B. E. SYLLABUS

COMPUTER SCIENCE & ENGINEERING

VII & VIII SEMESTER

With

Scheme of Teaching

& Examination

DEPARTMENT: COMPUTER SCIENCE & ENGINEERING

Sl. No.	Faculty Name	Qualification	Designation
1.	Dr. Niranjan.N. Chiplunkar	Ph.D	Principal
2.	Dr. K R Udaya Kumar Reddy	Ph.D	Professor & Head
3.	Dr. Udaya Kumar K Shenoy	Ph.D	Professor
4.	Dr. Deviprasad M	Ph.D	Professor
5.	Dr. D.K. Sreekantha	Ph.D	Professor
6.	Dr. Seetharam K	Ph.D	Professor
7.	Mrs. Jyothi Shetty	M.Tech, (Ph.D)	Asso. Prof
8.	Mrs. Sharada Udaya Shenoy	M.Tech, (Ph.D)	Asso. Prof
9.	Mr.Venugopala P.S.	M.Tech, (Ph.D)	Asso. Prof
10.	Mr. RoshanFernandes	M.Tech, (Ph.D)	Asso. Prof
11.	Mr. Radhakrishna	M.Tech, (Ph.D)	Asso. Prof
12.	Mrs. Sarika Hegde	M.Tech, (Ph.D)	Asso. Prof
13.	Mr. Raju K	M.Tech, (Ph.D)	Asso. Prof
14.	Mr. Sudeepa K.B	M.E., (Ph.D)	Asso. Prof
15.	Mr. Pradeep Kanchan	M.Tech, (Ph.D)	Asst. Prof Gd III
16.	Mr. Ravi B	M.Tech, (Ph.D)	Asst. Prof Gd III
17.	Mr. VijayaMurari T	M.Tech, (Ph.D)	Asst. Prof Gd III
18.	Mrs. Pallavi KN	M.Tech(Ph.D)	Asst. Prof Gd II
19.	Mr. Ranjan Kumar HS	M.Tech	Asst. Prof Gd II
20.	Mrs. Anisha P Rodrigues	M.Tech, (Ph.D)	Asst. Prof Gd II
21.	Mr. Raghunandan KR	M.Tech	Asst. Prof Gd II
22.	Mrs. Minu P. Abraham	M.Tech	Asst. Prof Gd II
23.	Mr. Ramesha Shettigar	M.Tech	Asst. Prof Gd II
24.	Mr. SampathKini	M.Tech	Asst. Prof Gd II
25.	Mr. Mahesh Kini. M	M.Tech	Asst. Prof Gd II
26.	Mrs. Asmita Poojary	M.Tech	Asst. Prof Gd II
27.	Mrs. Shruthi M	M.Tech, (Ph.D)	Asst. Prof Gd II

28.	Ms. Savitha	M.Tech	Asst. Prof Gd I
29.	Mr. Sannidhan M.S	M.Tech	Asst. Prof Gd I
30.	Mr. SunilkumarAithal	M.Tech	Asst. Prof Gd I
31.	Mrs. Keerthana B. Chigateri	M.Tech	Asst. Prof Gd I
32.	Mr. Pawan Hegde	M.Tech	Asst. Prof Gd I
33.	Mrs. ShabariShedthi. B	M.Tech, (Ph.D)	Asst. Prof Gd I
34.	Mr. Naveen Chandawerkar	M.Tech, (Ph.D)	Asst. Prof Gd I
35.	Mr. Krishna Prasad Rao	M.Tech	Asst. Prof Gd I
36.	Mr. Shashank Shetty	M.Tech	Asst. Prof Gd I
37.	Mrs. Divya Jennifer D'Souza	M.Tech	Asst. Prof Gd I
38.	Mr. Puneeth R.P	M.Tech	Asst. Prof Gd I
39.	Mrs. Shilpa Karegoudar	M.Tech	Asst. Prof Gd I
40.	Mrs. Rajalaxmi Prabhu	M.Tech	Asst. Prof Gd I
41.	Dr. Mohammed Javed	Ph.D	Asst. Prof Gd I
42.	Dr. Aravinda C V	Ph.D	Asst. Prof Gd III
43.	Mr. Sandeep Kumar Hegde	M.Tech	Asst. Prof Gd I
44.	Ms. Ankitha A Nayak	M.Tech	Asst. Prof Gd I
45.	Mrs. Swathi Pai M	M.Tech	Asst. Prof Gd I
46.	Ms. Rajashree	M.Tech	Asst. Prof Gd I

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

VISION:
To be a center of excellence in Computer science & Engineering education and research, empower the lives of individuals to fulfill their academic excellence, professional passions, and partnership for community development..

MISSION:
- To impart both theoretical and practical knowledge through the state-of-the-art concepts and technologies in Computer Science and Engineering.

- To inculcate values of professional ethics, leadership qualities and lifelong learning.

- To create professionals for employment in industry, research, higher education, and entrepreneurship to benefit the society.

Programme Educational Objectives (PEOs):

1. Graduates will be capable of practicing principles of Computer Science & Engineering, Mathematics and Engineering sciences to solve problems that are appropriate to the discipline

2. Graduates will be able to contribute to their profession and society

3. Graduates will be employed in computing profession or engaged in learning to pursue higher education

Programme Outcomes (POs):

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes

- Apply the knowledge of engineering science and mathematics in solving problems that are appropriate to the discipline

- Apply the knowledge of computing both hardware and software aspects to the solution of real-world engineering problems in the discipline

- Design & develop algorithms, programs, and projects using various software and modern tools appropriate to software industry or Research & Development activities in the discipline

Graduate Attributes :

Sl. No.	Graduate Attributes
a	Engineering Knowledge
b	Problem Analysis
c	Design / development of solutions
d	Conduct investigations of complex problems
e	Modern tool usage
f	The engineer and society
g	Environment and sustainability
h	Ethics
i	Individual and team work
j	Communication
k	Project management and finance
l	Life-long learning

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SCHEME OF TEACHING AND EXAMINATION

VII SEMESTER B.E.   **32 Hours / Week**

Sl. No.	Sub. Code	Subject	Theory/Tuto./Prac./ Self Study	Total Hrs./Week	C.I.E	S.E.E	Credits
1	14CS701	Object Oriented Modeling and Design	4+0+0+0	4	50	50	4
2	14CS702	Advanced Computer Architecture	4+0+0+S	4	50	50	4
3	14CS703	Software Architecture	4+1+0+0	4	50	50	4
4	14CS704	Python Programming	3+0+2+0	5	50+50	50+50	4
5	14CS71Y	Elective - IV	3+0+0+0	5	50	50	3
6	14CS72Y	Elective - V	3+0+0+0	5	50	50	3
7	14CS705	Project Phase-I**	0+0+3+0	3	50	--	1
8	14CS706	Seminar + Technical Paper Writing	0+2+0+0	2	50	--	1
		Total	**33**	**32**	**450**	**350**	**24**

Elective - IV	14CS711	Advanced Computer Networks
	14CS712	Business Intelligence
	14CS713	Advanced Web Technologies
	14CS714	Multimedia Processing
	14CS715	Programming interactivity
	14CS716	Machine learning
	14CS717	Entrepreneurship Development

Elective - V	14CS721	Network Management
	14CS722	Cryptography and Network Security
	14CS723	Image Processing
	14CS724	Service Oriented architecture
	14CS725	Bioinformatics
	14CS726	Heterogeneous Parallel Computing
	14CS727	Mobile Application Development Lab

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SCHEME OF TEACHING AND EXAMINATION

VIII SEMESTER B.E.   **22 Hours / Week**

Sl. No.	Sub. Code	Subject	Theory/Tuto./Prac./ Self Study	Total Hrs./Week	C.I.E	S.E.E	Credits
1	14HU801	Engineering Management	3+0+0+0	3	50	50	3
2	14CS81Y	Elective -VI	3+0+0+0	3	50	50	3
3	14CS82Y	Elective - VII	3+0+0+0	3	50	50	3
4	14CS8XY	Open Elective	3+0+0+S	3	50	50	3
5	14CS802	Project	0+0+9+0	9	50	50	9
			22	**22**	**250**	**250**	**21**

Elective - VI	14CS811	Decision Support System
	14CS812	Soft computing techniques
	14CS813	Ad hoc Wireless Networks
	14CS814	Game theory
	14CS815	Social and Web analytics

Elective - VII	14CS821	CAD for VLSI & VHDL
	14CS822	Supply Chain Management & ERP
	14CS823	Nano Technology and Quantum computing
	14CS824	Advanced Compilation Techniques
	14CS825	Big Data Analytics

Open Electives - offered by CSE Dept for non-IT streams:

14CS8X14: Object oriented programming with C++

14CS8X15: Essentials of Information technology (Industry elective for non-IT students)

14CS8X22: Essentials of IT service industry (For span selected students only)

Note: Wherever there is a combined theory and lab, students must score minimum passing marks in each of the component.

OBJECT ORIENTED MODELING AND DESIGN

Sub Code : 14CS701	**Credits : 04**
Hrs/Week : 4+0+0+0	**Total Hours : 52**

Course Learning Objectives:
This Course will enable students to

1. **Recall** the object-oriented concepts, three pillars of object-orientation and their benefits.
2. **Illustrate** the various models that can be used to **demonstrate** the object-oriented design of any real world software systems.
3. **Make use of** use-cases for interpreting the requirements and **develop** class diagrams that model both the domain model and design model of a software system.
4. **Examine** the dynamic aspects of a software system, **model** the interaction diagrams to **justify** those aspects.
5. **Relate** how the UML constructs are used to represent various models.

UNIT - I
INTRODUCTION, MODELING CONCEPTS, CLASS MODELING:
What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modeling history. Modeling as Design Technique: Modeling; abstraction; The three models. Class Modeling: Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model; Navigation of class models; Practical tips.
ADVANCED CLASS MODELING, STATE MODELING: Advanced object and class concepts; Association ends; N-ary associations;   **11 Hours**

UNIT – II
ADVANCED CLASS MODELING, STATE MODELING: Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages; Practical tips. State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior; Practical tips.
ADVANCED STATE MODELING, INTERACTION MODELING: Advanced State Modeling: Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model; Relation of class and state models; Practical tips. Interaction Modeling: Use case models; Sequence models; Activity models. Use case relationships; Procedural sequence models; Special constructs for activity models.   **10 Hours**

UNIT - III
PROCESS OVERVIEW, SYSTEM CONCEPTION, DOMAIN ANALYSIS: Process Overview: Development stages; Development life cycle. System Conception: Devising a system concept; Elaborating a concept; Preparing a problem statement. Domain Analysis: Overview of analysis; Domain class model; Domain state model; Domain interaction model; Iterating the analysis.
APPLICATION ANALYSIS: Application Analysis: Application interaction model; Application class model; Application state model; Adding operations.   **11 Hours**

UNIT – IV

SYSTEM DESIGN: Overview of system design; Estimating performance; Making a reuse plan; Breaking a system in to sub-systems; Identifying concurrency; Allocation of sub-systems; Management of data storage; Handling global resources; Choosing a software control strategy; Handling boundary conditions; Setting the trade-off priorities; Common architectural styles; Architecture of the ATM system as the example.   **10 Hours**

UNIT – V

CLASS DESIGN, IMPLEMENTATION MODELING, LEGACY SYSTEMS: Class Design: Overview of class design; Bridging the gap; Realizing use cases; Designing algorithms; Recursing downwards, Refactoring; Design optimization; Reification of behavior; Adjustment of inheritance; Organizing a class design; ATM example. Implementation Modeling: Overview of implementation; Fine-tuning classes; Fine-tuning generalizations; Realizing associations; Testing. Legacy Systems: Reverse engineering; Building the class models; Building the interaction model; Building the state model; Reverse engineering tips; Wrapping; Maintenance.   **10 Hours**

Course Outcomes:
At the end of the course the student will be able to:
1. **Explain** different modeling techniques.
2. **Design** and **analyze** class and state diagram.
3. **Illustrate** the process overview.
4. **Apply** various Implementation models.
5. **Analyze** legacy system.

Mapping of POs & COs:

POs COs	a	b	c	d	e	f	g	h	i	j	k	l
1		M									H	
2		H	H		M							
3		H	L		M							
3		H	H		M							
4		H										

H : High M: Medium L : Low

TEXT BOOKS:
1. Object-Oriented Modeling and Design with UML – Michael Blaha, James Rumbaugh, 2nd Edition, Pearson Education, 2005.

REFERENCE BOOKS:
1. Object-Oriented Analysis and Design with Applications – Grady Booch et al, 3rd Edition, Pearson Education, 2007.

2. Practical Object-Oriented Design with UML – Mark Priestley, 2nd Edition, Tata McGraw-Hill, 2003.
3. The Unified Modeling Language User Guide – Booch, G., Rumbaugh, J., and Jacobson I, 2nd Edition, Pearson, 2005.
4. Object-Oriented Systems Analysis and Design Using UML –Simon Bennett, Steve McRobb and Ray Farmer, 2nd Edition, Tata McGraw-Hill, 2002.

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ADVANCED COMPUTER ARCHITECTURE

Sub Code : 14CS702	**Credits : 04**
Hrs/Week : 4+0+0+S*	**Total Hours : 52**

* Self Study to be exercised under the supervision of course instructor and to be restricted to not more than 10% of the total teaching hours.

Course Learning Objectives:

This Course will enable students to

1. Outline the preamble of quantitative principles of computer architecture, various parallel computer models and fundamentals of parallel processing
2. Make use of the concept of pipelining and apply in Linear and Non Linear pipelining processors
3. Learn how to enhance a MIPS processor's ability by understanding challenges like hazards and techniques like static and dynamic scheduling
4. Get an idea of Cache coherence and Synchronisation mechanism in Multiprocessors and multicomputers and various data flow & parallel architectures
5. Summarise the fundamental aspects of Instruction Level Pipelining and utilise in case studies of itanium and Intel IA-64 Architecture along with the Hardware and Software

UNIT – I
Fundamentals of Computer Design: Introduction, Classes of Computers, measuring, reporting and summarising performance, quantitative principles of computer design (Text 1, chap: 1).
Parallel Computer Models: Shared memory multiprocessors, Distributed-Memory multicomputers(Text 3: chap 1.2). Introduction to Parallel processing: Concepts of concurrent and parallel execution, types and levels of parallelism. (Text 2: chap 3)
                                                                                    10 Hours
UNIT – II
Pipelining: introduction, the major hurdle of pipelining- pipeline hazards, How is pipelining implemented. (Text 1, Appendix A). Linear pipeline processors and Non-linear pipeline processors (Text 3, Chap 6).   **10 Hours**

UNIT - III

Instruction level parallelism: Concepts and Challenges, Basic compiler techniques for exposing ILP, Reducing branch cost with prediction, overcoming data hazards with dynamic scheduling, hardware based speculation, exploiting ILP using multiple issues and static scheduling, exploiting ILP using Dynamic scheduling, multiple issue and speculation, advanced techniques for instruction delivery and speculation. (Text 1, chap 2)

10 Hours

UNIT - IV

Multiprocessors and Multicomputers: cache coherence and Synchronisation mechanism (Text. 3: chap 7.2) Three generation of multicomputers (Text. 3: chap 7.3)

Data Flow Architecture: Data Flow and Hybrid Architecture – Data Flow Architecture (Text. 3: chap 9.5). Data Parallel Architecture: Introduction (Text. 2: chap 10), Static and dynamic interconnection networks – omega l and baseline networks (Text. 3: chap 2.4)

12 Hours

UNIT – V

HARDWARE AND SOFTWARE FOR VLIW AND EPIC (Text 1, Appendix G)

10 Hours

Course Outcomes:

At the end of the course the student will be able to:
1. Contrive the principles of computer design using parallelism, principle of locality and focus on common case.
2. Formulate how parallelism can be achieved in MIPS instructions using instruction level parallelism.
3. Explicate how to enhance a processor's ability.
4. Articulate multiprocessors in the perspective of cache coherence & synchronization mechanism.
5. Imbibe hardware and software support for the case study of Intel IA-64 architecture and itanium processor.

Mapping of COs to POs:

POs COs	a	b	c	d	e	f	g	h	i	j	k	l
1			L					H	M			
2	H				H							
3	H		H		H							
4	H							M				
5	H										L	

H : High M: Medium L : Low

TEXT BOOKS:
1. **Computer Architecture, A Quantitative Approach** – John L. Hennessey and David A. Patterson:, 4th Edition, Elsevier, 2007

2. **Advanced Computer Architectures- A Design space approach**, Dezso Sima, Terence Fountain, Peter Kacsuk, Pearson Education 1997.
3. **Advanced Computer Architecture Parallelism, Scalability** – Kai Hwang:, Programability**,** Tata Mc Grawhill, 2003.

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SOFTWARE ARCHITECTURE

Sub Code : 14CS703	Credits : 04
Hrs/Week : 4+1+0+0	Total Hours : 52

Course learning objectives:
On successful completion of this course, students will be able to:

1. **Outlines** how the architecture is influenced by organizational requirements and development strategies.
2. **Develop architecture** using different architecture styles.
3. **Make use of different case studies** to analyze the architecture.
4. **Choose different architectural pattern** and design patterns to design the architecture that yields system that has new organizational capabilities and requirements.
5. **Document** the software architecture.

UNIT-I

INTRODUCTION: The Architecture Business Cycle: Where do architectures come from? Software processes and the architecture business cycle; What makes a "good" architecture? What software architecture is and what it is not; Other points of view; Architectural patterns, reference models and reference architectures; Importance of software architecture; Architectural structures and views.

QUALITY: Functionality and architecture; Architecture and quality attributes; System quality attributes; Quality attribute scenarios in practice; Other system quality attributes; Business qualities; Architecture qualities.   **10 Hours**

UNIT-II

Achieving Quality: Introducing tactics; Availability tactics; Modifiability tactics; Performance tactics; Security tactics; Testability tactics; Usability tactics.

ARCHITECTURAL STYLES AND CASE STUDIES: Architectural styles; Pipes and filters; Data abstraction and object-oriented organization; Event-based, implicit invocation; Layered systems; Repositories; Interpreters; Process control; Other familiar architectures; Heterogeneous

architectures. Case Study: Mobile robotics.   **10 Hours**

UNIT-III

ARCHITECTURAL PATTERNS –: Introduction, Distributed Systems: Broker; Interactive Systems: MVC, Presentation-Abstraction-Control. Adaptable Systems: Microkernel.

11 Hours

UNIT-IV

SOME DESIGN PATTERNS: Structural decomposition: Whole – Part; Organization of work: Master – Slave; Access Control: Proxy. **11 Hours**

UNIT-V

DESIGNING AND DOCUMENTING SOFTWARE ARCHITECTURE: Architecture in the life cycle; designing the architecture; Forming the team structure; Creating a skeletal system. Uses of architectural documentation; Views; choosing the relevant views; Documenting a view; Documentation across views. **10 Hours**

Course outcomes
At the end of the course the student will be able to:
1. Identify the requirements which influence the architecture and development strategy.
2. Recognize architecture styles to design the architecture.
3. Analyze the architecture using different case studies and quality attributes.
4. Apply different architecture patterns and design patterns to develop architecture thatyields the system that has new organizational capabilities and requirements.
5. Make use of different views to **document** the architecture.

Mapping of POs & COs :

POs COs	a	b	c	d	e	f	g	h	i	j	k	l
1	H				H							
2	H	H					M	L				
3	H	H			H		M				M	
4	H	H					M					L
5			H						M		L	

TEXT BOOKS:
1. **Software Architecture in Practice** – Len Bass, Paul Clements, Rick Kazman, 2nd Edition, Pearson Education, 2003.
2. **Pattern-Oriented Software Architecture, A System of Patterns -Volume 1 –** Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal, , John Wiley and Sons, 2006.

3. **Mary Shaw and David Garlan**: Software Architecture-Perspectives on an Emerging Discipline, Prentice-Hall of India, 2007.

REFERENCE BOOK:
1. **Design Patterns- Elements of Reusable Object-Oriented Software** – E. Gamma, R. Helm, R. Johnson, J. Vlissides:, Addison- Wesley, 1995.

Web site for Patterns: http://www.hillside.net/patterns/

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PYTHON PROGRAMMING

Sub Code : 14CS704	**Credits : 03**
Hrs/Week : 3+0+2+0	**Total Hours : 39**

<u>**Course Learning Objectives:**</u>
This Course will enable students to
1. **Explain** the elementary programming constructs and file operations and **use** it in Python programming.
2. **Describe** the concepts like strings, conversion of strings to numbers, lists, tuples, dictionaries and use these in python programming.
3. **Illustrate** the functions, recursive functions and object oriented programming concepts in Python.
4. **Construct a Graphical User Interface (GUI) and write a multi-threaded and a** Client/Server program in Python.
5. **Perform** the database connection and Common Gateway Interface (CGI) programming in Python.

UNIT – I
Introduction to python, the concept of data types; variables, assignments; immutable variables;numerical types; arithmetic operators and expressions; comments in the program; understanding error messages;Conditions, boolean logic, logical operators; ranges;
Control statements: if-else, loops (for, while); short circuit evalauation; Strings and text files; manipulating files and directories, os and sys modules;text files: reading/writing text and numbers from/to a file; creating and reading a formatted file (csv or tab-separated).
                                                                                         7 Hours

UNIT – II
String manipulations: subscript operator, indexing, slicing a string; strings and number system: converting strings to numbers and vice versa. Binary, octal, hexadecimal numbers
Lists, tuples, and dictionaries; basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries.   **8 Hours**

UNIT – III

Design with functions: hiding redundancy, complexity; arguments and return values; formal vs actual arguments, named arguments. Program structure and design. Recursive functions.
Classes and OOP: classes, objects, attributes and methods; defining classes; design with classes, data modeling; persistent storage of objects inheritance, polymorphism, operator overloading (_eq_,_str_, etc); abstract classes; exception handling, try block   **8 Hours**

UNIT – IV

Graphical user interfaces; event-driven programming paradigm; creating simple GUI; buttons, labels, entry fields, dialogs; widget attributes - sizes, fonts, colors layouts, nested frames; Multithreading, Networks, and Client/Server Programming.   **11 Hours**

UNIT – V

Python database application programmer's interface (DB- API), connection and cursor objects, Type objects and constructors, python database adapters. Creating simple web clients, introduction to CGI, CGI module, building CGI applications, python web application frameworks.   **8 Hours**

Course Outcomes:
At the end of the course the student will be able to:
1. **Explain** the basic program constructs and file operations in Python and **express** it.
2. **Design** the Python programs using the concepts like strings, conversion of strings to numbers, lists, tuples, dictionaries.
3. **Implement** the functions and object oriented programming concepts in python.
4. **Create** a Graphical User Interface, multiple threads and Client/Server programs in python.
5. **Implement** a database connection and CGI programs in python.

Mapping of POs & COs:

POs / COs	a	b	c	d	e	f	g	h	i	j	k	l
1	H	H			H				L			H
2	H	H			H				L			H
3	H	H			H				M			H
4	H	H			H				H			H
5	H	H			H				M			H

H: High M: Medium L : Low
TEXTBOOKS:
1. Kenneth A. Lambert, <u>The Fundamentals of Python: First Programs</u>, 2011, Cengage Learning,
2. Magnus Lie Hetland, Beginning Python From Novice to Professional, Second Edition.

3. Mark Summerfield, Programming in Python 3 - A Complete Introduction to the Python Language, Second Edition.
4. Y. Daniel Liang, "Introduction to Programming Using Python", Pearson, ISBN:978-0-14-274718-9, 2014.

REFERENCE BOOKS:
1. Chun, J Wesley, Core Python Programming, 2nd Edition, Pearson, 2007 Reprint 2010.
2. Python Cookbook, Third Edition, David Beazley and Brian K. Jones, Shroff Publishers & Distributors Pvt. Ltd., ISBN : 978-93-5110-140-6
3. Learning Python FIFTH EDITION Mark Lutz.
4. Programming Python (English) 4th Edition Mark Lutz.
5. Testing Python, David Sale, Wiley India (P) Ltd., ISBN : 978-81-265-5277-1.

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PYTHON PROGRAMMING Lab

Sub Code: 14CS704   **Credits   : 1**
Hrs/Week : 2

Programs related to
- Basic concepts and language constructs
- Functions and String handling
- User interface design
- Database connectivity
- Web programming

To carry out a mini project using the concepts of Python programming

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ADVANCED COMPUTER NETWORKS

Sub Code : 14CS711	**Credits : 03**
Hrs/Week : 3+0+0+0	**Total Hours : 39**

Course Learning Objectives:
This Course will enable students to
1. Get the idea of the Application – Layer protocols.
2. Get the idea of the link layer communication, error detection and correction techniques.
3. Get the idea of various types of multimedia services and its flaws.
4. Get the idea of the risks of transferring data between parties.
5. Identify difficulties in managing networks and different protocols operations

UNIT – I
Chapter 1: Application Layer: Principles of Application Layer Protocols, The Web and HTTP, File Transfer: FTP, Electronic Mail in the Internet, DNS--The Internet's Directory Service, Review of Socket Programming with TCP & UDP, Building a Simple Web Server, Content Distribution.   **8 Hours**

UNIT – II
Chapter 2: Wireless and Mobile Networks : Data Link Layer: Introduction and Services, Error-Detection and -Correction Techniques, LAN Addresses and ARP, Ethernet, Hubs, Bridges, and Switches, Wireless Links, PPP: The Point-to-Point Protocol, Asynchronous Transfer Mode (ATM), Frame Relay, Broadband Wireless, Blue tooth.   **8 Hours**

UNIT – III
Chapter 3: Multimedia Networking: Multimedia Networking Applications, Streaming Stored Audio and Video, Making the Best of the Best-Effort Service: An Internet Phone Example, Protocols for Real-Time Interactive Applications, Beyond Best-Effort, Scheduling and Policing Mechanisms, Integrated Services, RSVP, Differentiated Services   **8 Hours**

UNIT – IV
Chapter 4: Security in Computer Networks : What Is Network Security? Principles of Cryptography, Authentication, Integrity, Key Distribution and Certification, Access Control: Firewalls, Attacks and Countermeasures, Security in Many Layers: Case Studi.   **8 Hours**

UNIT – V
Chapter 5: Network Management: Infrastructure of Network Management: The Internet standard management Framework: SMI, MIB, SNMP protocol operations and transport mappings, security and administration, ASN.1 syntax.   **7 Hours**

Course Outcomes:
After going through this course the students will be able to:
1. Identify and express how application-layer protocols are different from network-layer applications. Describe the different protocols.

2. identify the difference between Link-layer design and network-layer design. Describe the framing, different links, error detection and error correction code and link layer protocols
3. Express, Analyze and Evaluate the possibility and limitations of multimedia data. Real problems in multimedia processing and adopt the best methods.
4. Identify the security risks on the data during transmission.
5. identify and express different protocols used for managing the network and difficulties involved in network management

Mapping of POs & COs :

POs COs	a	b	c	d	e	f	g	h	i	j	k	l
1	H	H										
2	H	H	H					M				
3		H						M			L	
4	H	H										
5	H	H										

H : High   M: Medium   L : Low

TEXT BOOK:

1. **James F. Kurose and Keith W. Ross,** Computer Networking- A Top-Down Approach Featuring the Internet, 3rd Edition, Pearson Education (Chapters 1, 2, 6,7,8 (

REFERENCE BOOKS:

1. **Andrew S. Tanenbaum,** Computer Networks, Fourth edition, PHI / Pearson Publication, 2002

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BUSINESS INTELLIGENCE AND ITS APPLICATION

Subject Code   : 14CS712   **Credits   : 03**
Hrs/week   : 3   **Total Hours   : 39**

Course Learning Objectives:
This Course will enable students to

1. Identify various sources of data and identify the methods to process them.
2. Explain the ETL process and carryout the ETL process for a given data set.
3. Design a suitable schema for a given problem.
4. Illustrate the concepts of data mining.
5. Demonstrate the Classification and clustering methods.

UNIT-I

Introduction to Business Intelligence
Types of digital data; Introduction to OLTP, OLAP and Data Mining; BI Definitions & Concepts; Business Applications of BI; BI Framework, Role of Data Warehousing in BI, BI Infrastructure Components – BI Process, BI Technology, BI Roles & Responsibilities

7 Hours

UNIT-II

Basics of Data Integration (Extraction Transformation Loading); Concepts of data integration; Need and advantages of using data integration; Introduction to common data integration approaches; Introduction to data quality, data profiling concepts and applications, Introduction to SSIS Architecture, Introduction to ETL using SSIS;   **8 Hours**

UNIT-III

Data Warehouse and OLAP Technology – Definition, A Multidimensional Data Model, Concepts of dimensions, facts, cubes, attribute, hierarchies, star and snowflake schema; Data Warehouse Architecture. Introduction to data and dimension modeling, multidimensional data model, ER Modeling vs. multi dimensional modeling; Introduction to business metrics and KPIs; Introduction to enterprise reporting; Concepts of dashboards, balanced scorecards; Applications of Data mining and Case studies of BI   **8 Hours**

UNIT- IV

Data Mining—On What Kind of Data? Data Mining Functionalities—What Kinds of Patterns Can Be Mined? Mining Association rules: Basic concepts, frequent item set mining methods. Definitions of classification, prediction and clustering;   **8 Hours**

UNIT-V

Classification and Prediction - Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Prediction, Cluster Analysis - Types of Data in Cluster Analysis, Hierarchical Methods.   **8 Hours**

TEXT BOOKS :
1. R N Prasad and Seema Acharya "Fundamentals of Business Analytics", Wiley-India, 2011
2. Jiawei Han and Micheline Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufmann Publishers, 2000 (ISBN: 1-55860-489-8).
3. David Loshin, "Business Intelligence -The Savvy Manager's Guide", Morgan Kaufmann Publishers.

Course Outcomes:
After going through this course the students will be able to:

1. Distinguish the data based on the type and design the methods to handle them.
2. Design the ETL process for handling the data from a given source.
3. Design a star / snowflake schema for a given problem.
4. Illustrate the data mining concepts with suitable examples.
5. Apply classification and prediction concepts to various applications.

Mapping of POs & COs :

POs COs	a	b	c	d	e	f	g	h	i	j	k	l
1	H	H										
2		H	H		H			M				H
3		H	H					M			L	H
4	H	H										
5	H	H										H

H : High   M: Medium   L : Low

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ADVANCED WEB TECHNOLOGIES

Subject Code: 14CS713   **Credits   : 03**
Hours/Week: 3+0+0+0   **Total Hours: 39**

Course Learning Objectives

This Course will enable students to:

1. **Develop**the interactive user interface for the web applications using HTML5, CSS3, JavaScript and AJAX.

2. **Understand** Bootstrap framework and AngularJS programming to develop more interactive web applications.

3. **Analyze** the use of Modules, Scopes, Controllers, Expression, Filters and Directives for the development of web applications.

4. **Apply**the concepts of Routing and NodeJS in web application development.

5. **Understand** ExpressJSandbuildthe mobile applications with Cordova.

UNIT – I
Introduction to HTML5 and CSS3:
Introduction to HTML5, Semantic Elements in HTML5, Selectors 2D/3D Transformations, Transitions, Animations, Shadow Effects, Media Queries.

Overview of JavaScript:
Basics of Javascript, Data types in Javascript, call back function using Javascript, what is JSON?, JSON Syntax, JSON Data type, JSON Object, JSON Array, HTTP Request (Get and Post).

Introduction to AJAX:
Introduction to AJAX, How AJAX works, XMLHttpRequest Object, Response from server, PHP, Database, Application.   **8 Hours**

UNIT – II
Introduction to Bootstrap Framework:
Grid Basics, Bootstrap Text, Tables, Images, Jumbotron, Wells and Alerts, Buttons, Labels, Progress Bar, Pagination and Pager, List Groups and Panels, Dropdowns, Collapse, Tabs/Pills, Dropdowns, Navbar, Forms, Inputs, Media Objects, Carousel, Modal, Tooltip, Popover, Scrollspy.

Introduction to Angular JS:
What is AngularJS? Angular Directives, AngularJS Expression, Angular Expression, AngularJS Module, AngularJS Controller, AngularJS Filter.

Build Your First App using AngularJS:
Introduction to Data Binding, Simple Data Binding, Best Practice in data binding.   **8 Hours**

UNIT – III
Modules, Scopes, Controllers, Expression and Filters:
What is a Module and its properties, $scope view of the world, $scope Lifecycle, Directive and scopes, How to use controller, Controllers Hierarchy, Parsing an expression, Interpolating a string, Making our own filters, Form Validation.

Introduction to Directives:
What are Directives, Attributes, Directive scope, ng-Model, Custom HTML Elements and Attributes, Passing data into a directive.

Built-In Directives:
Basic ng Attribute Directive (ng-href, ng-src, ng-disable, ng-checked, ng-readable, ng-selected, ng-class,ng-style), Directives with child scope, configuration, run block.   **8 Hours**

UNIT – IV
Introduction to Multiple Views and Routing:
Routers, $location Service, Routing Modes, Dependence Injection, Annotation, Introduction to service, using service, Using $http, Shortcut Methods (get(), delete(), head(), jsonp(), post(), put()), Configuration Object, Interceptors, Configuration of $httpProvider, $resource.

Introduction to NodeJs:
Introduction to NodeJs, Feature of NodeJs, REPL Terminal, NPM, Callback Concept, Event Loop, Event Emitter, Web Module.   **8 Hours**

UNIT – V

Introduction to ExpressJS:
Environment, Request and Response, Routing, Serving Static Files, HTTP Methods, Middleware, Templating, Database, Cookies, Sessions, RESTful APIs, Scaffolding.

Mobile Apps:
Responsive Web Apps, Interaction, Native applications with Cordova, Getting started with Cordova, Including Angular, Building with Yeoman.   **7 Hours**

REFERENCES BOOKS:
1.   Jake Spurlock, Bootstrap, O'Reilly publications, 2013.
2.   Ari Lerner, Ng-book, The complete book on Angular JS, 2013.
3.   Steven Holzner, AJAX A Beginner's Guide, McGraw-Hill, 2009.

WEB TUTORIALS:
1. www.w3schools.com
2.www.tutorialpoint.com
3. https://www.w3.org/TR/2001/CR-css3-selectors-20011113/

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

- **Develop** the interactive user interface for the web applications using HTML5, CSS3, JavaScript and AJAX.
- **Develop and Execute** more interactive web applications using Bootstrap framework and AngularJS programming.
- **Analyze** the use of Modules, Scopes, Controllers, Expression, Filters and Directives for the development of web applications.
- **Apply** the concepts of Routing and NodeJS in web application development.
- **Understand** ExpressJS and build the mobile applications with Cordova.

Mapping of POs & COs :

POs COs	a	b	c	d	e	f	g	h	i	j	k	l
1	M		H									
2		H	H									
3		H										
4								H				H
5					H							M

MULTIMEDIA PROCESSING

Sub Code   : 14CS714   **Credits   : 03**
Hrs/Week : 3+0+0+0   **Total Hours : 39**

Course Learning Objectives:
After successful completion of this course students will be able to:
1. **Get** the key concepts in current multimedia technology.
2. **Summarize** the representation of text, images, audio and video.
3. **Classify** and **develop** various compression techniques for text, images, audio and video.
4. **Analyze** and **evaluate** the strengths and limitations of various audio and video codecs.
5. **Design** codecs using the best techniques of compression, encoding and decoding.

UNIT - I

Multimedia Communications: Introduction to Multimedia Systems and Processing, multimedia information representation, multimedia networks, multimedia applications, network QoS and application QoS.
Information Representation: text, images, audio and video,
Text compression: Text compression principles, Lossless compression , Lossy compression, static coding, dynamic coding, Static Huffman Coding, Dynamic Huffman coding, Arithmetic coding, Lempel – Ziv coding, Lempel – Ziv Welsh coding   **8 Hours**

UNIT - II

transform encoding, entropy encoding, differential encoding, **Image compression:** GIF format, TIFF format, digital Pictures, Raster scan principles, JPEG   **7 Hours**

UNIT - III

Audio: types, Audio compression: PCM, Adaptive PCM, Adaptive Differential PCM, Adaptive predictive coding, Linear predictive coding, code excited LPC, perceptual coding, MPEG audio coders, Dolby Audio coders   **9 Hours**

UNIT - IV

Video: broadcast TV, color signals, NTSC, PAL, Digital formats: 4:2:2, 4:2:0, HDTV format, SIF, CIF, QCIF, PC video.
Video compression: video compression principles, frame types, motion estimation and compensation,, encoding of frames, implementation issues.   **9 Hours**

UNIT - V

Video compression standards: H.261, H.263,MPEG 1, MPEG 2, MPEG 4 (scene composition,coder , decoders), MPEG 7 , MPEG 21 multimedia framework.   **6 Hours**

Course Outcomes:

1. **Describe how** text, audio, image and video information can be represented digitally in a computer, so that it can be processed, transmitted and stored efficiently.
2. **Able** to **differentiate** and **design** lossless and lossy compression techniques.
3. **Analyze** and **evaluate** the possibility and limitations of multimedia data compression
4. **Evaluate** the audio coding techniques including predictive coding and more advanced techniques based around LPC and others.
5. **Apply** various compressions, encoding and decoding techniques to **solve** the real problems in multimedia processing and adopt the best methods.

Mapping of POs & Cos:

POs COs	a	b	c	d	e	f	g	h	i	j	k	l
1	M	H	L		H							
2		H			L					M	H	H
3	L	M									H	M
4	L		H		H							
5		H	H	L		L		H	L	M	M	M

TEXT BOOKS:

1. Fred Halsall, "**Multimedia Communications: Applications, Networks, Protocols And Standards**", Pearson education, 2001.
2. K. R. Rao, Zoran S. Bojkovic, Dragorad A. Milovanovic, "**Multimedia Communication Systems**", Pearson education, 2004.

REFERENCE BOOKS:

1. Raif steinmetz, Klara Nahrstedt, "**Multimedia: Computing, Communications and Applications",**Pearson education, 2002.
2. John Billamil, Louis Molina, "**Multimedia : An Introduction**", PHI, 2002.
3. NPTEL materials on multimedia processing, IIT Kharagpur : http://nptel.iitk.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Multimedia %20Processing/New_index1.html

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PROGRAMMING INTERACTIVITY

Sub Code	**: 14CS715**		**Credits**	**: 03**
Hrs/Week	**: 3+0+0+0**		**Total Hours**	**: 39**

Course Learning Objectives:
This Course will enable students to
1. **Outline** the concepts of user interaction and interface design
2. **Make use of** Design programs to handle the drawing, bitmaps, audio and user inputs.
3. **Make use of** various interactive libraries.
4. **Illustrate** the Physical devices interfacing with interaction programs.
5. **Demonstrate** Open CV concepts for computer vision applications and use of various interface devices and protocols

UNIT - I

Introductions: Introducing Interaction Design: Nature, Messages, Interfaces, Languages, Design, Art, Data Exchange, Exploration.

Processing: Installation, IDE, Basics of a Processing Application, Drawing with Processing, Capturing Simple User Interaction, Importing Libraries, Loading Things into Processing, Running, Debugging & Exporting Processing Applications.

Arduino: Introduction, Touring Two Arduino Boards – The Controller, Duemilanove vs Mini, Touring the Arduino IDE, Arduino apps basics, features, connectivity, First Program, Debugging, Libraries, Running your code on board without USB connection.   **8 Hours**

UNIT - II

openFrameworks: Introduction, Starter & Tour on oF, First Program, Drawing in 2D, Displaying Video Files and Images, Importing Libraries, Compilation & Debugging in different OS.

Sound & Audio: Sound as feedback & interaction, How Sound works on a Computer, Audio in Processing, Using Minim, oF, FMOD Ex, Sound Object libraries for Sound processing, Magic of FFT, Physical manipulation of Sound with Arduino, PWM, Creating Interactions with Sound.

Physical Input: Interacting with Physical Controls, Thinking about Kinetics, Controlling Controls, Turning Knobs, Using Lights like LED, Detecting Touch & Vibration with Piezo Sensors, Communication with other Apps, Arduino message framework, Detecting Motion, Reading Distance from an IR Sensor, Detecting Forces & Tilt, I2C, Physical Interface.

8 Hours

UNIT – III

Programming Graphics: Screen & Graphics, Seeing vs Looking, Drawing Strategies, Processing & Transformation Matrices, Creating Motion, Using Vectors & Graphical Controls, Importing & Exporting Graphics.

Bitmaps & Pixels: Using Pixels & Bitmaps as Data, Input, Feedback providers; Looping through Pixels, Manipulating Bitmaps, Analyzing Bitmaps in oF, Using Pixel Data & Textures, Saving a Bitmap.

Physical Feedback: Using DC & Stepper Motors, Using Servos, Household Currents, Appliances, LilyPad Board, Using Vibration, LED Matrix, LCD Matrix, Using Solenoids for Movement.   **8 Hours**

UNIT - IV

Protocols & Communication: Network Communication, Using XML, Understanding Networks & the Internet, Handling Network Communication in Processing, Understanding Protocols in Networking, Using ofXNetwork, Creating Networks with the Arduino, Communicating with Carnivore, Bluetooth & MIDI.

Detection & Gestures: Computer Vision, OpenCV, Using Blobs & Tracking, OpenCV in Processing, Detecting Gestures, Face Recognition, Touch Devices with oF.

Movement & Location: Using Movement as & in Interaction, Software based Serial Ports, Using GPS, Storing Data, Logging GPS data into Arduino, Sending GPS data, Determining Location by IP Address.   **8 Hours**

UNIT – V

Interfaces & Controls: Examining tools, Affordances & Aesthetics, Reexamining Tilt, Exploring InputShield, Understanding Touch, Exploring OpenSource Touch Hardware, Communicating using OSC, Using the Wiimote.

Spaces & Environments: Using Architecture & Space, Sensing Environmental Data, Using an Xbee with Arduino, Placing objects in 2D, Using the X10 Protocol, Setting up an RFID Sensor, Reading Heat & Humidity.

Future Directions: Software tools, Construction Processes, Artificial Intelligence, Physics, Hardware Platforms,   **8 Hours**

<u>Course Outcomes:</u>

At the end of the course the student will be able to:
1. Identify the concepts of user interaction and interface design.
2. Design programs to handle the drawing, bitmaps, audio and user inputs.
3. Implement and apply and various interactive libraries**.**
4. Analyze Physical devices interfacing with interaction programs.
5. Apply the Open CV concepts for computer vision applications and use of various interface devices.

Mapping of POs & COs:

POs / COs	a	b	c	D	e	f	g	h	I	j	k	l
1	M		H		H							M
2	M				H				L		M	M
3	M				H				L		M	M
4	M		H		H				L		M	M
5	M		H		H						M	M

H : High   M: Medium   L : Low

TEXT BOOK:
1. Programming Interactivity, Joshua Noble, O'Reilly Media Inc., © 2009, First Edition.

REFERENCE BOOKS :
1. Alan Cooper, About Face 3: The Essentials of Interaction Design, 3rd edition, Wiley 2007.
2. Bill Moggridge, Designing Interactions, MIT Press, 2008.
3. Jenny Preece, Yvonne Rogers, and Helen Sharp: Interaction Design: Beyond Human-Computer Interaction, 3nd ed., Wiley, 2011.
4. Alan Dix, Janet Finlay, Gregory D. Abowd, and Russell Beale, Human-Computer Interaction (3rd Edition), Pearson, 2004.

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MACHINE LEARNING

Course Code: 14CS716   **Credits : 03**
Hours/Week: 3 Hours   **Total Hours : 39**

Course Learning Objectives
This Course will enable students to
1. Understand the need and basics of machine learning
2. Learn the different types of regression models
3. Explore the various learning algorithms using Supervised learning
4. Understand the important aspects of Unsupervised learning and evaluation measures
5. Analyze the techniques related to reinforcement learning

UNIT-I
Foundations of Machine Learning
Introduction to Artificial Intelligence, What is machine learning? , Applications of Machine leanring, Understand Data, Types of machine learning: Supervised, Unsupervised, Reinforcement Learning, Theory of learning: feasibility of learning, error and noise, training versus testing, theory of generalization, bias and variance, learning curve   **7 Hours**

UNIT-II
Supervised Learning-I
Linear Regression: Introduction, univariate linear regression, multivariate linear regression, regularized regression, Logistic regression: classification, Artificial Neural Networks, Support Vector Machines.   **8 Hours**
UNIT III
Supervised Learning – II
Classification: Introduction, Decision Trees, Linear Discriminant Analysis, K-nearest neighbor model, Bayesian Learning, Introduction to Hidden Markov Models and deep learning   **8Hours**
UNIT IV

Unsupervised Learning
Clustering: Introduction, K-means, Hierarchical clustering

Evaluation Measures and Combining Learners
Evaluation Measures: Cross-validation and Re-sampling, Measuring Error, Hypothesis Testing,
Combining Learners: Voting, Bagging, Boosting **8Hours**

UNIT V

Reinforcement Learning
Introduction, K-armed Bandit, Elements of reinforcement learning, Model Based Learning, Policy Iteration , Temporal Difference Learning, Exploration Strategies **8Hours**

Course Outcomes
At the end of the course the student will be able to:
1. Develop an appreciation for what is involved in learning models from data.
2. Demonstrate the application of linear regression and logistic regression for real world problems
3. Design and implement algorithms for supervised learning
4. Construct basic unsupervised learning algorithms and evaluate the generated learning models
5. Apply reinforcement techniques for real world problems

Mapping of POs & COs:

POs / COs	a	b	c	d	e	f	g	h	I	j	k	l
1	M											M
2		M						H				
3			H		H							
4			M									
5		M						H				

H : High   M: Medium   L : Low

TEXT BOOKS:
1. C. M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006
2. Ethem Alpaydin, Introduction to Machine Learning, Second Edition, 2004

REFERENCE BOOK:
1. T. M. Mitchell, "Machine Learning", McGraw Hill, 1997.
2. R. O. Duda, P. E. Hart and D. G. Stork Pattern Classification, Wiley Publications, 2001
3. T. Hastie, R. Tibshirani, J. Friedman. The Elements of Statistical Learning, 2e, 2008.
4. P. Flach, "Machine Learning: The art and science of algorithms that make sense of data", Cambridge University Press, 2012.
5. K. P. Murphy, "Machine Learning: A probabilistic perspective", MIT Press, 2012.
6. M. Mohri, A. Rostamizadeh, and A. Talwalkar, "Foundations of Machine Learning", MIT Press, 2012.
7. S. Russel and P. Norvig, "Artificial Intelligence: A Modern Approach", Third Edition, Prentice Hall, 2009.

ENTREPRENEURSHIP DEVELOPMENT

Sub Code : 14CS717	**Credits : 03**
Hrs/Week : 3+0+0+0	**Total Hours : 39**

Course Learning Objectives:

1. **Outline** the theory behind the basic idea behind enterprenurship and strengthen entrepreneurial quality and motivation in students.
   2. **Make use of** Business planning process, costing and feasibility analysis.To impart basic entrepreneurial skills and understandings to run a business efficiently and effectively.
2. **Make use of** various organizations supporting entrepreneurs and international opportunities.
3. Get the idea of Analyze risk capital and venture capital.
4. Make use of business planning process and analyse the innovations

UNIT - I

Module 1

Entrepreneur: Meaning of entrepreneur: Evolution of the concept: Functions of an Entrepreneur, Types of Entrepreneur, Intrapreneur- an emerging class, Concept of Entrepreneurship-Evolution of Entrepreneurship: Development of Entrepreneurship; The Entrepreneurial Culture; Stages in entrepreneurial process.   **6 Hours**

Module 2:

Creativity and Innovation: Creativity, Exercises on Creativity, Source of New Idea, Ideas into Opportunities. Creative Problem Solving: Heuristics, Brainstorming, Synectics, Value Analysis Innovation and Entrepreneurship: Profits and Innovation, Globalization, Concept and Models of Innovation. Significance of Intellectual Property Rights.   **4 Hours**

UNIT - II

Module 3

Business Planning Process: Meaning of business plan, Business plan process, Advantages of business planning, Marketing plan, Production/operations plan, Organization plan, financial plan, final project report with feasibility study, preparing a model project report for starting a new venture.   **6 Hours**

UNIT - III

Module 4

Institutions Supporting entrepreneurs: Small industry financing developing countries, A brief overview of financial institutions in India, Central level and state level institutions, SIDBI,NABARD, IDBI,SIDCO, Indian Institute of Entrepreneurship, DIC, Single Window, Latest Industrial Policy of Government of India   **4 Hours**

UNIT - IV

Module 5

Family Business: Importance of family business, Types, History, Responsibilities and rights

of shareholders of a family business, Succession in family business, Pitfalls of the family business,   strategies for improving the capability of family business, improving family business performance.   **4 Hours**

Module 6
International Entrepreneurship Opportunities: The nature of international entrepreneurship, Importance of international business to the firm, International versus domestic entrepreneurship, Stages of economic development, Entrepreneurship entry into international business, exporting, Direct foreign investment, barriers to international trade.

4 Hours

UNIT - V
Module 7
Informal risk capital and venture capital: Informal risk capital market, venture capital, nature and overview, venture capital process, locating venture capitalists, approaching venture capitalists. Social Entrepreneurship: Social enterprise-need, types, characteristics and benefits of social enterprises-Social entrepreneurship, Rural entrepreneurship-need and problems of rural entrepreneurship, challenges and opportunities-Role of government.   **4 Hours**

Case studies in Entrepreneurship Development   **3 Hours**
Practical component:
1. Make a business plan for your intended business, talk to bankers to find out what they look for in a business plan , modify accordingly and present it in the class
2. Analyze the performance of listed family firms. How is their performance compared to the performance of other firms? Does a family firm successfully manage to create wealth for non-family investors?
3. Interview a local entrepreneur to find out his/her major motivations to start a business, which of the skills and characteristics do you find in the entrepreneur?
4. Study a local for-profit business and try to list out the positive social impacts of the business
5. Visit a trade show and try to compare the marketing activities of various stalls in that show , make a list of good practices you come across in the show
6. Research on innovation that has been done in the Indian setting that has alleviated the life in rural India. Find out extent of its commercial success and analyze the reasons behind the same. Present your thoughts in the class
7. Choose an NGO in your locality. Interview the founder and present the case in class on the motivations, challenges, ecosystem support and their impacts, arrive at possible solutions and convey back to NGO.   **4 Hours**

Course Outcomes:
At the end of the course the student will be able to:
1. **Express** the basic idea behind enterprenurship and strengthen entrepreneurial quality and motivation in students in more detail
2. **Analyze** Business planning process, costing and feasibility basic entrepreneurial skills and understandings to run a business efficiently and effectively
3. **Make use of** various organizations supporting entrepreneurs and international opportunities.
4. **Analyze** the risk capital and the venture capital.
5. **Explain** business planning process and analyse the innovations.

Mapping of POs & COs:

POs COs	a	b	c	d	e	f	g	h	i	j	k	l
1	H	H	M		M		H		H	H	H	
2	H	H	M		H						H	H
3	H	H			M		H		H			H
4		H		M	L						M	M
5			H	H				H	M	M	H	H

H : High   M: Medium   L : Low

TEXT BOOKS:
1. Poornima Charantimath, Entrepreneurship Development-Small Business Enterprise PearsonEducation,2007.
2. Rober D Hisrich, Michael P Peters, Dean A Shepherd, Entrepreneurship, 6th edition, The McGraw-Hill companies, 2007.

REFERENCE BOOKS:
1. Dr.Mathe J Manimala, Entrepreneurship Theory at crossroads, Biztantra, 2007.
2. Vasant Desai, Entrepreneurship Development and Management, Himalaya Publishing House, 2007.
3. Raj Shankar, Entrepreneurship-Theory and Practice, Vijay Nicole Imprints Pvt. Ltd, 2006.
4. Rajiv Roy, Entrepreneurship, Oxford University Press, 2nd edition, 2011.
5. Kurakto, Entrepreneurship-Principles and Practices, 7th edition, Thomson Publication, 2007.

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NETWORK MANAGEMENT

Sub Code : 14CS721	**Credits : 03**
Hrs/Week : 3+0+0+0	**Total Hours : 39**

Course Learning Objectives:
This Course will enable students to
1. **Describe** the data and telecommunication network, **outline** internet protocols and standards.
2. **Make use of** various standards and models to the network management process.
3. **Demonstrate** Communicational and functional model to SNMP.
4. **Identify** different SNMP operations and remote monitoring techniques.
5. **Tell how** broadband network management in ATM networks, DSL and ADSL networks.

UNIT - I
Data Communications and Network Management Overview 8Hrs

Analogy of telephone network, Data and telecommunication network, Distributed computing environment, Internet, Protocols and standards, IT management, Network and system management, Current status and future of network management

UNIT - II
Basic Foundations: Standards, Models, and Language 8Hrs

Network Management Standards, Network Management Model, Organizational Model, Information Model, Communication Model, Abstract Syntax Notation One, TLV Encoding, Functional Model.

UNIT - III
SNMPv1 Network management: Organization and Information Models 8Hrs

Managed Network, The history of SNMP management, Internet Organizations and Standards, The SNMP model, The Organization Model, System Overview, The information model

UNIT - IV
SNMPv1 Network management: Communication and Functional Models 4Hrs

Communication and Functional Models, Administrative Model, SNMP Community, Administration Model, Generalized Administration Model, Get and Set PDU, Trap PDU, SNMP Operations, MIB for Get-Next-Request, MIB Lexicographic Order, Get-Next-Request Operation, Sniffer Data, SNMP MIB

SNMP Management: RMON 4Hrs

What is Remote Monitoring? RMON SMI and MIB, RMON1, RMON2, ATM Remote Monitoring, Case Study, Case Study Results

UNIT - V
Broadband Network management 8Hrs

ATM Technology, ATM Network management, HFC Management, DSL Technology and ADSL Management, Network management applications

TEXT BOOK:
1. Network Management- Principles and Practice, Mani Subramanian, Pearson Education, 2003

Course Outcomes

At the end of the course the student will be able to:
1. Explain the concept of data communication and network management; identify the concepts of internet protocols and standards.
2. Apply various standards and models to the network management process.
3. Apply Communicational and functional model to SNMP.
4. Illustrate different SNMP operations and remote monitoring techniques.
5. Illustrate the management of broadband network.

Mapping of POs & COs:

POs COs	a	b	c	d	e	F	g	h	i	j	k	l
1	M								M			L
2	H	M			H				H			H
3	H	M			H				H		H	H
4	H	M			H				H		H	H
5	L				H				M			

H : High M: Medium L : Low

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CRYPTOGRAPHY AND NETWORK SECURITY

Sub Code : 14CS722   **Credits   : 03**
Hrs/Week : 3+0+0+0   **Total Hours : 39**

Course Learning Objectives:
This Course will enable students to
1. **Outline** the basic principles of Network security and its applications .
2. **Classify various block ciphers and design** various cryptographic algorithms .
3. **Use** the theorems needed for cryptographic operations and **compare & contrast** different types of cryptography.
4. **State** the concepts & uses of Digital signature and web security.
5. **Demonstrate** the need and **summarize** the concept of Secure Electronic Transactions & Intrusion detection system**.**

<div align="center">UNIT - I</div>

Overview: Services, Mechanisms and Attacks. A Model   of Network Security. Conventional Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography. Block Cipher and the Data Encryption Standard: Simplified DES. Block Cipher Principles.   **8 Hours**

<div align="center">UNIT - II</div>

The Data Encryption Standard, The Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes of Operations. Triple DES, Blowfish, Random Number Generation.   **8 Hours**

<div align="center">UNIT - III</div>

Number Theory: Prime Numbers, Fermat's and Euler's Theorems,   Public-Key Cryptography and RSA: Principles of Public-Key Cryptosystems, The RSA Algorithm, Key Management, Diffie- Hellman Key Exchange. Elliptic Curve Cryptography. Digital signature, DSS.

<div align="right">8 Hours</div>

UNIT - IV

Network Security: Electronic Security Pretty good privacy, IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, Combining Security Associations.   **8 Hours**

UNIT - V

Web Security: Web Security Requirements, Secure Sockets Layer and Transport Layer Security, Secure Electronic Transaction. Intruders, Viruses, and Worms: Viruses and Related Threats, Firewalls: Firewall Design Principles, Trusted Systems.   **7 Hours**

Course Outcomes:

At the end of the course the student will be able to:
1. **Explain** basic network security model and its applications.
2. **Classify** various block ciphers and its usages.
3. **Illustrate** the concept public key cryptography & a**pply** digital signatures in email processing.
4. **Describe** different techniques used in key exchange protocols
5. **Explain** usages of email-security, IP security and web security

Mapping of POs & COs :

POs COs	a	b	c	d	e	f	g	h	i	j	k	l
1	H	H	H		H							
2	H	H			H	L						
3	H				H			L				
4	H		H						L		M	

H : High   M: Medium   L : Low

TEXT BOOK :
1. William Stallings, Cryptography and Network Security, 2nd edition, Prentice Hall, 2000. OR William Stallings, Cryptography and Network Security, 3rd edition, Pearson Education, 2003

REFERENCE BOOKS:
1. Charlie Kaufman, Radia Perlman, Mike Speciner, Network Security: Private communication in a Public World, 2nd edition, Pearsdon Education Asia, 2002.
2. Atul Kahate, Cryptography and Network Security, Tata McGrawHill, 2003.

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IMAGE PROCESSING

Sub Code : 14CS723   **Credits   : 03**
Hrs/Week: 3+0+0+0   **Total Hours : 39**

Course Learning Objectives:
This Course will enable students to
1. **Outline** the theory behind the basics of digital image processing, the **relation** between the components of image processing system.
2. **Make use of** Electromagnetic Spectrum, **find** the equivalence between pixels.
3. **Make use of** Homomorphic Filtering and how to **simplify** Detection of Discontinuities.
4. **Get** the idea of Models Elements of Information**, find** the equivalence between Dilation and Erosion, Opening and Closing, and **identify** the Hit-or-Miss Transformation.
5. **Tell how** Components of an Image Processing System works, their **design**, and **get** the feeling of Histogram Processing.

UNIT - I
Introduction - What Is Digital Image Processing? Examples of Fields that Use Digital Image Processing, Fundamental Steps in Digital Image Processing , Components of an Image Processing System

Digital Image Fundamentals - Elements of Visual Perception, Brightness Adaptation and Discrimination, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships between Pixels

Image Enhancement in the Spatial Domain - Background, Some Basic Gray Level Transformations, Histogram Processing.   **7 Hours**

UNIT - II
Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters,

Image Enhancement in the Frequency Domain- Background, Introduction to the Fourier Transform and the Frequency Domain, Smoothing Frequency-Domain Filters,   **8 Hours**

UNIT - III
Sharpening Frequency Domain Filters, Homomorphic Filtering.

Image Segmentation- Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation, Segmentation by Morphological Watersheds, the Use of Motion in Segmentation   **8 Hours**

UNIT - IV
Image Compression - Fundamentals Image Compression, Models Elements of Information, Theory Error-Free Compression, Lossy Compression, Image Compression Standards

Morphological Image Processing - Preliminaries, Dilation and Erosion, Opening and Closing, the Hit-or-Miss Transformation Some Basic, Morphological Algorithms   **8 Hours**

UNIT- V

Color Image Processing - Color Fundamentals, Color Models, Pseudo color Image Processing, Basics of Full-Color Image Processing, Color Transformations, Smoothing and Sharpening, Color Segmentation, Noise in Color Images, Color Image Compression. Introduction to wavelet based processing.   **8 Hours**

Course Outcomes:
At the end of the course the student will be able to:
1. **Identify** the concept of Digital Image Processing, and **design** Steps in Digital Image Processing.
2. **Apply** Image Sampling and Quantization, **illustrate** an equivalence between Light and the Electromagnetic Spectrum, **prove** Some Basic Relationships between Pixels.
3. **Design** and **apply** Smoothing Spatial Filters, Sharpening Spatial Filters.
4. **Design** a Smoothing Frequency-Domain Filters, **illustrate** an equivalence between Transform and the Frequency Domain, Smoothing Frequency-Domain Filters, **prove** the properties Region-Based Segmentation.
5. **Construct** Image Compression Standards and **explain** the concept of Morphological Image Processing.

Mapping of POs & COs:

POs COs	a	b	c	d	e	F	g	h	i	j	k	l
1	H	H			H							
2		H					M					
3	H							M	L			
4		H		H			M					
5	H		H		H						L	

H : High   M: Medium   L : Low

TEXT BOOK:
1. Rafel C Gonzalez and Richard E Woods, "Digital Image Processing", Pearson Education, 2nd Edition, 2003.

REFERENCE BOOKS:
1. Anil K Jain, "Fundamentals of Digital Image Processing", Prentice-Hall of India Pvt. Ltd., 1997.
2. Milan Sonka, Vaclav Hlavac and Roger Boyle, "Image Processing, Analysis and Machine Vision", Thomoson Learning, Brooks/Cole, 2nd Ed. 2001.
3. B.Chanda, D Dutta Majumder, "Digital Image Processing and Analysis",Prentice- Hall, India, 2002.
4. The Scientist and Engineers Guide to Digital Signal Processing – by Steven W. Smith 2nd Edition , 1999, California Technical Publishin

SERVICE ORIENTED ARCHITECTURE

Sub Code : 14CS724   **Credits   : 03**
Hrs/Week : 3+0+0+0   **Total Hours : 39**

Course Learning Objectives:
This Course will enable students to
1. **Outline** the fundamental concepts of Service Oriented Architecture and explain the evolution of SOA and basic characteristics of SOA.
2. **Illustrate** and analyse web service, primitive SOA and contemporary SOA.
3. **Get** the idea of Service Layers and **Analyze** the role of each layer.
4. **Illustrate** Business process design and SOA platforms.

UNIT – I

INTRODUCTION TO SOA, EVOLUTION OF SOA:
Fundamental SOA; Common Characteristics of contemporary SOA; Common tangible benefits of SOA; An SOA timeline (from XML to Web services to SOA); The continuing evolution of SOA(Standards organizations and Contributing vendors); The roots of SOA (comparing SOA to Past architectures).   **8 Hours**

UNIT – II

WEB SERVICES AND PRIMITIVE SOA: The Web services framework; Services (as Web services); Service descriptions (with WSDL); Messaging (with SOAP).   **4 Hours**
 WEB SERVICES AND CONTEMPORARY SOA – 1: Message exchange patterns; Service activity; Coordination; Atomic Transactions; Business activities; Orchestration; Choreography.   **4 Hours**

UNIT – III

WEB SERVICES AND CONTEMPORARY SOA – 2: Addressing; Reliable messaging; orrelation; Polices; Metadata exchange; Security; Notification and evening.   **4 Hours**
PRINCIPLES OF SERVICE – ORIENTATION: Services-orientation and the enterprise; Anatomy of a service-oriented architecture; Common Principles of Service-orientation; How service orientation principles interrelate; Service-orientation and object-orientation; Native Web service support for service-orientation principles.   **4 Hours**

UNIT – IV

SERVICE LAYERS: Service-orientation and contemporary SOA; Service layer abstraction; Application service layer, Business service layer, Orchestration service layer; Agnostic services; Service layer configuration scenarios.   **4 Hours**
BUSINESS PROCESS DESIGN: WS-BPEL language basics; WSCoordination overview; Service-oriented business process design; WSaddresing language basics; WS-Reliable Messaging language basics.   **4 Hours**

UNIT – V

SOA PLATFORMS: SOA platform basics; SOA support in J2EE; SOA support in .NET; Integration considerations. **7 Hours**

Course Outcomes:
At the end of the course the student will be able to:
1. **Comprehend** and **explain** evolution of SOA and basic characteristics of SOA.
2. **Compare** and **analyse** web service, primitive SOA and contemporary SOA
3. **Describe** and **Analyse** Service layers in SOA.
4. **Illustrate** Business process design and SOA platforms.

Mapping of POs & COs:

POs COs	a	b	c	d	e	f	g	h	i	j	k	l
1	H		H	H	H	M						
2	H		H	H	H			H				H
3	H	M	H	H	H	M		H	L		M	H
4	H	M	H		H			H	L	L	M	H

H : High M: Medium L : Low
TEXT BOOK:
1. **Service-Oriented Architecture – Concepts, Technology, and Design -**Thomas Erl, Pearson Education, 2005.

REFERENCE BOOK:
1. **Understanding SOA with Web Services** – Eric Newcomer, Greg Lomow, Pearson Education, 2005.

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BIOINFORMATICS

Sub Code : 14CS725 **Credits : 03**
Hrs/Week : 3+0+0+0 **Total Hours : 39**

Course Learning Objectives:
This Course will enable students to
1. **Illustrate** basics of molecular biology such as cell architecture, importance of proteins,nature of genome,viruses and immune system.
2. **Identify types of databases and explain** structure database.
3. **List** alignment approaches and **describe** methods and use of alignment.
4. **Analyze** search strategies, search methods and problems with search search technique.
5. **Describe** nearest neighbor ,clustering approaches and decision tree approach.

UNIT - I

Introduction to Basics of Molecular Biology

Basic Cell Architecture, The Structure, Content and Scale of DNA, History of Human Genome, genes and proteins, Current Knowledge and 'central dogma', Why proteins are important, Gene and Cell regulation, what is Bioinformatics.

Introduction to Problems and Challenges

Introduction, Genome, Transcription, Proteome, Interference Technology, viruses and immune system   .**8 Hours**

UNIT - II

DATABASES

Database, Types of database (Flat file, RDBMS (E-R diagram and Object Oriented),SQL.Sequence Database: Nucleotide and protein sequence database. Primary (Genbank, EMBL, DDBJ) and Secondary database. Sequence File Formats .Genbank flat file-A dissection. Structure Database: Protein structure databases (PDB). PDB format A dissection. Protein Structure viewers (RASMOL). Search engine, Entre   **7 Hours**

UNIT – III

DATABASE SEARCHES AND SEQUENCE ALIGNMENT

Introduction to sequence alignment, Local alignment, Global alignment, Methods of sequence alignment (Pairwise and multiple), Dot plot , optimal alignment,Dynamic programming Needleman and Wunsch, Smith waterman) ,Gap penalties. Database similarity searching-BLAST, FASTA, Progressive alignment methods, Practical issue of alignment   .**8 Hours**

UNIT – IV

Introduction to Artificial Intelligence and Computer Science - Introduction to search

Search algorithms Heuristic search methods, Optimal search strategies, Problems with search techniques, Complexity of search, Use of graphs in bioinformatics, Grammars, languages and automata, Classes of problems .

Introduction to probability, Bayes' Theorem, Bayesian networks, Markov networks .

                                                                                                   8 Hours

UNIT - V

Nearest Neighbor and Clustering Approaches Introduction, nearest neighbor method, nearest neighbor approach for secondary structure protein folding prediction, Clustering, Advanced clustering techniques Application guidelines. Identification (Decision) Trees, Method

Application guidelines, Bioinformatics applications   **8 Hours**

Course Outcomes:

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

1. **Demonstrate** concepts molecular biology such as cell architecture, importance of proteins,nature of genome,viruses and immune system.
2. **Compare** types of databases and **explain** structure database.
3. **Evaluate** alignment approaches and describe methods and use of alignment.
4. **Apply** search strategies, search methods and problems with search search technique.
5. **Assess** nearest neighbor ,clustering approaches and decision tree approach.

Mapping of POs & COs :

POs COs	a	b	c	d	e	f	g	h	i	j	k	l
1			H					L				
2		M		H								
3					M							
4				H				L				
5				H				L				

H : High   M: Medium   L : Low

TEXTBOOKS :
1. Intelligent Bioinformatics, The application of artificial intelligence techniques to bioinformatics problems by Edward Keedwell and Ajit Narayanan .
2. Fundamental concept of bioinformatics by Dan E.Krane and Michael L. Raymer,pearson publication
3. Bioinformatics databases and algorithms by N.Gautham,Narosa publication
4. Essential bioninformatics by Jin Xiong,Cambridge university press

REFERENCE BOOKS :
1. Bioinformatics – A Beginner's Guide by Jean Michel Claverie and Cedric Notredame.
2. Bioinformatics Computing by Bryan Bergeron.

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HETEROGENEOUS PARALLEL COMPUTING

Sub Code   : 14CS726   **Credits   : 03**
Hrs/Week : 3+0+0+0   **Total Hours : 39**

Course Learning Objectives:
This Course will enable students to
1. **Outline** the theory behind parallel programming, the **relation** between architecture and programming languages and their applications.
2. **Explain** OpenCL device architecture
3. **Design** basic OpenCL Programs.
4. **Outline and Compare** the different types of GPU programming languages
5. **Experiment** with profilers and debuggers to understand the behavior of parallel program

UNIT – I

Introduction to Parallel Programming: Introduction, OpenCL, Thinking Parallel, Concurrency & Parallel Programming Models, Threads & Shared Memory, Message-Passing Communication, Different grains of Parallelism, Data Sharing & Synchronization. **4 Hours**

Introduction to OpenCL: OpenCL Standard, Specification, Kernels & Execution Model, Platform & Devices, Execution Environment, Memory Model, Writing Kernels.   **6 Hours**

UNIT – II

OpenCL Device Architectures: Hardware trade-offs, Performance, Superscalar Execution, VLIW, SIMD & Vector Processing, Hardware Multithreading, Multicore Architectures, Integration, Cache Hierarchies & Memory Systems, Architectural Design – CPU, GPU & APU.   **7 Hours**

UNIT – III

Basic OpenCL Examples: Introduction, Simple Matrix Multiplication, Image Rotation, Image Convolution, etc., Compiling OpenCL host applications.   **7 Hours**

UNIT – IV

Introduction to some of the GPU Programming Languages:
CUDA, Aparapi, WebCL, Microsoft Accelerator, Shaders - glsl.   **9 Hours**

UNIT – V

OpenCL profiling and debugging: Profiling with events, Parallel Processing Profiler & Kernel Analyzer, Debuggers. A case study of real time OpenCL application.   **6 Hours**

Course Outcomes:
At the end of the course the student will be able to:
1. **Discuss** the theory behind parallel programming, the relation between architecture and programming languages and their applications.
2. **Explain** OpenCL device architecture
3. **Design** basic OpenCL Programs.
4. **Discuss and Compare** the different types of GPU programming languages
5. **Analyze parallel programs** with profilers and debuggers

Mapping of POs & COs:

POs / COs	a	b	c	d	e	f	g	h	i	j	k	l
1	H											L
2	H											L
3	H	H			H						L	M
4	H	H			M						L	L
5	H	H			H						H	M

H : High M: Medium L : Low

TEXT BOOK:

1. "Heterogeneous Computing with OpenCL". Benedict R Gaster, Lee Howes, David Kaeli, Perhaad Mistry, Dana Schaa. Elsevier Inc. Publication, ISBN 978-0-12-387766-6, 2012.

REFERENCE BOOKS:

1. http://developer.amd.com/downloads/opencl_univ_kit_1.0.zip
2. CUDA: Programming Massively Parallel Processors: A Hands-On Approach. Authors: David Kirk, Wen-mei Hwu © ELSEVIER Inc.
3. Aparapi: http://code.google.com/p/aparapi/ and Gary Frost's blog
4. Microsoft Accelerator: http://research.microsoft.com/en-us/projects/accelerator
5. *Shaders:* www.lighthouse3d.com/opengl/**glsl**

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MOBILE APPLICATION DEVELOPMENT LAB

Sub Code : 14CS727	**Credits : 03**
Hrs/Week : 3+0+0+0	**Total Hours : 39**

Course Learning Objectives:
This Course will enable students to

1. **Explain** the architecture and overview of the android as well as **identify** different applications of android.
2. **Develop** a mobile application on android platform using various constructs of android.
3. **Test** the developed app in different testing environment.
4. **Apply** versioning, signing and packaging of developed mobile application.
5. **Illustrate** the **d**istribution of apps on mobile market place.

UNIT - I

USER INTERFACE DESIGNING

Mobility landscape, Mobile platforms, Mobile appsdevelopment, Overview of Android Platform, setting up the mobile app development environment along with an emulator.
App user interface designing – mobile UI resources (Layout, UI elements, Draw-able, Menu), Activity –states and life cycle, interaction amongst activities.   **8 Hours**

UNIT – II

APP FUNCTIONALITY BEYOND USER INTERFACE

App functionality beyond user interface – Threads, Async task, Services – state and lifecycle, Notifications, Broadcast receivers, Telephony and SMS APIs.   **8 Hours**

UNIT – III

DATA HANDLING Native data handing – on device file I/O, shared preferences, mobile databases such as SQLite, and enterprise data access.   **8 Hours**

UNIT - IV

GRAPHICS AND ANIMATION

Graphics and animation – custom views, canvas, animation APIs, multimedia-audio/video playback and record, location awareness, and native hardware access (sensors such as accelerometer and gyroscope)   **8 Hours**

UNIT – V

TESTING MOBILE APPS and **TAKING APPS TO MARTKET**

Debugging mobile apps, White box testing, Black box testing, and test automation of mobile apps using suitable tools like JUnit.

Versioning,signing and packaging mobile apps,distributing apps on mobile market place

7 Hours

Course Outcomes:

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

1. **Construct** mobile application development environment along with an emulator to bulid the new project.
2. **Develop** Mobile app having various features.
3. **Interpret** the result and **test** the application.
4. **Apply** database, sensors concepts for the mobile applications.
5. **Explain** the Method of distributing the developed mobile application project.

Mapping of POs & COs:

POs COs	a	b	c	d	e	f	g	h	i	j	k	l
1			H						L			
2		H			H				L		M	M
3	H				H				L		M	
4	H	H			H				L		M	
5		H							L		M	

H : High M: Medium L : Low

TEXT BOOKS:

1. Anubhav Paradhan, Anil V Deshpande, Mobile apps Development, Edition: 1, Publication: Wiley, 2014, ISBN: 978-81-265-4660-2
2. Barry Burd , Android Application Development All in one for Dummies
3. Teach Yourself Android Application Development in 24 Hours, Publication : SAMS

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ENGINEERING MANAGEMENT
(Institution Level Core Paper)

Sub Code : 14HU801	**Credits : 03**
Hrs/Week : 3+0+0+0	**Total Hours : 39**

Course Learning Objectives:
This Course will enable students to
1. Develop basic management knowledge essential to make a managerial career in professional life.
2. Impart some of the crucial and basic skills required to work in teams such as – communication skill, leadership traits, motivation techniques, personal and personnel management skills
3. Gain basic knowledge about production management, marketing strategies, consumer requirements and behaviour, marketing activities,
4. Understand the basics of accounting and finance and financial markets, managing engineering technology, project evaluation and selection
5. Create awareness among the engineering students about their social responsibilities and obligations.

UNIT - I
Management: Meaning – Functions of Management
Planning – Nature and Importance of Planning, Types of Plans, Planning Process, Planning Premises and Planning Horizon.
Objectives – Meaning, Characteristics/Qualities of Sound Objective.
Forecasting – Meaning, Methods of Forecasting (Qualitative methods and Quantitative methods – simple moving average method, weighted moving average method, exponential smoothing method, simple regression model)   **6 Hours**

UNIT - II
Organizing: Meaning, Legal Forms of Organization – Sole Proprietorship, Partnership, Corporation/Company, Co-operatives – Meaning and Features only)
Delegation of Authority and Span of Control – Meaning, Factors Determining the Span of Control.

Human Aspects of Management - Manpower Planning, Employing People (Recruitment, Selection Process, Making Job Offer, the Induction Process, Cost of Employing New Staff, Termination of Employment), Training and Development – Conducting Training and Methods of Training.
Performance Appraisal – aims and formal schemes/methods of performance appraisal, 360 degree performance appraisal.   **7 Hours**

UNIT - III
Motivation – Meaning, Theories of motivation (the Carrot and the Stick, Maslow's Need Hierarchy theory, Herzberg's Motivation-Hygiene theory, McClelland's Trio of Needs, Self-Motivation, General Motivational Techniques).

Leadership – Meaning, Ingredients/Traits of leadership, styles of leadership.   **6 Hours**

UNIT - IV
Controlling – Meaning, Controlling Process, Three Perspectives on the Timing of Control, Types of Control, Characteristics of Effective Control System.

Project Evaluation Techniques: Interest Rate Calculations, Simple Interest, Compound Interest, Effective Rate of Interest, Payback Time, Present Worth, Future Worth, Annual Worth Calculations.   **12 Hours**

UNIT -V
Project Planning Tools – Gantt (Bar) Charts, Network Analysis – PERT and CPM - Crashing the Project completion duration using network analysis.

Depreciation – Types and Causes, Computing Depreciation (using straight line method only) – Estimation of Sunk Cost.   **8 Hours**

Course Outcomes:
At the end of the course the student will be able to:
1. Demonstrate the basic management skills required for a professional
2. Apply team work, communication skill, leadership traits, motivation techniques
3. Practice of personal management, production management, financial management, accounting, marketing ,etc. in personal and professional life.
4. Demonstrate the management of engineering technology, project evaluation and selection.
5. Practice social responsibilities in real life.

Mapping of POs & COs:

POs COs	a	b	c	d	e	f	g	h	i	j	k	l
1			H	M		H	H	M	L			
2			H	H		H	H	H	M			
3		L	M	H	M	H		H	L	L		
4		L	H	M	M	M		H	M	H	M	
5			H			H	L	H	H			

H : High   M: Medium   L : Low

TEXT BOOKS :
1. "Managing Engineering and Technology", 3rd Edition,- Daniel L. Babcock, Lucy C Morse**.**
2. "Management in Engineering – Principles and Practice", Second Edition, - Gail Freeman Bell, James Balkwill; Prentice Hall of India Pvt. Ltd., New Delhi – 110001.
3. "Essentials of Management", Fifth Edition, - Harold Koontz, Heinz Weihrich; Tata MacGraw Hill Edition, New Delhi.
4. "Engineering Economics", 4th Edition, - James L. Riggs, David D. Bedworth, Sabah U. Randhawa; Tata McGraw Hill Edition.
5. "Industrial and Business Management", -Martand T Telsang; Sulthan Chand &

Company Ltd., New Delhi – 110055.

REFERENCE BOOKS :

1. "Fundamentals of Financial Management", - Prasanna Chandra; Tata McGraw Hill Publishing Company Ltd, New Delhi.
2. "Operation Research", - S. D. Sharma.
3. "Operation Research – An Introduction", - Hamdy A Taha; Pearson Prentice Hall.
4. "Organizational Behaviour", - Stephen P Robbins; Prentice Hall, India.
5. "Organizational Behaviour", - Fred Luthans; McGraw Hill International Edition.
6. "Financial Management – Text, Problems & Cases", - M Y Khan, P K Jain; Tata McGraw Hill.

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DECISION SUPPORT SYSTEMS

Sub Code : **14CS811**		**Credits**	: **03**
Hrs/Week : **3+0+0+S**		**Total Hours**	: **39**

Course Learning Objectives:
This Course will enable students to
1. **Outline** a framework for decision support.
2. **Categorize** phases of decision making process.
3. **Illustrate** the characteristics, capabilities and components of DSS.
4. **Make use of** the DSS development methodology and to **get** the feeling of the concept.
5. **Explain** Group Decision making.

UNIT - I

Decision Making and Computerized Support

Managers and Decision Making, Managerial Decision Making and Information Systems, Managers and Computerized Support, The need for Computerized Support technologies, a frame work for decision support, the concept of Decision Support systems, Group Decision Support Systems. Executive systems and Information (support) Systems, Expert Systems, Artificial Neural Networks, and Hybrid Support Systems.   **8 Hours**

UNIT - II

Decision Making and Computerized Support (Contd...)

The Evolution and Attributes of Computerized Decision aids, Introduction and Definitions, Systems, Models, The Modeling Process, Decision Making: The Intelligent Phase, Decision Making: The Design Phase, Decision Making: The Choice Phase, Evaluation, Decision Making: Implementation Phase   .   **8 Hours**

UNIT - III

Decision Support Systems-I
DSS Configuration, What is DSS?, Characteristics, Capabilities, Components of DSS, The Data Management Sub System, The Model Management Subsystem, The Knowledge Based

Management System, The User Interface, The User, DSS Hardware, Distinguishing DSS from Management Science and MIS, DSS Classification. **7 Hours**

UNIT - IV

Decision Support Systems – II

Introduction to DSS development, The Traditional System Development Life cycle, Alternate Development Methodologies, Prototyping: The DSS Development Methodology, DSS Technology Levels and Tools, DSS Development Platforms, DSS Development Tool Selection, Team-Developed DSS, End User-Developed DSS, Developing DSS: Putting the System Together, DSS Research Directions and the DSS of the future. Group Decision Making, Communication and Collaboration, Communication Support, Collaboration Support: Computer- Supported Cooperative work, Group Support Systems, Group Support Systems Technologies, Group Systems, The GSS Meeting Process, Distance Learning, Creativity and Idea Generation, GSS and Collaborative Computing Issues and Research. **8 Hours**

UNIT - V

Knowledge Based DSS:

Concepts and Definitions of Artificial Intelligence, AI versus Natural Intelligence, The Artificial Intelligence field, Types of Knowledge-Based Decision Support systems, Basic Concepts, The Human Element in Expert System, How Expert System work? Problem areas addressed by ES, Benefits, Problems and Limitations of ES, ES Success Factors, Types of Expert Systems, ES and the Internet/ Intranet/ Web, Knowledge Engineering, Scope of Knowledge, Difficulties in Knowledge Acquisition, Methods of Knowledge Acquisition, Machine Learning, Intelligent Agents, Selecting an appropriate Knowledge Acquisition Method, Knowledge Acquisition from Multiple Experts, Validation and Verification of Knowledge Base, Analyzing and Coding, Documenting and Diagramming, Numeric and Documented Knowledge Acquisition, Knowledge Acquisition and Internet/ Intranet, Induction and Table Example. **8 Hours**

Course Outcomes:
At the end of the course the student will be able to:
1. **Design** a framework for decision support
2. **Illustrate** and **classify** phases of decision making process
3. **Outline** the characteristics, capabilities and components of DSS.
4. **Explain** the DSS development methodology
5. **Apply** Group Decision making

Mapping of POs & COs:

POs / COs	a	b	c	d	e	f	g	h	i	j	k	l
1		L			L			M		M		H
2	M		M		M	L			H		H	
3	H	M	M	H			H	H		H		H
4		H		L	H	M	M		M		H	
5		H	H			H			M			H

H : High   M: Medium   L : Low

TEXT BOOKS:
1. Efraim Turban & Jay E. Aronson : 'Decision Support Systems and Intelligent Systems', Sixth Edition, Pearson Education Asia, 2001
2. Giarratano& Riley: 'Expert Systems: Principles and Programming', Thomson Brooks / Cole, 2002.
3. Sprague R.H. Jr and H.J. Watson: 'Decision Support Systems' , Fourth Edition, Prentice Hall, 1996

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SOFT COMPUTING TECHNIQUES

Sub Code : 14CS812	**Crédits :03**
Hrs/week : 3+0+0+S	**Total Hours: 39**

Course Learning Objectives:
This Course will enable students to
1. Differentiate hard and soft computing, DefineSC constitutes, List Applications, Outline Intelligent systems architecture
2. Reproduce conceptual GA algorithm, Illustrate Mutation and Cross over operations, Define learning strategies, List ML applications, Describe the architecture of learning agent
3. Explain the structure and function of Biological Neuron, discuss MFF networks, represent back propagation
4. Demonstrate fuzzy operations, membership function, compare fuzzy models, derive fuzzy rules, outline Fuzzy inference systems
5. Analyse decision making strategies, list expert system features, tools, explain experts system architecture

UNIT - I
INTRODUCTION TO SOFT COMPUTING:
Evolution of Computing, Soft and Hard Computing, Soft Computing characteristics, Constituents and Applications, AI Definitions and Intelligent systems architecture   **7 Hours**

UNIT - II
GENETIC ALGORITHMS
Introduction to Genetic Algorithms (GA) – Conceptual GA algorithm, Reproduction operators Mutation and cross over, Applications of GA, Learning Definitions, strategies, Machine Learning Approach, applications andArchitecture of learning agent   **8 Hours**

UNIT - III
NEURAL NETWORKS
Introduction to Neural Networks, Applications, Structure and function of Biological Neuron, ANN introduction,Perceptron, Multi layer feed forward Networks with Back propagation
                                                                                                8 **Hours**

UNIT - IV

FUZZY LOGIC

Fuzzy Sets, Operations on Fuzzy Sets, MembershipFunctions, Fuzzy Rules, Models,Fuzzy Reasoning and Fuzzy Inference Systems.   **8 Hours**

UNIT - V

DECISION MAKING AND EXPERT SYSTEMS

Single person, multi person, Multi criteria and Multi stage decision making, Expert system features,architectureand applications   **8 Hours**

Course Outcomes:
1. Explain the constitutesand applications Soft Computing
2. Perform reproduce operations like mutations and cross over
3. Demonstrate the concepts of neural networks.
4. Explain the fuzzy member ship functions and models
5. Apply decision making strategies to real world examples

Mapping of POs & COs:

POs / COs	a	b	C	d	e	f	g	h	i	j	k	l
1	H				H				L			
2	H	M	M		H						M	L
3	H				H				L		M	
4	H	H	M		H				L		M	L
5	H	H	H		H			H	M		M	L

H : High   M: Medium   L : Low

TEXT BOOKS
1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, EijiMizutani, "Neuro-Fuzzy and Soft Computing", Prentice-Hall of India, 2003.
2. George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic-Theory and Applications",Prentice Hall, 1995.
3. James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Pearson Edn., 2003.
4. Simon Haylion "Neural Networks", Prentice-Hall of India

REFERENCE BOOKS:
1. Mitchell Melanie, "An Introduction to Genetic Algorithm", Prentice Hall, 1998.
2. David E. Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning", Addison Wesley, 1997.
3. S. N. Sivanandam, S. Sumathi and S. N. Deepa, "Introduction to FuzzyLogic using MATLAB", Springer, 2007.
4. S.N.Sivanandam · S.N.Deepa, "Introduction to Genetic Algorithms", Springer, 2007.
5. Jacek M. Zurada, "Introduction to Artificial Neural Systems", PWS Publishers, 1992.

ADHOC WIRELESS NETWORKS

Sub Code : 14CS813   **Credits : 03**

Hrs/Week : 3+0+0+S   **Total Hours: 39**

<u>**Course Learning Objectives**</u>:

After successful completion of this course students will be able to:

1. **Distinguish** the characteristics of ad hoc wireless networks with other wireless networks.
2. **To identify** Ad-Hoc wireless networks, issues, classification of MAC Protocols.
3. **Describe** and **distinguish** different types of ad hoc Routing Protocols, TCP over Ad hoc Protocol and a brief introduction to security issues in ad hoc wireless networks.

UNIT – I

Review of Wireless Networks: IEEE Wireless Standard, Basic 802.11 MAC layer mechanisms, CSMA/CA mechanisms and other MAC layer functionalities.

Ad hoc Networks: Introduction, Issues in Ad Hoc wireless networks, Ad hoc wireless internet.

MAC Protocols for Ad hoc wireless Networks: Introduction, Issues in designing a MAC Protocol for Ad hoc wireless Networks, Design goals of a MAC protocol for Ad hoc wireless Networks. **8 Hours**

UNIT – II

Classification of MAC Protocols: Contention based protocols: MACAW, FAMA busy tone protocols, receiver initiated protocol: MARCH. Contention based protocols with reservation mechanisms: DPRMA, HRMA, FPRP. Contention-based MAC protocols with scheduling mechanism: DPS&MA.

Routing protocols for Ad hoc wireless Networks: Introduction, Issues in designing a routing Protocol for Ad hoc wireless Networks, Classification of routing Protocols.

8 Hours

UNIT – III

Table drive routing protocol: DSDV, WRP, CGSR. On-demand routing protocol: DSR, AODV, LAR, FORP.

Hybrid routing protocol: CEDAR, ZRP. Hierarchical routing protocols: FSR. Metrics used by power aware routing protocols. **8 Hours**

UNIT - IV

Transport layer protocols for Ad hoc wireless Networks: Introduction, Issues in designing a transport layer Protocol for Ad hoc wireless Networks, Design goals of a transport layer protocol for Ad hoc wireless Networks, Classification of transport layer solutions, TCP over Ad hoc wireless Networks: TCP-F, TCP with ELFN, TCP-BuS, ATCP, Split TCP. Other transport layer protocols for Ad hoc wireless Networks: ACTP, ATP. **8 Hours**

UNIT -V

Security in wireless Ad hoc wireless Networks: Network Security requirements, Issues & Challenges in security provisioning, Network security attacks, Key Management, Secure routing in Ad hoc wireless Networks: SAR, SEAD, Security-Aware AODV.

Quality of service in Ad hoc wireless Networks: Introduction, Issues & challenges in providing QoS in Ad hoc wireless Networks, Classification of QoS solutions, MAC layer solutions, network layer solutions. **7 Hours**

COURSE OUTCOMES
CO1: **Define** the MAC layer functionalities of wireless networks.
CO2: **Define** the working of major MAC layer protocols for ad hoc wireless networks
CO3: **Classify** and **distinguish** Network layer protocols for ad hoc wireless networks.
CO4: **Identify** the issues with TCP/IP Transport layer protocols with wireless networks and **examine** few solutions provided by ad hoc transport layer protocols.
CO5: **Identify** security and QoS issues and challenges with ad hoc wireless networks.

Mapping POs & Cos:

POs COs	a	b	c	d	e	f	g	h	i	j	k	l
1	M	H			M							
2	M	H			H							
3					H			M		L		M
4	M	H	M								H	
5	M					L		L			H	H

TEXTBOOKS:
1. Ad Hoc Wireless Networks: Architectures and Protocols, 2nd edition, C. Siva Ram Murthy and B S Manoj, Pearson Education, 2005.

REFERENCE BOOKS:
1. Ad Hoc Networks: Technologies and Protocols, PrasantMohapatra and Srikanth Krishnamurthy, Springer Science, 2005.
2. Ad Hoc Mobile Wireless Networks: Principles, Protocols, and Applications, Subir Kumar Sarkar, T G Basavaraju and C Puttamadappa, Auerbach Publications, 2007.
3. Guide to Wireless Ad Hoc Networks, SudipMisra, Isaac Woungang, Subhas Chandra Misra, Springer-Verlag, 2009.
4. The Handbook of Ad Hoc Wireless Networks, Editor Mohammad Ilyas, CRC Press, 2003.
5. Ad hoc Mobile Wireless Networks: Protocols & Systems, C. K. Toh, Prentice-Hall PTR, 2002.

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GAME THEORY

Sub Code : 14CS814		**Credits** : 03
Hrs/Week : 3+0+0+S		**Total Hours** : 39

Course Learning Objectives:
This Course will enable students to
1. **Define and illustrate** Strategic Games, Compute Nash equilibrium and examples.
2. **Compute** Mixed Strategy Equilibrium using graphical method, Median voter theorem.
3. **Model** Extensive Games , Finding sub game perfect equilibria of finite horizon games.
4. **Describe** Strictly Competitive Games and maximization, Rationalizability.
5. **Apply** Game Theory in Cryptography, Adhoc network and network security.

UNIT – I

Introduction; Strategic Games:
What is game theory? Four elements, Classification of games, The theory of rational choice; Interacting decision makers, Strategic games; Example: The prisoner's dilemma; Nash equilibrium; Examples of Nash equilibrium; Best- response functions; Dominated actions; Equilibrium in a single population: symmetric games and symmetric equilibria, Interpretation of Nash Equillibrium. **8 Hours**

UNIT – II

Mixed Strategy Equilibrium:
Introduction; Strategic games in which players may randomize; Mixed strategy Nash equilibrium; Finding mixed strategy by graphical method; Finding mixed strategy by analysing subset of all actions; Dominated actions; Pure equilibria when randomization is allowed, examples; The formation of players beliefs; Eliminating dominated actions, Median Voter theorm. **8 Hours**

UNIT – III

Extensive Games
Extensive games with perfect information; Strategies and outcomes; Nash equilibrium; Subgame perfect equilibrium; Finding subgame perfect equilibria of finite horizon games.
7 Hours

UNIT – IV

Extensions: Allowing for simultaneous moves, examples, Discussion: subgame perfect equilibrium and backward induction.
Strictly Competitive Games and maximization: Maximization and Nash equilibrium; Strictly Competitive Games; Maximization and Nash equilibrium in strictly competitive games
Rationalizability: Iterated elimination of strictly dominated actions; Iterated elimination of weakly dominated actions; Dominance solvability. **8 Hours**

UNIT – V

Applications of Game Theory
Assumptions and issues in Game theory, Mechanism design problem and examples, game theory and cryptography, game theory and wireless adhoc networks, game theory and network security, Pareto optimal, Selfish routing, Correlated equilibrium. **8 Hours**

Course Outcomes:
At the end of the course the student will be able to:
1. **Identify and Illustrate** different types Strategic games, Mixed strategy games, Extensive Games.
2. **Model , Formulate** different types of games.
3. **Analyze** different types of games.
4. **Creation of graph** for different types of games.
5. **Apply Game Theory** in Cryptography, Adhoc Network and Network Security.

Mapping of POs & COs:

POs COs	a	b	c	d	e	f	g	h	i	j	k	l
1	H											
2					H						L	
3					H						L	
4			M									
5	H										H	H

H : High   M: Medium   L : Low

TEXT BOOKS:
1. Martin Osborne: An introduction to game theory, Oxford University Press, Indian Edition, 2004.
2. An Introduction to Game Theory: Strategy, Joel Watson, W W Norton and Company
3. Algorithmic Game Theory, Noam Nisan, Tim Roughgarden, Eva Tardos, Vijay V Vazirani, Cambridge University Press

REFERENCE BOOKS:
1. Roger B Myerson: Game theory: Analysis of Conflict, Harvard University Press, 1997.

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SOCIAL AND WEB ANALYTICS

Subject Code   : 14CS815   **Crédits   : 03**
Hrs/week   : 3+0+0+S   **Total Hours : 39**

<u>**Course Objectives:**</u> This course will enable students to

1. Understand social media, web and social media analytics, and their potential impact.
2. Determine how to Leverage social media for better services and Understand usability metrics, web and social media metrics
3. Use various data sources and collect data relating to the metrics and key performance indicators
4. Identify key performance indicators for a given goal, identify data relating to the metrics and key performance indicators
5. Use ready-made web analytics tools (Google Analytics) and be able to understand a statistical programming language (R), also use its graphical development environment (Deduce) for data exploration and analysis

UNIT – I
Introduction to Web & Social Analytics
Overview of web & social media (Web sites, web apps, mobile apps and social media), Impact of social media on business, Social media environment, , How to leverage social media for better services, Usability,   user experience, customer experience, customer sentiments, web marketing, conversion rates, ROI, brand reputation, competitive advantages

Need of using analytics, Web analytics technical requirements., current analytics platforms, OpenSource vs licensed platform, choosing right specifications & optimal solution, Web analytics and a Web analytics 2.0 framework (clickstream, multiple outcomes   **8 Hours**

UNIT – II
Relevant Data And its Collection using statistical Programming language R.
Data (Structured data, unstructured data, metadata, Big Data and Linked Data), Participating with people centric approach, Data analysis basics (types of data, metrics and data, descriptive statistics, comparing,
Basic overview of R
R-Data Types, R-Decision Making, R-Loops, R-functions, R-Strings, Arrays, R-Lists, R-Data Frame, R-CSV Files, R-Pie Charts, R-Bar charts, R-Barplots. Basic Text Mining in R and word cloud.   **8 Hours**

UNIT – III
KPI/Metrics
Understand the discipline of social analytics, Aligning social objectives with business goals, Identify common social business objectives, developing KPIs; Standard vs Critical metrics. PULSE metrics (Page views, Uptime, Latency, Seven-day active users) on business and technical Issues, HEART metrics (Happiness, Engagement, Adoption, Retention, and Task success) on user behaviour issues; Bounce rate, exit rate, conversion rate, engagement,

strategically aligned KPIs, Measuring Macro & micro conversions, On-site web analytics, off-site web analytics, the goal-signal-metric process. Case study on Ready-made tools for Web and social media analytics (Key Google Analytics metrics, dashboard, social reports, Tableau Public and KNIME   **7 Hours**

UNIT – IV

Mining Twitter: Exploring Trending Topics, Discovering What People Are Talking About, and More
Why Is Twitter All the Rage?, Exploring Twitter's API, Fundamental Twitter Terminology, Creating a Twitter API Connection, Exploring Trending Topics, Searching for Tweets, Analyzing the 140 Character, Extracting Tweet Entities, Analyzing Tweets and Tweet Entities with Frequency Analysis, Computing the Lexical Diversity of Tweets, Examining Patterns in Retweets, Visualizing Frequency Data with Histograms

Mining Facebook: Analyzing Fan Pages, Examining Friendships, and More
 Overview, Exploring Facebook's Social Graph API, Understanding the Social Graph API, Understanding the Open Graph Protocol, Analyzing Social Graph Connections, Analyzing Facebook Pages, Examining Friendships.   **8 Hours**

UNIT – V

Data Mining in Social Media
 Introduction, Data Mining in a Nutshell, Social Media, Motivations for Data Mining in Social Media, Data Mining Methods for Social Media, Data Representation, Data Mining - A Process, Social Networking Sites: Illustrative Examples, The Blogosphere: Illustrative Examples, Related Efforts, Ethnography and Netnography, Event Maps

Text Mining in Social Networks
 Introduction, Keyword Search, Query Semantics and Answer Ranking, Keyword search over XML and relational data, Keyword search over graph data, Classification Algorithms, Clustering Algorithms, Transfer Learning in Heterogeneous Networks   **8 Hours**

Course Outcomes: After Studying this course, students will be able to
1. Use Social Media Analytics and Web analytics,
2. Explain how to leverage social media for better services.
3. Develop KPIs and to build scorecards & dashboards to track KPIs.
4. Understand text mining and data mining in social networks.
5. Use ready-made web analytics tools (Google Analytics) and be able to understand a statistical programming language (R), also use its graphical development environment (Deduce) for data exploration and analysis

TEXT BOOKS:
1. Matthew A. Russell, Mining of Social web, O′Reilly; 2 edition (8 October 2013), ISBN-13: 978-1449367619.
2. Charu C Agarwal, Social Network Data Analytics, Springer; 2011 edition (1 October 2014), 978-1489988935

REFERENCE BOOKS:

1. Hand, Mannila, and Smyth. *Principles of Data Mining*. Cambridge, MA: MIT Press, 2001. ISBN: 026208290X.
2. Avinash Kaushik, Web Analytics 2.0: The Art of Online Accountability and Science of Customer Centricity, John Wiley & Sons; Pap/Cdr edition (27 Oct 2009)
3. Tom Tullis, Bill Albert, Measuring the User Experience: Collecting, Analyzing, and Presenting Usability Metrics, Morgan Kaufmann; 1 edition (28 April 2008).
4. Jim Sterne, Social Media Metrics: How to Measure and Optimize Your Marketing Investment, John Wiley & Sons (16 April 2010)
   Brian Clifton, Advanced Web Metrics with Google Analytics, John Wiley & Sons; 3rd Edition edition (30 Mar 2012

E-BOOKS / ONLINE RESOURCES:

1. Mining of Social web, http://www.webpages.uidaho.edu/~stevel/504/Mining-the-Social-Web-2nd-Edition.pdf
2. *Principles of Data Mining*. ,
   :http://dbmanagement.info/Books/MIX/Computer_Science_Mit_Press_Principles_Of_Data_Mining_Big_Data.pdf

MOOC:

1. Stanford: http://library.stanford.edu/projects/r
   Tutorial Points: http://www.tutorialspoint.com/r/r_tutorial.pdf

Mapping of COs to POs

POs\COs	a	b	c	d	e	f	g	h	i	j	k	l
1		H				L			H		M	
2	H		H					M				
3					H							H
4		H			H						H	

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CAD FOR VLSI AND VHDL

Sub Code : 14CS821	Credits : 03
Hrs/Week : 3+0+0+S	Total Hours: 39

Course Learning Objectives:
1. This subject will enable the student to:
2. Explain the VLSI and the fabrication process.
3. Carryout synthesis process
4. Give the algorithmic approach for the fabrication
5. Explain the logical synthesis process.

UNIT – I

Overview of VLSI Design:- Overview of VLSI Design: Digital Systems and VLSI: Why Design Integrated Circuits, Integrated Circuit manufacturing, CMOS Technology, Integrated Circuit Design Techniques, Fabrication Process, Transistors, Wires and Vias, Design Rules, Layout Design and Tools, Static Complementary gates, Wires and delay, switch logic, layout design methods, Combinational Logic Testing, Sequential Machines: Introduction, latchesand flip flops,,FPGAs, PLAs. **8 Hours**

UNIT - II

High level synthesis: Synthesis, Y-chart Partitioning in High level Synthesis, Introduction, Partitioning, Basic Partitioning Methods: Random Selection, Clustering Growth, Hierarchical Clustering
The Min-Cut Partitioning , Scheduling in High level Synthesis, Introduction , Basic Scheduling Algorithms, Time-Constrained Scheduling, Integer Linear Programming Method, Force-Directed Heuristic Method, Resource-Constrained Scheduling, DFG Restructuring
8 Hours

UNIT - III

Data Path Allocation in High level Synthesis, Introduction, Allocation Tasks, Unit Selection, Functional- Unit Binding, Storage Binding, Interconnection Binding, Interdependence and Ordering, Allocation Methods, Greedy Constructive Approaches, Decomposition Approaches, Clique Partitioning,, Left-Edge Algorithm, Weighted Bipartite-Matching Algorithm. **8 Hours**

UNIT - IV

Logic Synthesis: Algebraic and Boolean Division Shannon's expansion theorem, Binary Decision Diagrams (BDD), ROBDD, ITE graphs, Combinational Optimization, PLAs, Two level optimization –PLA Folding, Multilevel logic circuits and Optimization, Physical Synthesis**:** Floor Planning Placement and Routing, Compaction. **8 Hours**

UNIT - V

VHDL, language constructs, entity and architecture, behavioral description, structural description, examples, Sequential Statements , Testbenches **7 Hours**

Course Outcomes :

The student will be able to

1. Explain the concepts and terms related to VLSI design.
2. Select the synthesis process and process of VLSI circuit.
3. Apply the algorithm for the VLSI design.
4. Illustrate the logic synthesis process.
5. Write descriptions using VHDL

Mapping of POs & COs:

POs / COs	a	b	c	d	e	f	g	h	i	j	k	l
1					L							
2	L	M			M						M	L
3	L	H			H						M	H
4					M							L
5	M				H						M	M

H : High   M: Medium   L : Low

TEXT BOOKS & REFERENCE BOOKS:

1. VLSI CAD – Niranjan N.Chiplunkar and Manjunath Kothari, PHI Learning Pvt. Ltd. NewDelhi, 2011
2. Modern VLSI Design – Wayne Wolf, Prentice Hall , 2nd Edition
3. VHDL Programming: -Douglas Perry, TMH
4. High level synthesis Introduction to chip and system design – Daniel Gajski, Nikhil Dutt, Allen C-HWunand Steve Y-L Lin, Kluwer Academic
5. Logic synthesis and Verification Algorithms – Gary Hatchel and Fabio somenzi, Kluwer Academic
6. Algorithms for VLSI Physical Design Automation- 3rd edition, Naveed Sherwani, Springer International

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SUPPLY CHAIN MANAGEMENT AND ENTERPRISE RESOURCE PLANNING

Sub Code : 14CS822	**Credits : 03**
Hrs/Week : 3+0+0+S	**Total Hours : 39**

Course Learning Objectives:
This Course will enable students to

1. **Outline** the concepts of a supply chain with various case studies and **explain** the strategic framework to analyze supply chains and their management.
2. **Illustrate** the role of transportation and coordination in a supply chain with design and comparison of various transportation modes and coordination methodologies.
3. **Analyze** the role of pricing and revenue management in a supply chain with key factors and tactics.
4. **Get** the idea of role of IT in a supply chain and how to **apply** the IT and ERP to the Supply Chain Management.

UNIT - I
Building a Strategic Frame Work to Analyze Supply Chains: Supply chain stages and decision phases process view of a supply chain. Supply chain flows. Examples of supply chains. Competitive and supply chain strategies. Achieving strategic fit. Expanding strategic scope. Drivers of supply chain performance. Framework for structuring drivers – Inventory, Transportation, Facilities, Information. Obstacles to achieving fit. Case discussions. **8 Hours**

UNIT – II
Transportation in a supply chain: roles of transportation in a supply chain, modes of transportation and their performance characteristics, transportation infrastructure and policies, design option for a transportation network, trade-offs in transportation design, tailored transportation, role of IT in transportation, risk management in transportation, Indian transportation system-in need of innovations to propel economic growth, making transportation decisions in practice, transportation network in support of Indian cooperative endeavor-milk run for milk.

Coordination in a supply chain: Lack of supply chain coordination and bullwhip effect, the effect on performance of lack of coordination, obstacles to coordination in supply chain, managerial levels to achieve coordination, building strategic partnerships and trusts within, continuous replenishment and vendor managed inventories, collaborative planning, forecasting and replenishment (CPFR), collaborative planning, forecasting and replenishment-Indian experiences, the role of IT in coordination **8 Hours**

UNIT – III
Pricing and Revenue Management in a Supply Chain: Role of pricing and Revenue Management in the supply chain, Revenue management and pricing for: Multiple customer segments, perishable assets, seasonal demand, bulk and spot contracts, Role of IT in pricing and revenue management, Using Pricing and Revenue management in practice. **8 Hours**

UNIT – IV
IT in a supply chain: The role of IT in a supply Chain, The Supply Chain IT framework, CRM, Internal SCM, SRM, The Transaction Management Foundation, The future of IT in Supply chain, risk management in IT, Supply chain IT in practice, IT system selection

processes-Indian approach and experiences.   **8 Hours**

UNIT – V

ERP: Benefits, business engineering, ERP and management concerns, Business Modeling for ERP, ERP implementation, customization, post implementation options. ERP and competitive advantage, ERP domain: SAP, BAAN, SAP r/3, MGF/PRO, IFS/Avalon.   **7 Hours**

Course Outcomes:

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

1. **Analyse** various supply chains in the real world and **apply** the various methodologies for the supply chain profitability.
2. **Describe** the role of transportation and coordination in a supply chain and how it can be managed for the success of a supply chain.
3. **Design** a good pricing and revenue management system for a successful supply chain.
4. **Apply** Information Technology and ERP in a supply chain.

Mapping of POs & COs:

POs COs	a	b	c	d	e	f	g	h	i	j	k	l
1	H		H	H	H			H				
2	H		H	H	H			H	L		M	
3	H		H	H	H			H	L		M	
4	H		H		H			H	L	L	M	H

H : High   M: Medium   L : Low

TEXT BOOKS:

1. Sunil Chopra, Peter Meindl, D.V.Karla, "Supply Chain Management Strategy, Planning, and Operation, Pearson Education 2010, Fourth Edition.
2. Vinod Kumar Garg, N.K.Venkatakrishnan, "Enterprise Resource planning concepts and Practice", PHI 2003, Second Edition.

REFERENCE BOOK:

1. Martin Christopher, "Logistics and supply chain management", strategies for reducing cost and improving Science,Pearson Education 2008,Second Edition

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NANOTECHNOLOGY AND QUANTUM COMPUTING

Sub Code   : 14CS823   Credits   : 03
Hrs/Week : 3+0+0+S   Total Hours : 39

Course Learning Objectives:
This Course will enable students to
1. **Explain** the concept of nano technology.
2. **Demonstrate** the methods of measuring the size of nano materials.
3. **List** the properties and structure of nano materials.
4. **Illustrate** the synthesis method.
5. **Apply** the nano technology concepts in computation.

UNIT - I
 Introduction to nanotechnology and nano concept
Introduction to Solid state physics – Structures, Energy bands
Methods of measuring Properties – Structure, Microscopy, Spectroscopy, Measuring the surface   **8 Hours**

UNIT – II
Properties of Individual Nano particles – Metals, Semiconductors.
Structure and working of various microscopes (SEM, STM, AFM etc), size determination
Carbon Nanotube – Structure, Synthesis, properties and applications.

7 Hours

UNIT - III
Bottom up and top down Technology and Nano robotics, Nano mechanical and computational Systems, quantum Dots. Nano electronics, MEMS, NEMS   **7 Hours**

UNIT - IV
Nano Computers, DNA Computing and DNA gates. Examples of DNA computing. Quantum Computers, introduction and overview, quantum computation, quantum algorithms, Quantum circuits, qubit operation, controlled operations, measurements.   **8 Hours**

UNIT - V
Universal quantum gates, simulation of quantum systems, introduction to different types of quantum computers. Applications of Nanotechnology in Computation (Memory, Peocessing, Communication), Example of various computer component design using Nano concepts.

8 Hours

Course Outcomes
CO1: Explain the key concepts of Nanotechnology.
CO2: Use the Nanoparticles in metals for the semiconductors.
CO3: Apply the Nano characterization, Synthesizing, properties for various applications.
CO4: Design Nano mechanical and computation systems and Nanoelectronics.
CO5: Design the nano based Computers and apply Nanotechnology in Computation, Memory, Processing and Communication

Mapping of POs & COs:

POs COs	a	b	c	d	e	f	g	h	i	j	k	l
1	H				H			L				
2	H		M		H			L	L		M	
3	H	L	H		H			L	L		M	
4	H		M		H			L	L		M	
5	H	L	H		H			L			M	L

H : High   M: Medium   L : Low

TEXT BOOKS:
1. Introduction to Nanotechnology, Charles P Poole, Frank J Owns, John Wiely Publications. (Chapters 2, 3, 5, 4, 9,14)
2. Nanotechnology Fundamentals and Applications, Manasi Karkare, I.K. International Publishing, 2008 (Chapters 1, 2, 3, 9, 11, 12)
3. Nanotechnology for Dummies®, Richard Booker and Earl Boysen, Wiley Publishing, Inc. (Chapters 6-9) Other reference materials given in moodle as courseware

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ADVANCED COMPILATION TECHNIQUES

Sub Code : 14CS824	**Credits**	**: 03**
Hrs/Week : 3+0+0+S	**Total Hours**	**: 39**

Course Learning Objectives:
This Course will enable students to
1. **Outline** issues in compiler design and optimization
2. **Bring out** the issues in code generation.
3. **Perform** data flow analysis, Partial-redundancy elimination, Region-based analysis; Symbolic analysis.
4. **Perform** Basic-block scheduling; Global code scheduling; Software pipelining.
5. **Describe** instruction level parallelism and optimizing for parallelism.

UNIT – I

Introduction and Review: Language processors; The structure of a Compiler; The evolution of programming languages; The science of building a compiler; Applications of Compiler technology; Programming language basics. **7 Hours**

UNIT – II

Topics in Code Generation: Issues in the design of Code Generator; Peephole optimization; Register allocation and assignment; Instruction selection by tree rewriting; Optimal code generation for expressions; Dynamic programming code generation.   **8 Hours**

UNIT – III

Machine-Independent Optimizations: The principle sources of optimization; Introduction to data flow analysis; Foundations of data flow analysis; Constant propagation; Partial-redundancy elimination; Loops in flow graphs; Region-based analysis; Symbolic analysis.

8 Hours

UNIT – IV

Instruction-Level Parallelism: Process architectures; Code-scheduling constraints; Basic-block scheduling; Global code scheduling; Software pipelining.   **8 Hours**

UNIT – V

Optimizing for Parallelism and Locality: Basic concepts; An example of matrix multiplication; Iteration spaces; Affine array indexes; Data reuse; Array data – dependence analysis; Finding synchronization-free parallelism; Synchronization between parallel loops; Pipelining; Locality optimizations.   **8 Hours**

Course Outcomes:
At the end of the course the student will be able to:
1. **List basic** issues in Compiler design and Code generation.
2. **Perform** flow analysis, Partial-redundancy elimination, Region-based analysis; Symbolic analysis.
3. **Construct** Basic-block scheduling; Global code scheduling
4. **Illustrate** the parallelism concept
5. **Exploit Parallelism** for Optimization

Mapping of Pos & COs:

Pos COs	a	b	c	d	e	f	g	h	i	j	k	l
1	H											L
2					H						H	
3			M									
4	H											H
5	H											H

H : High   M: Medium   L : Low

TEXT BOOKS:
1. Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D Ullman: Compilers - Principles, Techniques and Tools, 2nd Edition, Pearson, 2007.

REFERENCE BOOKS:

1. Charles N. Fischer, Richard J. leBlanc, Jr.: Crafting a Compiler with C, Pearson, 1991.
2. Andrew W Apple: Modern Compiler Implementation in C, Cambridge University Press, 1997.
3. Kenneth C Louden: Compiler Construction Principles & Practice, Cengage Learning, 1997.

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BIG DATA ANALYTICS

Subject Code : 14CS825	**Credits : 03**
Hrs/week : 3+0+0+S	**Total Hours : 39**

Course Objectives: This course will enable students to

1.   Comprehend in depth the fundamental issues behind Big Data problem
2.   Understand Big Data technologies, different databases and Hadoop foundations
3.   Discuss the philosophy of Hadoop MapReduce
4.   Learn Pig and Hive Scripts using Hadoop environment
5.   Relate different Analytics associated with Big Data problem

UNIT – I
Introduction to big data: Data, Characteristics of data and Types of digital data: Unstructured, Semi-structured and Structured, Sources of data, Working with unstructured data, Evolution and Definition of big data, Characteristics and Need of big data, Challenges of big data, Data environment versus big data environment   **7 Hours**

UNIT - II
Big data technologies and Databases: Introduction to NoSQL, Uses, Features and Types, Need, Advantages, Disadvantages and Application of NoSQL, Overview of NewSQL, Comparing SQL, NoSQL and NewSQL, Introduction to MongoDB and its needs, Characteristics of MongoDB, Introduction of apache cassandra and its needs, Characteristics of cassandra

Hadoop foundation for analytics: History, Needs, Features, Key advantage and Versions of Hadoop, Essential of Hadoop ecosystems, RDBMS versus Hadoop, Key aspects and Components of Hadoop, Hadoop architectures.   **8 Hours**

UNIT - III
Hadoop MapReduce and YARN framework: Introduction to MapReduce, Processing data with Hadoop using MapReduce, Introduction to YARN, Components, Need and Challenges of YARN, Dissecting YARN, MapReduce application, Data serialization and Working with common serialization formats, Big data serialization formats   **8 Hours**

UNIT –IV

Big data with Hive and Pig: Overview of hive and its architecture, Hive data types and File format, Hive query language (HQL), Introduction to Pig, pig latin overview, Data types in Pig and Running Pig   **8 Hours**

UNIT –V

Big data analytics: Overview of business intelligence, Data science and Analytics, Meaning and Characteristics of big data analytics, Need of big data analytics, Classification of analytics, Challenges to big data analytics, Importance of big data analytics, Basic terminologies in big data environment   **8 Hours**

Course Outcomes: After Studying this course, students will be able to
1. Identify the issues and challenges related to Big Data.
2. Choose and apply Big Data technologies and tools in solving real life Big Data problem.
3. Design MapReduce architecture for Big Data problem.
4. Write scripts using Pig and Hive to implement Big Data problem
5. Derive different Analytics from the Big Data problem

Graduate Attributes (as per NBA)
1. Engineering Knowledge
2. Problem Analysis
3. Conduct Investigations of Complex Problems
4. Modern Tool usage

TEXT BOOKS:
1. Seema Acharya, Subhashini Chellappan – "Big Data and Analytics", Wiley.
2. Alex Holmes-"Big Data Black Book", Dreamtech.

REFERENCE BOOKS:
1. Minelli, Chambers, Dhiray- "Big Data Big Analytics", Wiley.
2. Bart Baesens – "Analytics in a Big Data World", Wiley.
3. Boris Lublinsky, Kevin T. Smith – "Hadoop Solutions", Wrox.
4. Chuck Lam – "Hadoop in Action", Dreamtech.

POs COs	a	b	c	d	e	f	g	h	i	j	k	l
1		H			M				H			
2		H			H						H	
3	M	H			H							H
4		H									H	
5			H		H				M			H

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