Consistency and Replications.
2. Use and apply important methods in distributed systems to support scalability and fault Tolerance.
3. Design and implement distributed applications of Distributed Systems.

Text Books:

1. *"Distributed System",*Tanenbaum& Steen, PHI, 2002, ISBN:0-13-148521-0.

Reference Books:

1. *"Distributed System: Concepts and Design",*Coulouris, Dollimore, Kindberg, Pearson Education, 2011, ISBN: 978-81-317-1840-7.
2. "*Distributed Operating System",*P.K.Sinha, Addison Wesely, 2003, ISBN: 6321117891.
3. *"Advanced Concept in Operating Systems",*Singhal&Shivaratri, McGraw Hill Publication, 1996, ISBN: 0-7803-1119-1.

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DISTRIBUTED SYSTEM LAB

	Teaching Scheme		**P:2**
Evaluation Scheme	**Continuous Evaluation**	**ESE**	**Minimum Passing Marks**
	30 Marks	**70 Marks**	**40%**

Term Work:

1. Instructor will frame programming assignments based on the suggested list of assignments using C, C ++ and Java language.
2. Instructor is expected to incorporate variations in list.
3. Students will submit term work in the form of a journal that will include at least 8 to10 practical assignments. Each programming assignment will consists of pseudo algorithm, program listing with proper documentation and printout of the output.
4. Practical examination will consist of performance and viva-voice examination based on the term work.

The assessment will be based on the following –

1. Performance in the practical examination.
2. Record of programs submitted by the candidate.
3. Setting goals higher than expected from problem statement.
4. Innovation & Creativity.
5. Team building skills.
6. Technical writing skills.

Suggested List of Practicals:

1. Implement the concept of RPC.
2. Implement the concept of RMI.
3. Design a Distributed Application using Message passing Interface for remote computation.
4. Implementation of Clock Synchronization (logical/physical).
5.To write Program multi-threaded client/server processes.
6. Implement concurrent echo client-server application
7. Implement concurrent day-time client-server application.
8. Configure following options on server socket and tests them: SO_KEEPALIVE, SO_LINGER, SO_SNDBUF, SO_RCVBUF, TCP_NODELAY .
9. Incrementing a counter in shared memory.

10. To Study Implementation of Election algorithm.
11. To study Implementation of Mutual Exclusion algorithms.
12. Implement Network File System (NFS).
13. Write a program using CORBA to demonstrate object brokering.

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CS419: ELECTIVE-V: COMPUTER VISION

Teaching Scheme **L: 4 T: 0**

Evaluation Scheme	**ME**	**ESE**	**Minimum Passing Marks**
	20 Marks	**80 Marks**	**40%**

Course Objectives

1. This course introduces basic concepts and techniques in computer vision.
2. Students will be able to apply a variety of computer techniques for the design of efficient algorithms for real-world applications, such as optical character recognition, face detection and recognition, motion estimation, human tracking and gesture recognition.

Course Contents

Unit–I: Introduction (6 Hrs)

Computer vision, Relationship to other fields, Role of knowledge, Image geometry, Sampling and quantization, Level of computations: Point level, Local level, Global level, Object level.

Unit-II: Shape representation (8 Hrs)

Edge detection: Gradient, Steps in edge detection, Roberts operator, Sobel operator, Prewitt operator, Second derivative operators, Laplacian operator, Second directional derivative, Laplacian of gaussian image approximation.Contours: Geometry of curves, Digital curves, Chain codes, Slope representation, Slope density function, Curve fitting, Polyline representation, Polyline splitting, Segment merging, Split and merge.

Unit-III: Color and texture (8 Hrs)

Color: Color physics, Color terminology, Color perception, Colorprocessing, Color constancy. Texture: Introduction, Statistical methods of texture analysis, Structural analysis of ordered texture, Model-based methods for texture analysis, Shape from texture.

Unit–IV: Dynamic vision (8 Hrs)

Change detection, Difference pictures, Static segmentation and matching, Segmentation using motion, Time-varying edge Detection, Stationary camera, Motion correspondence, Image flow, Computing image flow, Feature-based methods, Gradient-based methods, Variationalmethods for image flow, Robust computation of image flow, Information in image flow.

Unit–V: Object recognition (8 Hrs)

System Components**,** Complexity of object recognition**,** Object representation**,** Observer-centered representations**,** Object-centered representations**,** Feature detection**,** Recognition strategies, Classification**,** Matching**,** Feature Indexing**,** Verification**,** Template matching**,** Morphological approach**,**

Unit-VI: Optimization techniques in recognition (7 Hrs)

Genetic algorithms, Simulated annealing, Fuzzy systems: Fuzzy sets and fuzzy membership functions, Fuzzy set operators, Fuzzy reasoning, Fuzzy system design and training.

Reference Books:

1. *"Computer Vision",*Ramesh jain, RangacharKasturi, Brian G. Schunck, McGrawHill International Publication, ISBN:0-07-113407-7.
2. *"Image Processing, Analysis and Machine Vision",* Milan Sonka, Vaclav Hlavac, Roger Boyle, 2nd Edition, Thomson, ISBN:978-81-315-0300.
3. *Computer Vision: A Modern Approach"*, David A. Forsyth, Jean Ponce,1st Edition, Pearson Prentice Hall, ISBN: 81-317-0936-1.

Reference Books:

1. *"Computer Vision",*Dana H. Ballard, Christopher M. Brown, Prentice Hall, ISBN:0-13-165316-4.
2. *"Robot Vision",*Berthold K.P. Horn, MIT press, ISBN: 978-0262081597.

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COMPUTER VISION LAB

Teaching Scheme P: 2

Evaluation Scheme	Continuous Evaluation	ESE	Minimum Passing Marks
	30 Marks	70 Marks	40%

Term Work:

1. Instructor will frame programming assignments based on the suggested list of assignments using MATLAB or Python
2. Instructor is expected to incorporate variations in list.
3. Students will submit term work in the form of a journal that will include at least 06- 08 practical assignments.
4. Practical examination will consist of performance and viva-voce examination based on the term work.

The assessment will be based on the following:

1. Performance in the practical examination.
2. Record of programs submitted by the candidate.
3. Setting goals higher than expected from the problem statement.
4. Innovation & creativity.
5. Team building skills.
6. Technical writing skills.

Suggested list of assignment

1. Write a program to implement Differential motion analysis methods - Cumulative difference image
2. Write a program to implement Differential motion analysis methods - Moving edge image
3. Write a program to calculate Area, perimeter and compactness
4. Write a program for region identification (Connected component labeling) using 4 neighborhoods and 8 neighborhoods.
5. Write a program to obtain Freeman's chain code for the given image.
6. Write a program to calculate seven moments
7. Write a program for region convex hull construction
8. Write a program to implement co-occurrence matrix for given direction and given distance.
9. Write a program to calculate entropy of an image.

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CS420: ELECTIVE-V: CLOUD COMPUTING

Teaching Scheme			**L: 4 T: 0**
Evaluation Scheme	**ME**	**ESE**	**Minimum Passing Marks**
	20 Marks	**80 Marks**	**40%**

Course Objectives:

1. To provide an in-depth and comprehensive knowledge of the Cloud Computing fundamental issues, technologies, applications and implementations
2. To expose the students to the frontier areas of Cloud Computing
3. To motivate students to do programming and experiment with the various cloud computing environments

Course Contents:

Unit-I: Introduction (06 Hrs)

Cloud computing at a glance, Historical developments, Building cloud computing environments, Computing platforms and technologies, Principles of parallel and distributedcomputing- eras of computing, parallel vs. Distributed computing, Elements of parallel computing, Technologies for distributed computing.

Unit–II: Virtualization (06 Hrs)

Introduction, Characteristics of virtualized environments, Taxonomy of virtualization techniques- execution virtualization, Other types of virtualization, Virtualization and cloud computing, Pros and cons of virtualization, Technology examples- Xen: para virtualization, VMware: full virtualization, Microsoft hyper-V.

Unit-III: Cloud computing architecture (08 Hrs)

Introduction, cloud reference model-architecture, Infrastructure / hardware as a service, Platform as a service, Software as a service, Types of clouds-public clouds, Private clouds, Hybrid clouds, Community clouds, Economics of the cloud, Open challenges-cloud definition, Cloud interoperability and standards, Scalability and fault tolerance, Security, Trust and privacy organizational aspects

Unit-IV: Cloud application platform (08 Hrs)

Framework overview, Anatomy of the aneka container-from the ground up:platformabstraction layer, Fabric services, Foundation services, Application services, Building aneka clouds -

infrastructure organization, Logical organization, Private cloud deployment mode, Public cloud deployment mode, Hybrid cloud deployment mode, Cloud programming and management-aneka SDK, Management tools

Unit-V: Cloud platforms in industry (06 Hrs)

Data-intensive Computing-characterizing Data-intensive computations, Challenges ahead, Historical perspective, Technologies for data-intensive Computing-storage systems, Programming platforms, Amazon web services, Compute services, Storage services, Communication services, Additional services, Google app engine, Architecture and core concepts, Application life-cycle, Cost model observations, Microsoft azure, Azure core concepts, SQL azure, Windows azure Platform appliance

Unit-VI: Cloud security (06 Hrs)

Cloud computing software security fundamentals, Cloud information security objectives, Cloud security services, Relevant cloud security design principles. Cloud computing security architecture-architectural considerations, General issues, Identity management and access Control, Autonomic security

Course Outcomes:

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

1. Compare various cloud computing providers / Software.
2. Understand and familiarize with the basic concepts of cloud computing.
3. Understand how to build large scale distributed systems and cloud applications.
4. Comprehend the importance of cloud security.

Text Books:

1. "Mastering Cloud Computing", RajkumarBuyya, Christian Vecchiola& S. ThamaraiSelvi, McGraw Hill Education (India). ISBN: 1-25-902995-6.
2. "Cloud Security:A Comprehensive Guide to Secure Cloud Computing", Ronald Krutz and Russell Dean Vines, 1st Edition, Wiley, 2010 ISBN-10**:** 8126528095

Reference Books:

1. "Cloud Computing, Implementation, Management and Strategy", John Rittinghouse& James Ransome CRC Press, 2010 ISBN-10: 1439806802
2. " Cloud Computing Bible", Barrie Sosinsky , Wiley ISBN-10: 8126529806
3. "Cloud Computing : A Practical Approach", Anthony T Velte, Toby J Velte, Robert Elsenpeter Tata McGraw-Hill 2010ISBN-10: 0070683514
4. "Cloud Computing Principles and Paradigms", RajkumarBuyya, J.Broberg, A. Goscinski Wiley-Blackwell publications ISBN-10: 0470887990

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CLOUD COMPUTING LAB

Teaching Scheme		**L: 4 T: 0**	
Evaluation Scheme	**Continuous Evaluation**	**ESE**	**Minimum Passing Marks**
	30 Marks	**70 Marks**	**40%**

Term Work:

- Instructor should frame experiments based on the below given suggested list of experiments using C/C++/JAVA/PHP/ASP and different platform as a service tools (PAAS) such as Google App Engine, Microsoft Azure or any similar tool available. Instructors are expected to incorporate variations in the lists.
- The term work will include at least 8-10 programming assignments from cloud computing. Each assignment will consists of program listing with proper documentation and printout of the output.
- Practical examination will consist of performance and viva-voce examination on the term work.

The assessment will be based on the following:

1. Performance in the practical examination.
2. Record of programs submitted by the candidate.
3. Setting goals higher than expected from problem statement.
4. Innovation & creativity.
5. Team building skills.
6. Technical writing skills.

Suggested list of Practical Assignments:

1. Working of Google Drive to make spreadsheet and notes.
2. Installation and configuration of Justcloud.
3. Working in Cloud9 to demonstrate different language.
4. Working in Codenvy to demonstrate provisioning and scaling of a website.
5. Installation and configuration of Hadoop/ Eucalyptus
6. Working and installation of Google App Engine

7. Working and installation of Microsoft Azure
8. Working with Mangrasoft Aneka Software
9. Installation and working with virtual machine
10.Implementation of SOAPweb services in C#/JAVA applications
11.Demonstrate the use of map and reduce tasks

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CS421: ELECTIVE-VI: CYBER SECURITY

Teaching Scheme			**L:4 T:0**
Evaluation Scheme	**ME**	**ESE**	**Minimum Passing Marks**
	20 Marks	**80 Marks**	**40%**

Course Objectives:

1. To understand cyber-attack in real domain
2. To familiarize with types of cybercrimes
3. To know basics of cyber laws
4. To learn protection techniques from against from such attacks

Course Contents:

Unit–I: (7 Hrs)

Overview of vulnerability scanning, Open Port / Service Identification, Banner / Version Check, Traffic Probe, Vulnerability Probe, Vulnerability Examples, OpenVAS, Metasploit.Networks Vulnerability Scanning - Netcat, Socat, understanding Port and Services tools - Datapipe, Fpipe, WinRelay, Network Reconnaissance – Nmap,

Unit-II: (7 Hrs)

THC-Amap and System tools. Network Sniffers and Injection tools – Tcpdump and Windump, Wireshark, Ettercap, HpingKismet.The basic of Virtual Private Networks, Linux Firewall, Windows Firewall, Snort: Introduction Detection System

Unit–III: (7 Hrs)

Scanning for web vulnerabilities tools: Nikto, W3af, HTTP utilities - Curl, OpenSSL and Stunnel, Application Inspection tools – Zed Attack. Proxy, Sqlmap. DVWA, Webgoat, Password Cracking and Brute-Force Tools – John the Ripper, L0htcrack, Pwdump, HTC-Hydra

Unit–IV: Introduction to cyber crime and law (7 Hrs)

Cyber Crimes, Types of Cybercrime, Hacking, Attack vectors, Cyberspace and Criminal Behavior, Clarification of Terms, Traditional Problems Associated with Computer Crime, Digital Forensics, Computer Language, Network Language, Realms of the Cyber world

Unit–V: (6 Hrs)

A Brief History of the Internet, Recognizing and Defining Computer Crime, Contemporary Crimes, Computers as Targets, Contaminants and Destruction of Data, Indian IT ACT 2000.

Unit–VI: Introduction to cyber crime investigation (7 Hrs)

Firewalls and Packet Filters, password Cracking, Keyloggers and Spyware, Virus and Warms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow, Attack on wireless Networks

Outcomes:

At the end of course students will be able to

1. understand cyber-attack
2. understand types of cybercrimes, cyber laws
3. learn how to protect them self and ultimately society from such attacks

Text Books:

1. *"Anti-Hacker Tool Kit (Indian Edition)",*Mike Shema, Publication McGraw Hill. ISBN: 978-0-07-180015-0
2. *"Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives"* Nina Godbole and SunitBelpure, Publication Wiley ISBN-10: 8126521791

Reference Books:

1. *"Cyber Security Paperback",* Er. Abhishek Kumar Singh Er. Sushil Kumar Singh, Vayu Education of India; First edition (2015),ISBN-10: 9385077023,ISBN-13: 978-9385077029

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CS422: ELECTIVE–VI: MACHINE LEARNING

Teaching Scheme			**L:4 T: 0**
Evaluation Scheme	**ME**	**ESE**	**Minimum Passing Marks**
	20 Marks	**80 Marks**	**40%**

Course Objectives:

1. To understand the concepts of machine learning .
2. To learn aspects of computational learning theory.
3. To understand primitives in learning process by computer.
4. To appreciate the concepts and algorithms of reinforcement learning.

Course Contents:

Unit-I: Introduction (07 Hrs)

Definition of learning systems, Goals and applications of machine learning, Well posed learning problems, Designing a learning System, Perspective & issues in machine learning,Classification,Regression, Supervised learning, Unsupervised Learning, Reinforcement Learning

Unit-II: Linear models (07 Hrs)

The least-squares method, Multivariate linear regression, Regularised regression, Using least-squares regression for classification, The perceptron, Support vector , Soft margin SVM, Obtaining probabilities from linear classifiers, Going beyond linearity with kernel methods

Unit-III: Distance-based models (06 Hrs)

Neighbours and exemplars, Nearest-neighbour classification, Distance-based clustering, *K*-means algorithm, Clustering around medoids, Silhouettes, Hierarchical clustering, From kernels to distances.

Unit-IV: Tree and rule models (07 Hrs)

Decision trees, learning decision trees, ranking and probability estimation trees, regression trees, clustering trees, learning ordered rule lists, learning unordered rule lists, descriptive rule learning, association rule mining, first-order rule learning

Unit-V: Reinforcement learning (08 Hrs)

Introduction, The learning task, Active and Passive reinforcement learning, Q Learning, Nondeterministic rewards and actions, temporal-difference learning, Generalization in reinforcement learning, Relationship to dynamic programming, applications in game playing, applications in robot control

Unit-VI: Genetic algorithms (05 Hrs)

Motivation, Genetic Algorithms, Hypothesis space search, Genetic programming, Models of evolution & learning, Parallelizing Genetic algorithm

Outcomes:

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

1. Model the learning primitives.
2. Build the learning model.
3. Tackle real world problems in the domain of Data Mining, Information Retrieval, Computer vision, Linguistics and Bioinformatics.

Text Books:

1. "*Machine Learning: The Art and Science of Algorithms that Make Sense of Data*", Peter Flach (Cambridge University Press, Edition 2012), ISBN: 9781107422223.
2. "*Machine Learning*", Tom Mitchell (McGraw-Hill, 1997), ISBN: 0071154671, ISBN-13: 9780071154673.

Reference Books:

1. "*Introduction to Machine Learning*", EthemAlpaydin (PHI 2nd Edition-2013), ISBN: 9780262012430 .
2. "*Introduction to Statistical Machine Learning with Applications in R*", Hastie, Tibshirani, Friedman (Springer, 2nd Edition-2012), ISBN: 9781461471370.
3. "*Machine Learning: A Probabilistic Perspective*", Kevin P. Murphy(MIT Press, 2012), ISBN: 0262018020, 9780262018029.

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CS423: ELECTIVE–VI: HUMAN COMPUTER INTERACTION

	Teaching Scheme		**L:4 T: 0**
Evaluation Scheme	**ME**	**ESE**	**Minimum Passing Marks**
	20 Marks	**80 Marks**	**40%**

Course Objectives:

1. To provide the future user interface designer with concepts and strategies for making design decisions.
2. To expose the future user interface designer to tools, techniques, and ideas for interface design.
3. Describe and apply core methodologies from the field of HCI.
4. Design, prototype, and evaluate usable and satisfying graphical interactive computer interfaces
5. To design good/user-friendly interfaces/interaction

Course Contents:

Unit-I: Introduction to interaction design (08 Hrs)

Interaction design-Introduction good and poor design, The user experience, The process of interaction design,Interaction design and the user experience.Understanding and conceptualizing interaction: Introduction, Understanding the problem space and conceptualizing interaction, Conceptual models, Interface metaphors, Interaction types paradigms, Visions, Theories, Models and Frameworks.

Unit-II: Designing for communication and affective aspects (05 Hrs)

Cognitive aspects-Cognition,Cognitive frameworks.Social interaction: Face-to-Face conversation, Remote conversations, Telepresence co-presence. Emotional interaction: **E**motions and the user experience, Expressive interfaces. Annoying interfaces detecting emotions and Emotional technology, Persuasive technologies and behavioural change.

Unit-III: Interfaces and data analysis, interpretation, and presentation (08 Hrs)

Interfaces -Introduction, Interface types,Natural user interfaces and beyond.Data gathering: Key Issues, Data recording, Interviews, Questionnaires. Observation, choosing and combining techniques. Data analysis, interpretation, and presentation: Qualitative and quantitative, Simple

quantitative analysis, Simple qualitative analysis, Tools to support data analysis, Using theoretical frameworks,Presenting the findings.

Unit-IV: Design process (08 Hrs)

Process of interaction Design: Involvement in interaction design, Establishing requirements ,Data gathering for requirements, Data analysis, Interpretation and presentation,Task description,Task analysis.Design, prototyping, and construction: Prototyping - Conceptual design, Concrete design, Using scenarios, Generating prototypes, Construction,Interaction design in practice: Agile UX, design patterns, Open source resources, Tools for interaction design.

Unit-V:Introducing evaluation (06Hrs)

Introducing evaluation -Introduction, Types of evaluation.Evaluation studies: From controlled to natural settings. Introduction usability testing, Conducting experiments,Field studies.

Unit - VI: Analytical Evaluation (05 Hrs)

Evaluation: inspections, analytics, and models. Inspections:Introduction, Heuristic evaluation and walkthroughs,analytics, Predictive models.

Course Outcomes:

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

1. Understand the basics of human and computational abilities and limitations.
2. Understand basic theories, tools and techniques in HCI.
3. Understand the fundamental aspects of designing and evaluating interfaces.
4. Apply appropriate HCI techniques to design systems that are usable by people.

Text Books:

1. "Interaction Design: Beyond Human-Computer Interaction", 4th EditionJenny Preece, Helen Sharp, Yvonne Rogers,ISBN: 978-1-119-02075-2, ISBN: 978-1-119-08879-0
2. "User Interface Design", SorenLausen, Pearson Education Limited 2005, ISBN 0-321-18143-3.

Reference Books:

1."Human – computer Interaction", Alan Dix, Janet Finlay, Gregory D. Abowd, Rusell Beale, 3rd Edition, Pearson Education Limited, 2011, ISBN 978-81-317-1703-5.
2. The Essential Guide to User Interface Design, 3 rd edition (2007) Wiley, Wilbert O. Galitz, ISBN: 978 -0-470-05342-3.
3. Designing the user interface. 3rd Edition Ben Shneidermann, Pearson Education Asia. ISBN-13: 978-0201694970, ISBN-10: 0201694972.

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CS424: ELECTIVE - IV: BUSINESS INTELLIGENCE

Teaching Scheme		**L:4 T: 0**	
Evaluation Scheme	**ME**	**ESE**	**Minimum Passing Marks**
	20 Marks	**80 Marks**	**40%**

Course Objectives:

1. To understand the process of decision support and the key steps involved well enough to lead/manage a real-life decision support & business intelligence system project
2. To know the basics of decision support and how it facilitates business intelligence
3. To acquire knowledge on how to design BI solutions for different BI targets and users.

Course Contents:

Unit-I:Concepts with mathematical treatment (8 Hrs)

Introduction to data, Information and knowledge, Decision support system, Theory of operational data and informational data, Introduction to business intelligence, Defining BI cycle, BI environment and architecture, Identify BI opportunities, Benefits of BI. Role of mathematical model in BI, Factors responsible for successful BI project, Obstacle to business intelligence in an organization

Unit-II: Decision making concepts (6 Hrs)

Concepts of decision making, Techniques of decision support system (DSS), Development of decision support system (DSS), Applications of DSS, Role of business intelligence in DSS.

Unit-III: Data-warehouse (6 Hrs)

Introduction: Data warehouse modeling, data warehouse design, data-ware-house technology, Distributed data warehouse and materialized view

Unit-IV: Data pre-processing and outliers (8 Hrs)

Data analytics life cycle, Discovery, Data preparation, Preprocessing requirements, data cleaning, data integration, data reduction, data transformation, Data discretization and concept hierarchy generation, Model planning, Model building, Communicating results & findings, Operationalizing, Introduction to OLAP, Real-world applications, Types of outliers, Outlier challenges, Outlier detection methods, Proximity-based outlier analysis, Clustering-based outlier analysis.

Unit-V: Designing and managing BI systems (6 Hrs)

Determining infrastructure requirements, Planning for scalability and availability, Managing and maintenance of BI systems, Managing BI operations for business continuity

Unit-VI: BI and data mining applications (6 Hrs)

Data analytics, Business analytics, ERP and business intelligence, BI applications in CRM, BI applications in marketing, BI applications in logistics and production, Role of BI in finance, BI applications in banking, BI applications in telecommunications, BI applications in fraud detection, BI applications in retail industry.

Outcomes:

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

1. Operate data warehouse to meet business objectives.
2. Use Analytics concepts like data mining, Exploratory and statistical techniques for predictive analysis in Business Intelligence.
3. Demonstrate application of concepts in BI.

Text Books:

1. *"Business Intelligence and Analytics: Systems for Decision Support",* R. Sharda, D. Delen, & E. Turban, 10th Edition. Pearson/Prentice Hall, 2015. ISBN-13: 978-0-13-305090-5, ISBN-10: 0-13-305090-4
2. *"Decision Support and Business Intelligence Systems",* Efraim Turban, Jay E Aronson, Ting-Peng Liang, and Ramesh Sharda,', 8thEdition, PHI, 2006. ISBN: 0-13-198660-0

Reference Books:

1. *"Data Mining for Business Intelligence"*, Nitin R. Patel, Peter C. Bruce and GalitShmueli,Wiley publication, ISBN-10: 8126517581, ISBN-13 :978-8126517589
2. *"Successful Business Intelligence: Secrets to Making BI a Killer App"*, CindiHowson, 1st edition, McGraw-Hill Osborne Media,2007, ISBN: 0071498516

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CS425: OPEN SOURCE TECHNOLOGY LAB

Teaching Scheme L:2 P:2

Evaluation Scheme	Continuous Evaluation	ESE	Minimum Passing Marks
	30 Marks	70 Marks	40%

Course Objectives:

1. To study the web development using Hypertext Preprocessor.
2. Understanding the integration of database using PHP.
3. To learn Apache web Server and MySQL for project development.

Course Contents:

Unit-I: Introduction (3Hrs)

Evaluation of Php, Basic Syntax, Defining variable and constant, Php data type, Operator and expression, Php.ini basics, .Htaccess basics, Superglobals.

Unit-II: PHP language structure (3Hrs)

The building Blocks of PHP, Conditional statements and Looping, Flow control functions in PHP, Functions, Call by value and Call by reference, Arrays, Objects.

Unit-III: Getting involved with the code (4 Hrs)

Working with Strings, Date, and Time, Forms handling, Cookies, Sessions management, Hidden form field, Url rewriting, Working with files and directories, String matching with regular expression.

Unit-IV: PHP and MySQL integration (3Hrs)

Understanding the database design process, Connection with MySQL database, Using tsransactions and stored procedures in MySQL, Interacting with MySQL using PHP, Introduction to AJAX, PHP with AJAX, AJAX with database.

Unit-V: Deployment and integration (3Hrs)

Managing a Simple Mailing List, Logging and Monitoring Web server Activity, Working with XML, Sms API Integration, payment gateway integration.

Unit-VI: Object oriented PHP (4Hrs)

Defining class and declaring objects, Defining class methods, Constructors and destructor, Inheritance, Overriding of parent methods, Class constants and scope resolution, Use of static and final keyword.

Course Outcomes:

1. Understand process of executing a PHP-based script on a webserver.
2. Be able to develop a form containing several fields and be able to process the data provided on the form by a user in a PHP-based script.
3. Understand the syntax and functions available to deal with file processing for files on the server as well as processing web URLs.
4. Understand the syntax and use of PHP object-oriented classes.

Text Books:

1. *"Teach Yourself Linux, Apache, PHP, MySQL"*, Julie C. Meloni, Sams Publications, ISBN 13- 978- 0672- 322976 -0
2. *"Learning PHP, MySQL & JavaScript with jQuery, CSS & HTML5",* Robin Nixon, O'REILLY, ISBN-9781491906972
3. *"PHP: The Complete Reference",* Steven Holzner, Tata McGraw Hill, ISBN:9780071508544

Reference Books:

1. *"Open Source Web Development with LAMP"*, James Lee and Brent Ware, Pearson Edu. ,Inc. ISBN : 978-81-7758-035-8
2. *"The Complete reference Linux",* Peterson, Tata McGraw Hill, ISBN: 0071744320 0071744339,

Term Work:

1. Instructor should frame assignments/programs based on the suggested list of assignments as given below. Instructors are expected to incorporate variations in list.
2. Students should submit Term Work in the form of a journal that will include at least 8-10 assignments/programs or a mini-project using above technologies.
3. Each programming assignment will consists of pseudo-algorithm, program listing with proper documentation and printout of the output.
4. Practical Examination will consist of Performance and Viva-voice Examination based on the term work.

The assessment will be based on the following:

1. Performance in the practical examination
2. Record of programs submitted by the candidate.
3. Setting goals higher than expected from problem statement
4. Innovation and Creativity.
5. Team building skills
6. Technical writing skills

Suggested list of assignments:

1. Install and configure php execution environment.
2. Perform different file manipulating operations on files and directories.
3. Perform different string, date and time functions.
4. Implementation of different types of arrays and its methods.
5. Execute basic SQL commands and stored procedures.
6. Create an application for session management.
7. Create a PHP application that reads Text File into String Variable
8. Execute Error handling and exception handling mechanisms.
9. Create Email with File Attachment using mail () or smtp configuration.
10. Perform ajax to send request and retrieve data from database asynchronously.
11. Create a PHP application that will Sort Email by Date
12. Create an application Connecting to a SQL Server Express Database
13. Use the XML Documentation Features in web applications.
14. Integrate a SMS API to send sms to multiple numbers.
15. Integrate Payment gateway to make a payment in small application.

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CS426: PROJECT- B

	Teaching Scheme		**P: 4**
Evaluation Scheme	**Continuous Evaluation**	**ESE**	**Minimum Passing Marks**
	50 Marks	**50 Marks**	**40%**

Evaluation criteria

The continuous evaluation of term work shall be of 50 Marks. The 45 Marks shall be distributed over 03 internal assessments / reviews during the semester by a review committee. The remaining 05 Marks shall be awarded for attendance.The Head of the department shall constitute the review committee. The student shall make a presentation on the progress made before the committee. The 50 Marks of the practical will be awarded based on the performance in the practical examination conducted by the University at the end of the semester.

General suggestions and expectations / guidelines

1. A different projects can be done in Semester VIII **OR** the same project of the Semester VII can be continued depending on the scope of the project and prior approval from the Head of Department.
2. Project work must be carried out by the group of **at most two** students and in special case three (subject to approval by HOD) , who will jointly work and implement the project. **The work must be original**.
3. To proceed with the project work it is very important to select a right topic. The Project can be undertaken on any subject addressing Computer Science and Engineering / any subject studied in previous semesters. Research and development projects on problems of practical and theoretical interest should be encouraged.

4. The Project shall be any one of the following:
    - Creation of software, hardware or middleware related to Computer Science technologies
    - Fabrication of devices, preferably those devices energized from converging technologies.
    - Creation of experimental setup and experimentation based on technological literature in the public domain.

5. Students should submit the Project Topic along with Project Abstract and Team Members' details for the approval. Project Topic Must be approved by the HOD and Project Coordinator.
6. The project work can be undertaken in a research institute or organization / company / any business establishment after taking prior approval of the HOD.
7. Before Implementation students must submit the project documentation in the form of SRS (i.e. System Specification Requirements) that includes:
    - System Details
    - Data Model (If Back End is used) /ER Diagrams /DFD and UML diagrams.
    - Module Description
    - Module allocation to every team member
8. Even though the project is a Group Activity, still it needs contribution of every team member as an individual; hence each team member must equally contribute in implementation of project.
9. The Project Report format will be decided by the Project Coordinator and the same should be followed by the students.
10. Student must submit Project report at least 2 weeks before the end of the semester.
11. **If a project is found to be Purchased/Downloaded/Copied, it will be rejected at any stage and the team will be penalized or declared failed as decided by the examiners.**
12. If a **one semester project** is undertaken then :

    (a) For Project I : The group should complete the Project-I in Semester VII only and prepare a project report in **Spiral Bound** which contains following details:- Abstract, Project overview, Problem Statement, Requirement Analysis, Project design, Implementation Details, Technologies used, Results, Conclusion and References.

    (b) For Project II : The group will submit the name of the New Project with a synopsis of the proposed work of not more than 03 to 08 pages. The group will submit a final **Hardbound** project report at the end of VIII semester as per specified format.
13. If a **two semester project** is undertaken then :

    For Project I : The group will submit the name of the project with a synopsis of the proposed work of not more than 03 to 08 pages. The group should complete detail system analysis and design, data flow design, data structure layout, file design, Procurement of Hardware and/or software requirements, and partial implementation of the project in Semester VII. The group should prepare a **Spiral bound** project report containing the work carried out in Semester VII and implementation plan for Semester VIII at the end of the Semester VII as a part of the term work submission.

    For Project II : The group will continue to work on the project selected during the Semester VII and submit a final **Hardbound** project report at the end of Semester VIII containing complete implementation of the Project with results, conclusion and future work as per specified format.