GURU GHASIDAS VISHWAVIDYALAYA
BILASPUR (C.G.)

(A Central University)

Koni, Bilaspur-495009, C.G (India)

OUTCOME BASED EDUCATION
WITH
CHOICE BASED CREDIT SYSTEM (CBCS)

MASTER OF TECHNOLOGY
IN
Computer Science and Engineering

COURSE STRUCTURE AND SYLLABUS

M.Tech Regular Two Year Degree Program

(Effective from the academic year 2021-22)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
SCHOOL OF STUDIES OF ENGINEERING & TECHNOLOGY,
GGV, BILASPUR, C.G. (INDIA)

Department of Computer Science & Engineering
School of Studies in Engineering & Technology
Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)

Minutes of Meeting

Today, on 29 Oct 2021, the board of studies (BOS) meeting held through online platform google meet from 04:00 pm. The following members attended this online meeting.

1. Dr. Alok Kumar Singh Kushwaha, **Head and Chairman of BOS**
2. Mr. Amit Sharma, **External Member, BOS**
3. Dr. Sanjay Kumar, **External Member, BOS**
4. Dr. Manish Shrivastava, Assistant Prof., CSE — Invited Members
5. Mr. Nishant Behar, Assistant Prof., CSE — Invited Members
6. Mr. Devendra Kumar Singh, Assistant Prof., CSE — Invited Members
7. Mr. Vaibhav Kant Singh, Assistant Prof., CSE — Invited Members
8. Mrs. Raksha Pandey, Assistant Prof., CSE — Invited Members
9. Mr. Amit Baghel, Assistant Prof., CSE — Invited Members
10. Mr. Satish Kumar Negi, Assistant Prof., CSE — Invited Members
11. Mr. Pushpendra Kumar Chandra, Assistant Prof., CSE — Invited Members
12. Mr Manjit Jaiswal, Assistant Prof., CSE — Invited Members
13. Dr. Princy Matlani, Assistant Prof., CSE — Invited Members

In this online meeting the following point has been concluded

1. M.Tech. Ist and 2nd year Scheme and Syllabus Designed and will be effected from Session 2021-22.

The Meeting ended with a vote of thanks by the Head of the Department.

Mr. Amit Sharma
(External Member, BOS)
(Consent through e-mail)

Dr. Sanjay Kumar
(External Member, BOS)
(Consent through e-mail)

Dr. Alok Kumar Singh Kushwaha

Dr. Manish Shrivastava

Mr. Nishant Behar

Mr. Devender Kumar Singh

Mrs. Raksha Pandey

Mr. Amit Baghel

Mr. Vaibhav Kant Singh

Mr. Satish Kumar Negi

Mr. Pushpendra K. Chandra

Dr. Princy Matlani

Mr. Manjit Jaiswal

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
SCHOOL OF STUDIES OF ENGINEERING & TECHNOLOGY, GGV,
BILASPUR, C.G. (INDIA)

SCHEME OF EXAMINATION

M.TECH. COMPUTER SCIENCE AND ENGINEERING

M.Tech. I-Semester

Sl.	Course Type/ Code	Subjects	Periods/Week			Evaluation			Credits
			L	T	P	IA	ESE	Total	
1	CSPATT1	Advanced Data Structure	3	0	0	40	60	100	3
2	CSPATT2	Advanced Computer Network	3	0	0	40	60	100	3
3	ITPATC1	Research Methodology and IPR	2	0	0	-	50	50	2
4	CSPATP1 CSPATP2 CSPATP3	Professional Elective -I 1. Logics of Computer Science 2. Advance Computer Architecture 3. Multimedia System	3	0	0	40	60	100	3
5	CSPATP4 CSPATP5 CSPATP6	Professional Elective -II 1. Advanced Artificial Intelligence 2. Specialized Machine Learning Multimedia System 3. Soft Computing	3	0	0	40	60	100	3
6	CSPATP7 CSPATP8 CSPATP9	Professional Elective -III 1. Cluster and Grid Computing Specialized 2. High Performance Network 3. Ad Hoc and Wireless Sensor Network.	3	0	0	40	60	100	3
7.	CSPALT1	Advanced Data Structure Lab	0	0	3	30	20	50	2
Total			17	0	3	230	370	600	19

M.Tech. II-Semester

Sl.	Course Type/ Code	Subjects	Periods/Week			Evaluation			Credits
			L	T	P	IA	ESE	Total	
1.	CSPBTT1	Advanced Algorithm	3	0	0	40	60	100	3
2.	CSPBTT2	Advanced Digital Image Processing	3	0	0	40	60	100	3
3.	CSPBTP1 CSPBTP2 CSPBTP3	Professional Elective-I 1. Data Science 2. Software Process and Project Management 3. GPU Computing	3	0	0	40	60	100	3
4.	CSPBTP4 CSPBTP5 CSPBTP6	Professional Elective-II 1. Data Base Engineering 2. Cryptography and Network Security 3. Multi-processor System	3	0	0	40	60	100	3
5.	MSPBTO1 IPPBTO2 IPPBTO3 CEPBTO4 MEPBTO5 CHPBTO6 ECPBTO7 MCPBTO8	Open Elective-1 1. Business Analytics 2. Industrial Safety 3. Operations Research 4. Cost Management of Engineering Projects 5. Composite Materials 6. Waste to Energy 7. IoT 8. MOOCs	3	0	0	40	60	100	3
6.	CSPALT1	Advanced Algorithm Lab	0	0	3	30	20	50	2
7.	CSPALT2	Advanced DIP Lab	0	0	3	30	20	50	2
8.	ELPBTX1 PEPBTX2 CEPBTX3 LAPBTX4	Audit Course/Value Added Course English for Research Paper Writing Stress Management by Yoga Disaster Management Constitution of India	2	0	0	40	60	100	2
Total			17	0	06	300	400	700	21

Note: Under MOOCs the students have to opt any subject other than Computer Science and Engineering from NPTEL/UGC SWAYAM

M.Tech. III-Semester

Sl.	Course Type/ Code	Subjects	Periods/Week			Evaluation			Credits
			L	T	P	IA	ESE	Total	
1.	CSPCLT1	Dissertation Stage–I	0	0	28	100	100	200	14
Total			0	0	28	100	100	200	14

M.Tech. IV-Semester

Sl.	Course Type/ Code	Subjects	Periods/Week			Evaluation			Credits
			L	T	P	IA	ESE	Total	
1.	CSPDPT1	Dissertation Stage–II	0	0	32	100	200	300	16
Total			0	0	32	100	200	300	16

Total Credits for the Program = 19 + 21 +14 +16 = 70

SubTitle:ADVANCED DATA STRUCTURE		
SubCode:CSPATT1	**No.ofCredits: 3=3:0:0 (L-T-P)**	**Nooflecturehours/week:03**
ExamDuration:3hours	**IA+ESE =40+60**	**Totalnoofcontacthours:21**

COURSEOBJECTIVE:

1. The fundamental design, analysis, and implementation of basic data structures.
2. Basic concepts in the specification and analysis of programs.
3. Principles for good program design, especially the uses of data abstraction.
4. Significance of algorithms in the computer field
5. Various aspects of algorithm development
6. Qualities of a good solution

UNIT No	SyllabusContent	Noof Hours
1	Algorithms, Performance analysis- time complexity and space complexity, Asymptotic Notation-Big Oh, Omega and Theta notations, Complexity Analysis Examples. Data structures-Linear and non-linear data structures, ADT concept, Linear List ADT, Array representation, Linked representation,Vector representation, singly linked lists - insertion, deletion, search operations, doubly linked lists-insertion, deletion operations, circular lists. Representation of single, two-dimensional arraysand their representation.	**10**
2	Stack and Queue ADTs, array and linked list representations, infix to postfix conversion using stack,implementation of recursion, Circular queue-insertion and deletion, Dequeue ADT, array and linked list representations, Priority queue ADT, implementation using Heaps, Insertion into a Max Heap, Deletion from a Max Heap, ArrayList, Linked List, Vector classes, Stacks and Queues.	**10**
3	Searching–Linear and binary search methods, Hashing-Hash functions, Collision Resolution Methods-Open Addressing, Chaining, Hashing, HashMap, HashSet, Hashtable. Sorting –Bubble sort, Insertion sort, Quick sort, Merge sort, Radix sort, comparison of sorting methods.	**08**
4	Search trees- Binary search tree-Binary search tree ADT, insertion, deletion and searching operations, Balanced search trees, AVL trees-Definition and examples only, Red Black trees – Definition and examples only, B-Trees-definition, insertion and searching operations, Trees, TreeSet, Tree Map Classes, Comparison of Search trees.	**10**
5	Trees- Ordinary and Binary trees terminology, Properties of Binary trees, Binary tree ADT, representations, recursive and non-recursive traversals, Threaded binary trees. Graphs- Graphs terminology, Graph ADT, representations, graph traversals/search methods-DFS and BFS, Application of Graph and algorithm. Heap Data structure: Fibonacci heap, Binomial heap, Binary heap.	**10**

COURSEOUTCOMES: Thestudentswouldhavelearnt

1. Basic ability to analyze algorithms and to determine algorithm correctness and time efficiency class.
2. Master a variety of advanced abstract data type (ADT) and data structures and their implementation's.
3. Master different algorithm design techniques (brute-force, divide and conquer, greedy, etc
4. Ability to apply and implement learned algorithm design techniques and data structures to solve problems.

TextBooks:

1. S. Sahni, "Data structures, Algorithms and Applications in Java", Universities Press. [ISBN:0-07-109217-x]
2. Adam Drozdek, "Data structures and Algorithms in Java", 3rd edition, Cengage Learning. [ISBN:978-9814239233]

ReferenceBooks:

1. R.Lafore "Data structures and Algorithms in Java", Pearson education. ISBN: 9788 131718124.
2. J.P.Tremblay and G.A.Cheston "Data structures and Software Development in an ObjectOriented Domain", Java edition, Pearson Education.

Sub Title: Advanced Data Structure Lab	
Sub Code: CSPALT1	**No. of Credits: 2=0:0:2(L-T-P)**
Exam Duration:3 hours	**IA+ESE =30+20**

COURSEOBJECTIVE:

1. The fundamental design, analysis, and implementation of basic data structures.
2. Basic concepts in the specification and analysis of programs.
3. Principles for good program design, especially the uses of data abstraction.
4. to understand the sorting techniques
5. to understand the non linear data structures
6. to learn bout the pattern matching

UNIT	Data structures:	Noof Hours
UNIT I,II, III, IV, V	1. Write Java programs that use both recursive and non-recursive functions for implementing the following searching methods: a) Linear search b) Binary search 2. Write Java programs to implement the following using arrays and linked lists a) List ADT. 3. Write Java programs to implement the following using an array. a) Stack ADT b) Queue ADT 4. Write a Java program that reads an infix expression and converts the expression to postfix form. (Use stack ADT). 5. Write a Java program to implement circular queue ADT using an array. 6. Write a Java program that uses both a stack and a queue to test whether the given string is a palindrome or not. 7. Write Java programs to implement the following using a singly linked list. a) Stack ADT b) Queue ADT 8. Write Java programs to implement the deque (double ended queue) ADT using a) Array b) Singly linked list c) Doubly linked list. 9. Write a Java program to implement priority queue ADT. 10. Write a Java program to perform the following operations: a) Construct a binary search tree of elements. b) Search for a key element in the above binary search tree. CSE 2014-2015 SR Engineering College 21 c) Delete an element from the above binary search tree. 11. Write a Java program to implement all the functions of a dictionary (ADT) using Hashing. 12. Write a Java program to implement Dijkstra's algorithm for Single source shortest path problem. 13. Write Java programs that use recursive and non-recursive functions to traverse the given binary tree in a) Preorder b) Inorder c) Postorder. 14. Write Java programs for the implementation of bfs and dfs for a given graph. 15. Write Java programs for implementing the following sorting methods: a) Bubble sort d) Merge sort g) Binary tree sort b) Insertion sort e) Heap sort c) Quick sort f) Radix sort 16. Write a Java program to perform the following operations: a) Insertion into a B-tree b) Searching in a B-tree 17. Write a Java program that implements Kruskal's algorithm to generate minimum cost spanning tree. 18. Write a Java program that implements KMP algorithm for pattern matching.	**24**

COURSEOUTCOMES: Thestudentswouldhavelearnt

1. Basic ability to analyze algorithms and to determine algorithm correctness and time Efficiency class.
2. Master a variety of advanced abstract data type (ADT) and data structures and their Implementations.
3. Master different algorithm design techniques (brute-force, divide and conquer, greedy, etc.)
4. Ability to apply and implement learned algorithm design techniques and data structures to solve problems

ReferenceBooks:

1. A. Drozdek "Data Structures and Algorithms in java", 3rd edition, Cengage Learning.
2. J. R. Hubbard, "Data Structures with Java", 2nd edition, Schaum's Outlines, TMH. (Note: Use packages like java.io, java.util, etc)

SubTitle:Advanced Computer Network		
SubCode:CSPATT2	**No.ofCredits: 3=3:0:0 (L-T-P)**	**Nooflecturehours/week:03**
ExamDuration:3hours	**IA+ESE =40+60**	**Totalnoofcontacthours:21**

COURSEOBJECTIVE:

1. Demonstrate in-depth knowledge in the area of Computer Networking.
2. To demonstrate scholarship of knowledge through performing in a group to identify, formulate and solve a problem related to Computer Networks.
3. Prepare a technical document for the identified Networking System.
4. Analyze the identified research work in building Computer Networks.

UNIT No	SyllabusContent	NoofHours
1	**Introduction to the Link Layer:** Services of Link Layer, Error-Detection and-Correction Techniques: Parity Checks, Check summing Methods, Cyclic Redundancy Check (CRC), Multiple Access Links and Protocols: Channel Partitioning Protocols, Random Access Protocols, Taking-Turns Protocols DOCSIS, Switched Local Area Networks, Multiprotocol Label Switching (MPLS)	**10**
2	**Data Forwarding and Routing:** Introduction, Forwarding and Routing, Network Service Models, Virtual Circuit and Datagram Networks, Virtual-Circuit Networks, Datagram Networks, Origins of VC and Datagram Networks, Router: Input Processing, Switching , Output Processing, The Internet Protocol (IP): Forwarding and Addressing in the Internet, Datagram Format, IPv4, Addressing, Internet Control Message Protocol (ICMP), IPv6: IP Security, Routing Algorithms: The Link-State (LS) Routing Algorithm, The Distance-Vector (DV) Routing Algorithm, Hierarchical Routing, Routing in the Internet: Intra-AS Routing in the Internet: RIP, Intra-AS Routing in the Internet: OSPF, Inter-AS Routing: BGP, Broadcast and Multicast Routing: Broadcast Routing Algorithms, Multicast	**10**

3	**Transport Layer:** Introduction and Transport-Layer Services, Relationship Between Transport and Network Layers, Overview of the Transport Layer in the Internet, Multiplexing and Demultiplexing, Connectionless Transport: UDP, UDP Segment Structure, UDP Checksum, Principles of Reliable Data Transfer, Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go-Back-N (GBN), Selective Repeat (SR), Connection-Oriented Transport: TCP, The TCP Connection, TCP Segment Structure, Round Trip Time Estimation and Timeout, Reliable Data Transfer, Flow Control, TCP Connection Management, Principles of Congestion Control	**12**
4	**Wireless and Mobile Networks:** Introduction, Wireless Links and Network Characteristics: CDMA, Wireless LANs: The 802.11 Architecture, The 802.11 MAC Protocol, The IEEE 802.11 Frame, Mobility in the Same IP Subnet, Advanced Features in 802.11, Personal Area Networks: Bluetooth and Zigbee, Cellular Internet Access,: An Overview of Cellular Network Architecture, 3G Cellular Data Networks: Extending the Internet to Cellular subscribers, On to 4G: LTE, Mobility Management: Principles: Addressing, Routing to a Mobile Node, Mobile IP, Managing Mobility in Cellular Networks: Routing Calls to a Mobile User, Handoffs in GSM, Wireless and Mobility: Impact on Higher-Layer Protocols.	**10**
5	**Network Management:** Overview of Network Management, The Infrastructure for Network Management, The Internet-Standard Management Framework, Structure of Management Information: SMI, Management Information Base: MIB, SNMP Protocol Operations and Transport Mappings, Security and Administration.	**10**

COURSEOUTCOMES: Thestudentswouldhavelearnt

CO1: Understand the general principles of Computer Network.
CO2: Differentiate between different LAN-based forwarding devices so that they can make thoughtful suggestions on how to build a network.
CO3: Evaluate the challenges in building networks and solutions.
CO4: Design and implement networking applications.

Text Books:

1. Ross, Computer Networking A Top down Approach, James F. Kurose, Keith W, Pearson.
2. TCP/IP Protocol Suite , Behrouz A Forouzan, Tata Mc Graw-Hill .
3. Data communications and Networking, Behrouz A Forouzan, Tata Mc Graw-Hill 5th edition.

Reference Books:

1. Larry Peterson and Bruce S Davis "Computer Networks :A System Approach" , Elsevier

2. Douglas E Comer, "Internetworking with TCP/IP, Principles, Protocols and Architecture", PHI.

Subject: CSPATC1	**Research Methodology and IPR (IPPATC1)**	**Credits**			
		L	T	P	Total
Teaching Scheme:	Lectures: 2 hours/week	2	0	0	2
Course outcomes:	**At the end of the course, students will be able to**				
1	Understand research problem formulation.				
2	Analyze research related information				
3	Follow research ethics				
4	Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property				
5	Right to be promoted among students in general & engineering in particular.				
6	Understand research problem formulation.				

Syllabus Contents:

- **Introduction and Design of research**: Meaning, objectives and significance of research, types and parameters of research, research process, identification and definition of the research problem, definition of construct and variables, pure and applied research design, exploratory and descriptive design methodology, qualitative vs. quantitative research methodology, field studies, field experiments vs. laboratory experiments, research design in social and physical sciences.

- **Data and Methods of Data Collection**: Survey, assessment and analysis: data collection, primary and secondary sources of data, Collection of primary data through questionnaire and schedules. Collection of secondary data, processing and analysis of data. Sample survey, simple random sampling, stratified random sampling, systematic sampling, cluster sampling, area sampling and multistage sampling. Pilot survey, scaling techniques, validity & reliability.

- **Data Analysis:** Procedure for testing of hypothesis, the null hypothesis, determining levels of significance, type i and ii errors, grouped data distribution, measures of central tendency, measures of spread/dispersion, normal distribution, analysis of variance: one way, two way, chi square test and its application, students 'T' distribution, non-parametric statistical techniques, binomial test. Correlation and regression analysis – discriminate analysis – factor analysis – cluster analysis, measures of relationship

- Research report preparation and presentation: Review of literature: historical survey and its necessity, layout of research plan, meaning, techniques and precautions of interpretation, types of report: technical report, popular report, report writing – layout of research report, mechanics of writing a research report. Writing bibliography and references.

- Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and

Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

References:

- Research in education, By J W Best and J V Kahn, Pearson/ Allyn and Bacon.
- Research Methodology – Methods and Techniques, C K Kothari, New Age International.
- Design and Analysis of Experiments, D C Montgomery, Wiley.
- Applied Statistics & Probability for Engineers, D C Montgomery & G C Runger, Wiley.
- Management Research Methodology: Integration of Principles, Methods and Techniques, K N Krishnaswamy, A I Sivakumar and M Mathiranjan, Pearson Education.

SubTitle: LOGICs IN COMPUTER SCIENCE		
SubCode:CSPATP1	**No.ofCredits: 3=3:0:0 (L-T-P)**	**Nooflecturehours/week:03**
ExamDuration:3hours	**IA+ESE =40+60**	**Totalnoofcontacthours:21**

COURSEOBJECTIVE:

1. To introduce the concept of mathematical logics and its importance.
2. To discuss propositional, predicate, temporal and modal logic and its applications.

UNIT No	Syllabus Content	No of Hours

1	**LOGICS FUNDAMENTALS** Mathematical Logic, Prepositional Logic, First Order Logic, Modal and Temporal Logic.Prepositional Logic: Formulae and interpretations, Equivalance satisfiability & validity, Semantic Tableaux, Soundness and Completeness.	**10**
2	**Hilbert Deductive Systems:** Hilbert Deductive systems, Derived Rules, Theorems and operators, Soundness and Completeness and Consistency. Resolution and propositional Logic: Conjunctive Normal form, Clausal form, resolution rule.	**10**
3	**Binary Decision Diagrams** Definition, reduced and ordered BDD,Operators. Predicate Logic: Relations, predicates, formulae and interpretation, logic equivalence, semantic tableaux, soundness.	**12**
4	**Resolution in Predicate Logic** The Hilbert deduction system for predicate logic, PCNF and clausal form, Her brand model. Resolution in predicate logic: ground resolution, substitution, unification and general resolution.	**10**
5	**Temporal Logic: Syntax and semantics, models of time, linear time temporal logic, semantic tableaux, Deduction system for temporal logic.** **Program Verification: -Need for verification, Framework for verification, Verification of sequential programs, deductive systems, verification, synthesis.**	**10**

COURSEOUTCOMES: Student will be able to

CO1:Explain the concept of logic and its importance.
CO2:Understand fundamental concepts of preposional
logic and apply resolution techniques
CO3:Understand fundamental concepts of predicate logic and apply resolution techniques
CO4:Understand fundamental concepts of temporal logic and apply resolution techniques

Textbooks:

- Modechai Ben Ari, Mathematical logic for computer science, Springer 3E, 2102.
- Arindhama Singh, Logics for Computer Science, Prentice Hall India, 2004.

Reference Books:

1. Michael Huth, Mark Ryan, Logics in Computer Science: Modelling and reasoning about systems, Cambridge University Press, 2005.

Sub.Title: ADVANCEDCOMPUTER ARCHITECTURE		
SubCode:CSPATP2	**No.ofCredits:3=3: 0:0(L-T-P)**	**No.oflecturehours/week:03**
ExamDuration:3hours	**IA+ESE=40+60**	**Totalno.ofcontacthours:21**

COURSEOBJECTIVE:

1. Understand the Concept of Parallel Processing and its applications.
2. Learn the function of each element of a memory hierarchy.
3. Develop the Pipelining Concept for a given set of Instructions.
4. Analyze processor performance improvement using instruction level parallelism.
5. Distinguish the performance of pipelining and non-pipelining environment in a processor.
6. Learn multiprocessor architecture and advanced processor technology.

UNIT No	SyllabusContent	Noof Hours

1	**Multiprocessors and Multi-computers**; Uniprocessor and Multiprocessor Architecture, Flynn's Classification: SISD, SIMD, MISD, MIMD, Parallel Processing: Definition, Theory of Parallelism. Parallel Computer Models, Parallelism in Uni-Processor Computers, Implicit Parallelism vs. Explicit Parallelism, Levels of Parallelism. Software Parallelism, Hardware Parallelism, Amdahl's Law.	**8**
2	**Memory Technology:** Cache Design Issues, Locality of Reference , Cache Addressing Model, Cache Performance Issues, Interleaved Memory Organization, Multicore Architecture and Cache Coherence Problem.	**8**
3	**Pipelining:** Linear Pipeline processor, Asynchronous and Synchronous models, speed up, Efficiency, Throughput, Pipelining in MIPS architecture, Nonlinear Pipeline Processor, Instruction Pipeline, Arithmetic Pipeline. Conditions of Parallelism: Data and Resource Dependencies, Control Dependence, Resource Dependence, Hardware and Software Parallelism, Pipeline Hazards and their Resolution Mechanisms, Dynamic Instruction Scheduling, Advanced Pipelining.	**9**
4	**System Interconnect Architecture:** Static and Dynamic Networks, Network Properties: Network Size, Graph, Node Degree, Diameter, Bisection Width etc., Data Routing Functions: Permutation, Perfect shuffle exchange, Hypercube Routing function. Network Topologies for Multiprocessor: Linear Array, Ring, Star, Tree, Mesh, Systolic Array, Chordal Ring, Completely Connected Network, Cube Connected Cycles, Torus, K-ary-n Cube, Barrel Shifter, Single Stage Interconnection Network and Multistage Interconnection Networks.	**8**
5	**Advanced Processor Technology:** Instruction Set Architecture, RISC Processor, CISC Processor, Superscalar Processor, VLIW Architecture, Vector & Symbolic Processors, Case Study of Pentium Processor & SPARC.	**7**

COURSEOUTCOMES: Thestudentswouldhavelearnt

CO1: Analyze the parallelism and identify the conditions of parallelism.

CO2: Understanding memory hierarchy and cache design issues.

CO3: Understanding pipelined and non-pipelined processing.

CO4: Understand the system interconnection architecture.

CO5: Understand the concepts of advanced processor technology

Text Books:

1. Computer Architecture, Hennessy, J. L. and Patterson, D. A., Morgan Kaufmann.
2. Advanced Computer Architecture, Rajiv Chopra, S. Chand India.
3. Advanced Computer Architecture, Hwang, K., Tata McGraw-Hill.

ReferenceBooks:

1. Computer Architecture & Organization, J. P. Hayes, McGraw-Hill India.

2. Parallel Computing: Theory and Practice, Michael, J.Q., Tata McGraw-Hill.

Subject Title : MultiMedia System		
SubCode:CSPATP2	**No.ofCredits: 3=3:0:0 (L-T-P)**	**Nooflecturehours/week:03**
ExamDuration:3hours	**IA+ESE =40+60**	**Totalnoofcontacthours:21**

COURSE OBJECTIVE

1. Explain standard Multimedia system architecture
2. Compare the various types of compression available both for image and video.
3. To analyze different media and design issues related to multimedia systems.

UNIT	TOPIC	CONTACT HOURS
1	**UNIT-I BASICS OF MULTIMEDIA TECHNOLOGY :**-Multimedia -An introduction: Multimedia application, Multimedia system architecture, Evolving technologies for	8

	multimedia system, Defining objects for multimedia systems, Multimedia data interface standards. multimedia devices CD Audio. CD-ROM. CD-presentation devices	
2	**UNIT-2 IMAGE COMPRESSION & STANDARDS :-** Making still images: Capturing images; scanning images; computer color models: color palettes; Losyy and lossless compression, JPEG-objectives and architecture: JPEG-DCT encoding and quantization, JPEG statistical coding; JPEG predictive loss less coding; JPEG performance; Overview of video coding standardsMPEG-1, MPEG-2, MPEG-4, MPEG-7.	**8**
3	**UNIT-3- MULTIMEDIA WEB APPLICATION AND PROTOCOL** :- Multimedia over IP: RTP, RTCP. Streaming media, Codec and Plugins, VoIP, Text and Voice Chat. Multimedia Communication across networks - packet audio / video, Streaming video across internet.	**10**
4	**UNIT IV- ARCHITECTURAL AND TELECOMMUNICATION CONSIDERATIONS** :- Specialized computational processors, memory systems, Multimedia board solutions, LAN/WAN Connectivity, Multimedia transport across ATM networks, Wireless Networks.	**8**
5	**UNIT V -MULTIMEDIA APPLICATION DESIGN (NITT)** :- Multimedia Application Classes – Types of Multimedia Systems – Virtual Reality – Components of Multimedia Systems -Multimedia Authoring Systems – Multimedia Authoring Tools - User Interface Design- Mobile Messaging – Hypermedia Message Components - Hypermedia Linking and embedding.	**8**

Outcome

1. Technical know to develop new compression standards
2. Acquire skill set to handle all multimedia components efficiently
3. Develop Integrated and Collaborative multimedia systems

Text Books

1. Prabat K Andleigh and Kiran Thakrar, "Multimedia Systems and Design", Prentice Hall India, 2007,New Delhi.
2. Ralf Steinmetz, Klara Steinmetz, "Multimedia Computing, Communications & Applications", Pearson education, 2009.

References

1. A.K. Jain, Fundamentals of Digital Image Processing ,PHI, New Delhi, 2001.
2. William K Pratt, Digital Image Processing, John Willey , 2012.
3. Rafael C Gonzalez, Richard E Woods 2nd Edition, Digital Image Processing - Pearson Education, 2011.
4. Tay Vaughan, "Multimedia Making It Work", McGraw Hill, 2011.
5. Parekh R "Principles of Multimedia" Tata McGraw-Hill, 2006.

SubTitle:ADVANCED ARTIFICIAL INTELLIGENCE		
SubCode:CSPATP4	**No.ofCredits:3=3:0:0(L-T-P)**	**Nooflecturehours/week:03**
ExamDuration:3hours	**IA+ESE =40+60**	**Totalnoofcontacthours:21**

COURSE OBJECTIVE

1. To Discuss the Problem and Search Techniques in AI
2. To Discuss Knowledge Representation Schemes
3. To Discuss Learning and Fuzzy Logic Systems
4. To Discuss Connectionist Models and Expert System
5. To Discuss PROLOG and LISP Programming Languages

UNIT No	SyllabusContent	Noof Hours

1	**PROBLEMS AND SEARCH** The importance of AI, Early Work in AI, The AI Problems, Defining the Problem as a State Space Search, Production Systems, Control Strategies, Heuristic Search Techniques (Hill Climbing, Best First Search).	**8**
2	**KNOWLEDGE REPRESENTATION** Approaches to Knowledge Representation, Representing Simple Facts in Logic, Resolution (Conversion to Clause Form, The Unification Algorithm, Resolution Algorithm), Procedural versus Declarative Knowledge, Weak Slot and Filler Structure (Semantic Nets, Frames), Strong Slot and Filler Structures (Scripts).	**8**
3	**LEARNING AND FUZZY LOGIC SYSTEMS:** What is Learning, Rote Learning, Learning by Taking Advice, Explanation-Based Learning, Formal Learning Theory, Crisp Sets, Fuzzy Sets, Some Fuzzy Terminology.	**8**
4	**CONNECTIONIST MODELS AND EXPERT SYSTEMS:** Introduction to Hopfield Networks, Learning in Neural Networks, Backpropagation Networks, Applications of Neural Networks, Recurrent Networks, Expert System Architecture, MYCIN, DENDRAL.	**8**
5	**PROLOG AND LISP** Introduction to PROLOG, Converting English to PROLOG Facts and Rules, Goals, PROLOG Terminology, Variables, Control Structures, Arithmetic Operators, Backtracking, Introduction to LISP, Basic List Manipulation Functions in LISP, Defining Functions, Predicates and Conditionals, Input, Output and Local Variables, Iteration and Recursion, Property Lists and Arrays	**8**

COURSE OUTCOMES: The Students would have Learnt

CO1: Understanding the basics of Problem Solving in AI
CO2: Understanding the Knowledge Representation Scheme
CO3: Understanding Fuzzy Logic
CO4: Understanding Expert System
CO5: Understanding the Languages PROLOG and LISP

TextBooks:

Artificial Intelligence,E. Rich, K. Knight and S.B. Nair,McGraw Hill Education,3edition.

ReferenceBooks:

Introduction to ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS,D.W. Patterson,PHI.

SubTitle:Specialized Machine Learning		
SubCode:CSPATP5	**No.ofCredits:3=3:0:0(L-T-P)**	**Nooflecturehours/week:03**
ExamDuration:3hours	**IA+ESE =40+60**	**Totalnoofcontacthours: 21**

COURSEOBJECTIVE:

3. Todiscussthefundamentalimportance ofMachine learning techniques
4. Todiscussthevarious ML algorithmsapplication.
5. Todiscusstransfer learning techniques for special domain datasets.
6. Todiscussand applications of ML techniques in the various domains

UNIT No	SyllabusContent	Noof Hours

1	**Unit 1: Foundations for ML:** ML Techniques overview, Validation Techniques (Cross-Validations), Feature Reduction/Dimensionality reduction, Principal components analysis (Eigen values, Eigen vectors, Orthogonality), supervised, unsupervised learning	**8**
2	**Unit 2: Clustering:** Distance measures, Different clustering methods (Distance, Density, Hierarchical), Decision-trees, Iterative distance-based clustering; Dealing with continuous, categorical values in K-Means , Constructing a hierarchical cluster , K-Medoids, k-Mode, Measures of quality of clustering	**10**
3	**Unit 3: Classification:** Naïve Bayes Classifier, Model Assumptions, Probability estimation, Required data processing, M-estimates, Feature selection: Mutual information, Classifier K-Nearest Neighbours, Support Vector Machines , Linear learning machines and Kernel space, Making Kernels and working in feature space , SVM for classification and regression problems over fitting and module evaluation parameters.	**10**
4	**Unit 4 Specialized AI models:** Image classification and hyper-parameter tuning, Emerging NN architectures Recurrent Neural Networks (RNN) Building recurrent NN, Long Short-Term Memory (LSTM), Time Series Forecasting, Deep Learning [, Auto-encoders and unsupervised learning, auto-encoders, Regularization - Dropout and Batch normalization	**8**

5	**Unit 5 ML applications in special domains:** Transfer learning concepts, applications of ML in the domain healthcare, security, text classification, image classifications, credit card fraud detection, smoke detection etc.	**8**

COURSEOUTCOMES: Thestudentswouldhavelearnt

CO1:UnderstandingofbasicMLtechniques.
CO2:Understanding of ML for Imageanalysis
CO3:Understanding various special CNN models
CO4:Building some ML models in some special domains like healthcare, security etc.

TextBooks:
Text/References:

1. Introduction to Machine learning, Nils J. Nilsson

2. Machine learning for dummies, IBM Limited ed, by Judith Hurwitz and Daniel Kirsch

3. Introduction to Machine Learning with Python A guide for data scientists, Andreas, C. Muller & Sarah Guido, O'Reilly

SubTitle:SOFT COMPUTING		
SubCode:CSPATP6	**No.ofCredits:3=3:0:0(L-T-P)**	**Nooflecturehours/week:03**
ExamDuration:3hours	**IA+ESE =40+60**	**Totalnoofcontacthours:21**

COURSEOBJECTIVE:

1. To Discuss Introduction of Soft Computing
2. To Discuss First Generation ANN.
3. To Discuss Second Generation ANN.
4. To Discuss Fuzzy Logic
5. To Discuss Genetic Algorithm and Swarm Intelligent Systems

UNIT No	SyllabusContent	Noof Hours
1	**INTRODUCTION TO SOFT COMPUTING** Hard Computing vs Soft Computing, Development of AI, Development of intelligent systems, Artificial Neural Networks (Developments of ANNs, Strengths and Weaknesses of ANNs, Neural Computing vs Conventional Computing), Fuzzy Systems, Genetic Algorithm and Evolutionary Programming.	8
2	**ARTIFICIAL NEURAL NETWORKS-FIRST GENERATION** Introduction to Neural Networks, Biological Inspiration (Comparison between Brain and Computer), Biological Neural Networks to Artificial Neural Networks(Information Processing at the Neurons and Synapses), Classification of ANNs (Neural Network Architecture, Multilayer-Neural Network, Competitive Neural Network, Learning/Training), First-Generation Neural Networks (McCulloch and Pitts Neuron Model, Learning Rules:Hebbian and Delta), Percepron Network, ADALINE Network, MADALINE Network.	8
3	**ARTIFICIAL NEURAL NETWORKS – SECOND GENERATION:** Introduction to Second-Generation Neural Networks, Backpropagation Neural Networks, Backpropagation Training for Multilayer Neural Network (Calculation of Weights for Output Neurons, Calculation of Weights for Hidden-Layer Neurons, Factors influencing Backpropagation Training, Character Recognition using Backpropagation Neural Network), Kohonen Neural Network,	8
4	**FUZZY LOGIC:** Introduction to Fuzzy Logic, Human Learning Ability, Imprecision and Uncertainty, Undecidability, Probability Theory vs Possibility Theory, Classical Sets and Fuzzy Sets, Representation of a Classical Set, Representation of a Fuzzy Set	8

5	**GENETIC ALGORITHMS AND SWARM INTELLIGENT SYSTEMS** Introduction to Genetic Algorithms, Genetic Algorithms, Procedures of GAs, Introduction to Swarm Intelligence, Background of Swarm Intelligent Systems, Ant Colony System, Particle Swarm Intelligent Systems	**8**

COURSEOUTCOMES: Thestudentswouldhavelearnt :
CO1:Understanding basics of Soft Computing.
CO2:Understanding First Generation ANN
CO3:Understanding Second Generation ANN
CO4:Understanding Fuzzy Logic.
CO5:Understanding Genetic Algorithm and Swarm Intelligent Systems

TextBooks:

1. **Soft Computing**, NP Padhy and SP Simon, Oxford Higher Education..

ReferenceBooks:

4. **Neural Networks and Fuzzy Systems**, Bart Kosko,PHI.

SubTitle:Cluster and Grid Computing Specialized		
SubCode:CSPATP7	**No.ofCredits: 3=3:0:0 (L-T-P)**	**Nooflecturehours/week:03**
ExamDuration:3hours	**IA+ESE =40+60**	**Totalnoofcontacthours:21**

COURSEOBJECTIVE:

1. To know the Basics for Cluster and Grid Computing
2. To understand any kind of heterogeneous resources over a network using open standards
3. To learn the Scheduling of Grid Computing.
4. To know about the Applications of Grid
5. To know about the grid architecture

UNIT No	SyllabusContent	Noof Hours
1	**Cluster Computing** Basic concept of distributed and parallel computing, shared memory, Scheduling Concept, Cluster Computing-Introduction, Architecture of Cluster Computing, Functionality of Cluster, Categories of Clusters.	**10**
2	**Grid Computing** Grid Computing: History of grid computing, Basic concept, benefits of grid computing,Clustering and Grid Computing: Conventional Service Model, Central Grid Approach and Distributed Grid Computing Environment. cluster Vs Grid. Grid Architecture, Grid Applications, Grid Components. .	**10**
3	**Scheduling** High performance Grid, HPC Grids; Grid scheduler and a local resource scheduler, Load Balancing, Grid Scheduling: Job Scheduling, Resource Scheduling, Various factors of Scheduling, Scheduling Procedure. Challenges in Grid Scheduling.	**08**
4	**Implementation: Grid Simulation tool kit** Grid Sim Tool kit —Overview, OGSA based Grids, Installation of Pre-requisites and Necessary Component, Installation of GridSim Toolkit, Salient Feature of GridSim.	**10**

5	Application integration- Application classification – SPSD , SPMD, MIMD, MPSD, Granularity, Grid requirements- Job Scheduling, Data Management, Security,Managing Grids– Different application areas of Grid computing.	**10**

COURSEOUTCOMES: Thestudentswouldhavelearnt

1. Be able to know about Grid Computing Basics
2. Be able to utilise grid computing, its application
3. able to Simulate Grid with Simulation Kit
4. Able to know the Structure of Grid Computing.

Text Books

1. Ahmar Abbas, "Grid Computing, A Practical Guide to Technology and Applications", Firewall Media.
2. Joshy Joseph and Craig Fellenstein, "Grid Computing", Pearson Education.
3. Fran Berman, Geoffrey Fox and Anthony J. G. Hey, "Grid Computing: Making the Global Infrastructure a Reality", Willy Publisher.

Reference Books

1. Grid and Cluster Computing by C.S.R. Prabhu, PHI.
2. Ian Foster and Carl Kesselman, "Grid Blue Print for New Computing Infrastructure", Morgan Kaufmann.

SubTitle:High Performance Network		
SubCode:CSPATP8	**No.ofCredits:3=3:0:0(L-T-P)**	**Nooflecturehours/week:03**
ExamDuration:3hours	**IA+ESE =40+60**	**Totalnoofcontacthours:21**

COURSEOBJECTIVE:

1. Demonstrate basics of networks with high speed network.
2. Demonstrate the traffic modeling of Network.
3. Demonstrate Networks Security issues and their solution.
4. Demonstrate the various high performance networking technologies.

UNIT No	SyllabusContent	Noof Hour
1	**UNIT- I INTRODUCTION** Review of OSI, TCP/IP, Multiplexing, Modes of Communication, Switching, Routing. SONET – DWDM – DSL – ISDN – BISDN, ATM.	10
2	**UNIT- II MULTIMEDIA NETWORKING APPLICATIONS** Streaming stored Audio and Video – Best effort service – protocols for real time interactive applications – Beyond best effort – scheduling and policing mechanism – integrated services – RSVP- differentiated services.	10
3	**UNIT- III ADVANCED NETWORKS CONCEPTS** VPN-Remote-Access VPN, site-to-site VPN, Tunneling to PPP, Security in VPN. MPLS -operation, Routing, Tunneling and use of FEC, Traffic Engineering, MPLS based VPN, overlay networks-P2P connections, IPv6. **TRAFFIC MODELLING** Little's theorem, Need for modelling, Poisson modelling and its failure, Non - poisson models, Network performance evaluation.	12
4	**UNIT IV NETWORK SECURITY & MANAGEMENT** Infrastructure for network management – The internet standard management framework – SMI, MIB, SNMP, Security and administration. Principles of cryptography – Authentication – integrity – key distribution and certification – Access control and: fire walls – attacks and counter measures – security in many layers.	10
5	**UNIT-IV SPECIAL NETWORKS** Vehicular Ad-hoc Network (VANET), Wireless Body Area Network (WBAN), Under Water Sensor Network, Latest high performance networking technologies.	10

COURSEOUTCOMES: Thestudentswouldhavelearnt

CO1: Understand the fundamentals of Network.
CO2: Understand the advanced networking concepts like VPN, Tunneling, MPLS etc.
CO3: Understand the concept of Security and Management of Network..
CO4: Understand latest High Performance Networking technologies.
CO-5 Analyse the different problems of latest technologies.

Text Books:

1. J.F. Kurose & K.W. Ross,"Computer Networking- A top down approach featuring the internet", Pearson.
2. Walrand .J. Varatya, High performance communication network, Morgan Kauffman – Harcourt Asia Pvt. Ltd.

Reference Books:

1. Anurag kumar, D. MAnjunath, Joy kuri, "Communication Networking", Morgan Kaufmann Publishers.
2. HersentGurle& petit, "IP Telephony, packet Pored Multimedia communication Systems", Pearson education.
3. LEOM-GarCIA, WIDJAJA, "Communication networks", TMH.
4. Fred Halsall and Lingana Gouda Kulkarni,"Computer Networking and the Internet" fifth edition, Pearson education.

SubTitle:Ad-Hoc And Wireless Sensor Networks		
SubCode:CSPATP9	**No.ofCredits: 3=3:0:0 (L-T-P)**	**Nooflecturehours/week:03**
ExamDuration:3hours	**IA+ESE =40+60**	**Totalnoofcontacthours:21**

COURSEOBJECTIVE:

1. The objectives of this course are to make the student
1. To study the fundamentals of wireless Ad-Hoc Networks.
2. To study the operation and performance of various Ad-hoc wireless network protocols.
3. To study the architecture and protocols of Wireless sensor networks.

UNIT No	SyllabusContent	Noof Hours
1	Wireless LANs and PANs: Introduction, Fundamentals of WLANS, IEEE 802.11 Standards, HIPERLAN Standard, Bluetooth, Home RF. Ad-hoc Wireless Networks: Introduction, Issues in Ad-hoc Wireless Networks.	**10**
2	MAC Protocols: Introduction, Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols, Contention - Based Protocols, Contention - Based Protocols with reservation Mechanisms, Contention – Based MAC Protocols with Scheduling Mechanisms, MAC Protocols that use Directional Antennas, Other MAC Protocols.	**10**
3	Routing Protocols: Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table –Driven Routing Protocols, On – Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power – Aware Routing Protocols. ‘	**08**
5	Wireless Sensor Networks: Introduction, Sensor Network Architecture, Data Dissemination, Data Gathering, MAC Protocols for Sensor Networks, Location Discovery, Quality of a Sensor Network, Evolving Standards, Other Issues.	**10**
4	Transport Layer Protocols: 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, Other Transport Layer Protocol for Ad Hoc Wireless Networks.	**10**

COURSEOUTCOMES: On completion of this course student will be able to
1. Understand the basis of Ad-hoc wireless networks.
2. Understand design, operation and the performance of MAC layer protocols of Ad-hoc wireless networks.
3. Understand design, operation and the performance of routing protocol of Ad-hoc wireless network.
4. Understand design, operation and the performance of transport layer protocol of Ad-hoc wireless networks.

Text Books:

1. Introduction to Wireless and Mobile Systems-Dharma Prakash Agrawal, Qing-An Zeng, Cengage Learning
2. Ad Hoc Wireless Networks: Architectures and Protocols - C. Siva Ram Murthy and B.S.Manoj, PHI.
3. Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control - Jagannathan Sarangapani, CRC Press.

References:

1. Ad- Hoc Mobile Wireless Networks: Protocols & Systems, C.K. Toh , Pearson Education.
2. Wireless Sensor Networks - C. S. Raghavendra, Krishna M. Sivalingam, Springer

Sub Title: Advanced Algorithm		
Sub Code: CSPBTT1	**No. of Credits:4=3:0:0(L-T-P)**	**No of lecture hours/week:03**
ExamDuration:3hours	**IA+ESE =40+60**	**Totalnoofcontacthours:21**

COURSE OBJECTIVE:

1. To making strategy for an adequate algorithm
2. To introduce some optimization technique
3. To introduce technique for making a hard approximation algorithm
4. To introduce some advance analysis for algorithm.
5. To expose students to how develop the different kind of algorithm for newly problem.

UNIT No	Syllabus Content	No of Hours
1	Greedy strategy and algorithm, Dynamic introduction and programming, Recursive algorithm	**10**
2	Amortized analysis: Aggregate analysis, Potential method, Accounting method, Dynamic tables, Disjoint set, Backtracking technique.	**10**
3	Graph algorithm: Elementary graph algorithms, Maximum Flow, Single source and all pair shortest paths,	**12**
4	String matching, Matrix operations, Optimized strategy and algorithm, some parallel sorting algorithm(specify one or two)	**10**
5	Complexity classes: P, NP, NP-completeness, NP-hardness, Approximation algorithms, Randomization and linear programming.	**10**

COURSE OUTCOMES:

CO1. Ability to find out adequate algorithm for a problem.
CO2. Able to spontaneous analysis of algorithm
CO3. Basic ability to design a technique and data structure to solve a problem
CO4. Learn different graph based algorithm
CO5. Ability to find the approximation solution for a hard problem.

Text Books:

1. Cormen T, Leiserson C, Rivest R, and Stein C: Introduction to Algorithms, MIT Press, 2009
2. Introduction to parallel algorithm C. Xavier,S.S. Iyengar,New York Willey c1998.
3. Data Structures, Algorithms and Applications in C++ by Sartaj Sahni. University Press.
4. Motwani and Raghavan: Randomized Algorithms. Cambridge University Press, 2004

Reference Books:

1.J. Kleinberg and E. Tardos, Algorithm Design, Pearson International Edition, 2005.
2. An Introduction to Optimization, Edwin KP. Chong& Stanislaw H. Zak, Wiley Publication.

Sub Title: Advanced Algorithm Lab	
Sub Code: CSPALT1	**No. of Credits: 2=0:0:2(L-T-P)**
Exam Duration:3 hours	**IA+ESE =30+20**

Lab OB

Lab OBJECTIVE:

1. To basic implementation of graph algorithm
   To analyze the code optimization strategy.
3. To expose students how to implement parallel algorithm.
4. To analyze the linear programming and maximum flow implementation.
5. Making good strategy towards the algorithm to be become the good researcher.

Unit No.	Content	Teaching Hours
I,II, III, IV and V	• Implement a graph algorithm. • Implement a string matching algorithm • Implement a greedy algorithm • Implement dynamic algorithm • Implement a matrix operation algorithm • Implement maximum flow algorithm • Implement some approximation algorithm • Implement shortest path algorithm • Implement for sparse graph algorithm • Implement some linear programming algorithm • Implement some optimized algorithm • Implement some parallel sorting algorithm	24

LAB OUTCOMES:

CO1: Bring the capabilities to students to be become the good researcher
CO2: To teach hot to make and formulate optimization problem.
CO3: Students spontaneous able to implement the some graph and approximation algorithm.
CO4: Students will able to implement the dynamic type problem.
CO5: To able to develop the mathematical formula and model.

Text Books:

1. Introduction to Algorithm, Thomas H. Cormen, Charles E. Leiserson, Ronald Rivest, Clifford Stein, Publisher PHI, ISBN 81-203-2141-3
2. Python Algorithms Mastering Basic Algorithms in the Python Language by Magnus Lie Hetland.
3. Introduction to parallel algorithm C. Xavier,S.S. Iyengar, New York Willey c1998

Reference Books:

1. Introduction to Parallel Computing: From Algorithms to Programming on State-of-the-Art Platforms, Roman Trobec, BoštjanSlivnik, Patricio Bulic, Borut Robi ´ c ,Spinger,2018

2. Data Structures and Algorithms Using Python Rance D. Necaise.

SubTitle: ADVANCED DIGITAL IMAGE PROCESSING

Sub Code: CSPBTT1	No.ofCredits:3=3:0:0(L-T-P)	No of lecture hours/week:03
ExamDuration:3hours	IA+ESE =40+60	Totalnoofcontacthours:21

COURSEOBJECTIVE:

1. Explain the essentials of digital image processing.
2. Describe various segmentation techniques for image analysis.
3. Outline the various feature extraction techniques for image analysis.
4. Discuss the concepts of image registration and fusion.
5. Outline various object recognition techniques.

UNIT No	Syllabus Content	Noof Hours
1	**REVIEW OF DIGITAL IMAGE FUNDAMENTALS** Steps in digital image processing, Digital Imaging system. Digital Image Transform – DFT, DCT etc. Image enhancement in spatial and frequency domain, Histogram equalization. .	10
2	**SEGMENTATION** Edge detection, Thresholding-Global thresholding, Adaptive thresholding etc. Region growing- Region growing, Split and merge algorithm etc. Active contour models, Validation of Segmented Algorithms, Colour Image Segmentation, Fuzzy segmentation.	10
3	**IMAGE FEATURE REPRESENTATION** Boundary Representation, Boundary Description- Simple descriptor, Fourier descriptor, Concavity Tree etc. Regional Descriptor – Shape Feature, Topological, Texture , Transform, Syntactic and structural feature. Feature Selection Technique.	10
4	**IMAGE REGISTRATION AND FUSION** Feature matching, Spatial alignment, Resampling- NearestNeighbour and Cubic Splines, Pixel level fusion , Feature level fusion operation , Decisive level fusion operators.	10
5	**OBJECT RECOGNITION** Pattern and Pattern Classes, Template Matching, Classification, Bayesian Classifier, K-NN Classifier, Regression Methods, Clustering Techniques.	10

COURSE OUTCOMES: The students would have learnt

CO1: Fundamentals of Image Processing.
CO2: Various Segmentation technique for Image Analysis.
CO3:Various feature extraction techniques for image analysis.
CO4: Concepts of image registration and fusion.
CO5: Various object recognition techniques.

TextBooks:

2. **Digital Image Processing**- RCGonzalez&REWoods,Pearson Education ,Third edition.
3. **Digital Image Processing** – S.Sridhar, Oxford University Press, 2nd Edition.

Reference Books:

5. **Digital Image Processing**-S.Jayaraman, S.Esakkirajan, T.Veerakumar, Tata Mcgraw Hill.
6. **Fundamentals of Digital Image processing**, AKJain, PHI/PearsonEducation,1989.
7. **Digital Image Processing**, SidAhmed, McGrawHill.

Sub Title: Advanced DIP Lab	
Sub Code: CSPALT2	**No. of Credits: 2=0:0:2(L-T-P)**
Exam Duration:3 hours	**IA+ESE =30+20**

COURS
1. Impl
2. Extra
3. Unde
4. Impl

UNIT	Practical List	Noof Hours
UNIT I,II, III, IV, V	1. Implementation of Transformation of Images. 2. Implementation of Histogram operations and Contrast stretching and gamma correction on images. 3. Implementation of different Image Detection Techniques. 4. Implementation of Clustering Techniques. 5. Implementation of K-Nearest Neighbour Classifier. 6. Understanding the Extraction of Image features and Specifications. 7. Understanding the colour models and manipulates colour images. 8. Understanding Image Segmentation using different Thresholding techniques. 9. Implementation of Regression methods. 10. Understanding the visual effects such as fusion and blending.	**24**

COURSE OUTCOMES: The students would have learnt about:

1. Implementation of Transformation, Image detection and clustering techniques.
2. Extraction of features and specification.
3. Understand about the color models, Image Segmentation.
4. Implementation of Regression methods.

Reference Books:

TextBooks:

1. **Digital Image Processing-** RCGonzalez&REWoods,Pearson Education ,Third edition.
2. **Digital Image Processing** – S.Sridhar, Oxford University Press, 2nd Edition.

Reference Books:

1. **Digital Image Processing-**S.Jayaraman, S.Esakkirajan, T.Veerakumar, Tata Mcgraw Hill.
2. **Fundamentals of Digital Image processing**, AKJain, PHI/PearsonEducation,1989.
3. **Digital Image Processing**, SidAhmed, McGrawHill.

SubTitle:DATA SCIENCE		
SubCode:CSPBTP1	**No.ofCredits: 3=3:0:0 (L-T-P)**	**Nooflecturehours/week:03**
ExamDuration:3hours	**IA+ESE =40+60**	**Totalnoofcontacthours:21**

COURSEOBJECTIVE:

1. Provideyou withtheknowledgeand expertisetobecomea proficientdatascientist.
2. Demonstratean understanding of statisticsandmachinelearning conceptsthatarevitalfordata science;
3. ProducePython codeto statisticallyanalysesadataset;
4. CritICallyevaluatedatavisualizationsbased ontheir design anduseforcommunicating storiesfrom data;

UNIT No	SyllabusContent	Noof Hours
1	**Unit 1:** Introduction tocoreconceptsand technologies: Introduction,Terminology,datascienceprocess,data sciencetoolkit,Typesof data,Exampleapplications.	**10**
2	**Unit 2:** Datacollection andmanagement:Introduction,Sources ofdata,DatacollectionandAPIs, Exploring andfixing data,Datastorageandmanagement,Usingmultipledatasources.	**10**
3	**Unit 3:** Data analysis:Introduction,Terminologyand concepts,Introduction tostatistics,Centraltendenciesanddistributions,Variance,Distributionpropertiesa nd arithmetic,Samples/CLT,Basicmachinelearning algorithms,Linearregression,SVM,NaiveBayes.	**08**
4	**Unit 4:** Datavisualization:Introduction,Typesofdata visualization,Dataforvisualization:Datatypes,Dataencodings,Retinalvariables,Mappingv ariables toencodings,Visualencodings.	**10**
5	ApplicationsofData Science,Technologiesfor visualization,Bokeh(Python), Recenttrends invariousdatacollection andanalysistechniques,variousvisualizationtechniques,applicationdevelopmentmethodsof usedin datascience.	

COURSEOUTCOMES:Oncompletion of the course the studentshould be able to

1. Explain howdata iscollected, managed andstored fordatascience;
2. Understand thekeyconceptsin datascience,including theirreal-worldapplications andthetoolkit usedbydatascientists;
3. Implement datacollectionand managementscriptsusing MongoDB

References:

1. CathyO'Neiland RachelSchutt.DoingDataScience,StraightTalkfromtheFrontline.O'Reilly.
2. JureLeskovek,AnnandRajaramanandJeffreyUllman.Mining ofMassiveDatasets.v2.1,CambridgeUniversityPress.

SubTitle:SOFTWARE PROCESS AND PROJECT MANAGEMENT		
SubCode: CSPBTP2	**No.ofCredits: 3=3:0:0 (L-T-P)**	**Nooflecturehours/week:03**
ExamDuration:3hours	**IA+ESE =40+60**	**Totalnoofcontacthours:21**

COURSEOBJECTIVE:

1. Describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project.
2. Compare and differentiate organization structures and project structures.
3. Implement a project to manage project schedule, expenses and resources with the application of suitable project management tools.
4. To understand the future software project management practices
5. To learn the different process models
6. To understand workflows, check points of process

UNIT No	SyllabusContent	Noof Hours
1	Software Process Maturity: Software maturity Framework, Principles of Software Process Change, Software Process Assessment, The Initial Process, The Repeatable Process, The Defined Process, The Managed Process, The ptimizing Process. Process Reference Models: Capability Maturity Model (CMM), CMMI, PCMM, PSP, TSP.	**10**
2	Software Project Management Renaissance: Conventional Software Management, Evolution of Software Economics, Improving Software Economics, The old way and the new way. Life-Cycle Phases and Process artifacts: Engineering and Production stages, inception phase, elaboration phase, construction phase, transition phase, artifact sets, management artifacts, engineering artifacts and pragmatic artifacts, model based software architectures.	**10**
3	Workflows and Checkpoints of process: Software process workflows, Iteration workflows, Major milestones, Minor milestones, Periodic status assessments. Process Planning: Work breakdown structures, Planning guidelines, cost and schedule estimating process, iteration planning process, Pragmatic planning.	**08**
4	Project Organizations: Line-of- business organizations, project organizations, evolution of organizations, process automation. Project Control and process instrumentation: The seven-core metrics, management indicators, quality indicators, life-cycle expectations, Pragmatic Software metrics and metrics automation.	**10**

5	CCPDS-R Case Study and Future Software Project Management Practices Modern Project Profiles, Next-Generation software Economics, Modern Process Transitions.	**10**

COURSEOUTCOMES:The student will be able to

1. Appreciate the importance of software process and management;
2. Apply project management techniques for information systems development;
3. Apply the management skills to monitor and control a software project;
4. Work together as a team in preparing a report
animation, e-research;
4. Describe the hardware and software concepts and architecture of cloud computing.

TEXT BOOKS:

1. Watts S.Humphrey,"Managing the Software Process" , Pearson Education.[ISBN-13:978- 0201180954]
2. Walker Royce"Software Project Management", Pearson Education. [ISBN: 9788177583786]

REFERENCE BOOKS:

1. Agile, Extreme, Robert Wysocki, "Effective Project Management: Traditional", Sixth edition, Wiley India, rp2011.[ISBN:978-1-118-01619-0]
2. Bob Hughes & Mike Cotterell ,"Software Project Management", fourth edition, TMH, 2006

SubTitle:GPU COMPUTING		
SubCode: CSPBTP3	**No.ofCredits: 3=3:0:0 (L-T-P)**	**Nooflecturehours/week:03**
ExamDuration:3hours	**IA+ESE =40+60**	**Totalnoofcontacthours:21**

COURSEOBJECTIVE
• Tolearn parallelprogramming with GraphicsProcessing Units(GPUs).

UNIT No	SyllabusContent	Noof Hours
1	**Introduction**:History,Graphics Processors,GraphicsProcessing Units,GPGPUs.Clockspeeds,CPU/GPUcomparisons,Heterogeneity,Accelerators,Parallelprogramming,CUDAOpen CL/ Open ACC, HelloWorldComputationKernels,Launchparameters,Threadhierarchy,Warps/ Wavefronts,Thread blocks / Workgroups,Streamingmultiprocessors, 1D/ 2D/ 3Dthreadmapping,Deviceproperties,SimplePrograms.	10
2	**Unit 2:** **Memory**:Memoryhierarchy,DRAM/global,local/shared,private/local,textures,ConstantMemory,Pointers,ParameterPassing,Arrays anddynamicMemory,Multi-dimensionalArrays,MemoryAllocation,Memorycopying acrossdevices,Programswith matrices,Performanceevaluation withdifferent memories.	10
3	**Unit 3:** **Synchronization**:MemoryConsistency,Barriers(localversus global),Atomics,Memoryfence.Prefixsum,Reduction.ProgramsforconcurrentDataStructuressuch asWorklists,Linked-lists.Synchronization acrossCPU andGPU**Functions**:Devicefunctions,Host functions,Kernelsfunctions, Usinglibraries(such asThrust), anddeveloping libraries.	08
4	**Unit 4:** **Support**:Debugging GPUPrograms.Profiling,Profiletools,Performanceaspects **Streams**:Asynchronousprocessing,tasks,Task-dependence,Overlappeddatatransfers,DefaultStream,Synchronizationwith streams.Events,Event-based-Synchronization -Overlapping datatransferand kernelexecution,pitfalls.	10
5	**Unit 5:** **Case Studies**:ImageProcessing,Graph algorithms,Simulations,DeepLearning. **Advancedtopics**:Dynamicparallelism,Unified VirtualMemory,Multi-GPUprocessing,Peeraccess,Heterogeneousprocessing.	

COURSEOUTCOMES
Aftercompletion ofcourse,studentswould be:
• Studentswould learn conceptsin parallelprogramming,implementationofprogramson GPUs, debugging andprofiling parallelprograms.

References:

1. Programming MassivelyParallelProcessors:A Hands-on Approach;DavidKirk,Wen-meiHwu;MorganKaufman;2010(ISBN:978-0123814722)
2. CUDAProgramming:ADeveloper'sGuideto

ParallelComputingwithGPUs;ShaneCook;MorganKaufman;2012(ISBN:978-0124159334)

SubTitle: DATABASE ENGINEERING		
Sub Code:CSPBTP4	**No.ofCredits:3=3:0:0(L-T-P)**	**No of lecture hours/week:03**
ExamDuration:3hours	**IA+ESE =40+60**	**Totalnoofcontacthours:21**

COURSEOBJECTIVE:

1. To provide students with basic concepts in databases both in terms of usage and implementation
2. To make the students understand all requirement and operations that the analyst needed to analyze, design, and implement the systems

UNIT No	Syllabus Content	Noof Hours
1	. Database System Applications, Purpose of Database Systems, View of Data – Data Abstraction, Instances and Schemas, Data Models – the ER Model, Relational Model, other Models, Database Languages – DDL, DML, Database Access from Applications Programs, Transaction Management, Data Storage and Querying, Database Architecture, Database Users and Administrators, ER Diagrams,	**10**
2	Introduction to the Relational Model – Integrity Constraints Over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design, Introduction to Views, Altering Tables and Views, Relational Algebra, Basic SQL Queries, Nested Queries, Complex Integrity Constraints in SQL, Triggers.	**10**
3	Introduction to Schema Refinement – Problems Caused by redundancy, Decompositions – Problem related to decomposition, Functional Dependencies - Reasoning about FDS, Normal Forms – FIRST, SECOND, THIRD Normal forms, BCNF, Properties of Decompositions- Loss less- join Decomposition, Dependency preserving Decomposition, Schema Refinement in Data base Design, Multi valued Dependencies, FOURTH Normal Form, Join Dependencies, FIFTH Normal form.	**10**
4	Transaction Management: The ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions, Lock Based Concurrency Control, Deadlocks, Performance of Locking, Transaction Support in SQL.	**10**

5	Concurrency Control: Serializability, and recoverability, Introduction to Lock Management, Lock Conversions, Dealing with Dead Locks, Specialized Locking Techniques, Concurrency Control without Locking. Crash recovery: Introduction to Crash recovery, Introduction to ARIES, the Log, and Other Recovery related Structures, the Write-Ahead Log Protocol, Check pointing, recovering from a System Crash, Media recovery.	**10**

COURSE OUTCOMES: The students would have learnt

CO1: • Aware of various database systems and its design issues

CO2: • Design and implement a database for any specified domain according to well-known design principles that balance data retrieval performance with data consistency guarantees

CO3 • Formulate data retrieval queries in SQL and the abstract query languages

REFERENCES:

1. Data base Management Systems, Raghu Ramakrishnan, Johannes Gehrke, TMH, 3rd Edition, 2003.
2. Data base System Concepts, A.Silberschatz, H.F. Korth, S.Sudarshan, McGraw hill, VI edition, 2006.
3. Fundamentals of Database Systems 5th edition. RamezElmasri, ShamkantB.Navathe, Pearson Education, 2008.
4. Introduction to Database Systems, C.J.Date,Pearson Education.
5. Database Management System Oracle SQL and PL/SQL, P.K.Das Gupta, PHI.
6. Database System Concepts, Peter Rob & Carlos Coronel, Cengage Learning, 2008.

SubTitle: Cryptography and Network Security		
Sub Code: CSPBTP5	**No.ofCredits:3=3:0:0(L-T-P)**	**No of lecture hours/week:03**

ExamDuration:3hours	IA+ESE =40+60	Totalnoofcontacthours:21

COURSEOBJECTIVE:

The course is designed to train the post graduates in:

1. In depth understanding of network security.
2. In depth understanding of the Cryptographic Techniques.
3. To apply cryptographic techniques in computer systems.
4. To design new or modify existing cryptographic techniques.
5. To work in research institutions / Industry in the field of Security

UNIT No	Syllabus Content	Noof Hours
1	(Introduction to Cryptography and Block Ciphers) Introduction to security attacks - services and mechanism - introduction to cryptography - Conventional Encryption: Conventional encryption model - classical encryption techniques - substitution ciphers and transposition ciphers – cryptanalysis – steganography - stream and blockciphers - Modern Block Ciphers: Block ciphers principals - Shannon's theory of confusion and diffusion - fiestal structure - data encryption standard(DES) - strength of DES - differential and linearcrypt analysis of DES - block cipher modes of operations - triple DES – AES.	10
2	(Public key cryptography and Authentication requirements) Principles of public key crypto systems - RSA algorithm - security of RSA - key management – Diffle-Hellman key exchange algorithm, Message Authentication and Hash Function: Authentication requirements - authentication functions - message authentication code - hash functions - birthday attacks – security of hash functions and MACS.	10
3	(Integrity checks and Authentication algorithms) MD5 message digest algorithm - Secure hash algorithm (SHA) Digital Signatures: Digital Signatures - authentication protocols - digital signature standards (DSS) - proof of digital signature algorithm - Authentication Applications: Kerberos and X.509 - directory authentication service - electronic mail security-pretty good privacy (PGP) - S/MIME.	10
4	(IP Security and Key Management) IP Security: Architecture - Authentication header - Encapsulating security payloads - combining security associations - key management.	10
5	(Web and System Security) Web Security: Secure socket layer and transport layer security - secure electronic transaction (SET) - System Security: Intruders - Viruses and related threads - firewall design principals – trusted systems.	10

COURSE OUTCOMES: Post Graduates after completing the course shall gain:

1. Ability to understand concepts of network security and cryptographic techniques.
2. Ability to design and analyze cryptographic techniques.
3. Ability to solve network security issues in real time applications.
4. Ability to take up doctoral level research work in security.

Text Books

1. William Stallings, "Crpyptography and Network security Principles and Practices", Pearson/PHI.

2. Wade Trappe, Lawrence C Washington, " Introduction to Cryptography with coding theory", Pearson.

Reference Books

1. W. Mao, "Modern Cryptography – Theory and Practice", Pearson Education.

2. Charles P. Pfleeger, Shari Lawrence Pfleeger – Security in computing – Prentice Hall of India.

Sub Title: Multiprocessor System		
Sub Code: CSPBTP6	**No. of Credits:3=3:0:0(L-T-P)**	**No of lecture hours/week:04**
ExamDuration:3hours	**IA+ESE =40+60**	**Totalnoofcontacthours:21**

COURSE OBJECTIVE:

1. To study basic multiprocessor system.
2. To expose the students about pipeline processor
3. To learn about parallelism strategy to enhance the speedup
4. Making the data and instruction level parallelism concept
5. To teach about multicore superpower GPU system

UNIT No	Syllabus Content	No of Hours
1	Fundamental of multiprocessor system, Speedup performance law, Amdahl's law, Bus, cache and shared memory organizations, latency time and efficiency. PRAM model	**10**
2	Pipeline architecture, problem to make pipeline hard, Hazard, dependencies, Instruction level parallelism, static scheduling and dynamic scheduling,	**10**
3	Data level parallelism, vectorization and pipeline vector processing, hardware and software parallelism concept. Synchronous and Asynchronous message passing , Loop parallelism	**12**
4	Multiprocessor programming, multithreading programming concept, multithreading issues and solutions, Threads inside the Hardware, What happens when a thread increased and decreased inside the hardware and program, message passing program development,	**10**
5	Overview of parallel languages, GPU, programming on multiple cores CPU and GPU, speedup comparisons, Architecture of GPU, SIMD array processor, Multicomputer system and distributed system.	**10**

Subject:	**Business Analytics (MSPBTO1)**	**Credits**			
Type:	Open Elective	L	T	P	Total
Teaching Scheme:	Lectures: 3 hours/week	3	0	0	3
Course outcomes:	**At the end of the course, students will be able to**				
1	Students will demonstrate knowledge of data analytics				
2	Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.				
3	Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.				
4	Students will demonstrate the ability to translate data into clear, actionable insights.				

Syllabus Contents:

- Unit1: Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.
- Unit 2: Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.
- Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.
- Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.
- Unit 5: Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, the Value of Information, Utility and Decision Making.
- Unit 6: Recent Trends in Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.

References:

- Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.
- Business Analytics by James Evans, persons Education..

Subject:	**Industrial Safety (IPPBTO2)**	**Credits**			
Type:	Open Elective	L	T	P	Total

Teaching Scheme:	Lectures: 3 hours/week	3	0	0	3
Course outcomes:	**At the end of the course, students will be able to**				
1	Apply the knowledge of Safety Measures				
2	Plan for Engineering maintenance.				
3	Determine the wear & Corrosion and apply methods for their prevention.				
4	Trace the Fault of machine tools and equipment				
5	Plan and implement the periodic and preventive maintenance for machines/equipment.				

Syllabus Contents:

- Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.
- Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.
- Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.
- Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.
- Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

References:

- Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
- Maintenance Engineering, H. P. Garg, S. Chand and Company.
- Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
- Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

Subject:	**Operations Research (IPPBTO3)**	**Credits**			
Type:	Open Elective	L	T	P	Total
Teaching Scheme:	Lectures: 3 hours/week	3	0	0	3
Course outcomes:	**At the end of the course, students will be able to**				

1	Students should able to apply the dynamic programming to solve problems of discreet and continuous variables.
2	Students should able to apply the concept of non-linear programming
3	Students should able to carry out sensitivity analysis
4	Student should able to model the real world problem and simulate it.

Syllabus Contents:

- Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models
- Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming
- Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT
- Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.
- Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

References:

- H.A. Taha, Operations Research, An Introduction, PHI, 2008
- H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
- J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
- Hitler Libermann Operations Research: McGraw Hill Pub. 2009
- Pannerselvam, Operations Research: Prentice Hall of India 2010
- Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

Subject:	**Cost Management of Engineering Projects (CEPBTO4)**	**Credits**			
Type:	Open Elective	L	T	P	Total
Teaching Scheme:	Lectures: 3 hours/week	3	0	0	3
Course outcomes:	**At the end of the course, students will be able to**				
1	Discuss the cost concepts in the cost management process.				

2	Able to handle the projects by the application of project cost control methods.
3	Determine all types of costing and carryout the analysis of pricings for profitability.
4	Application of PERT/CPM for cost management.

Syllabus Contents:

- Introduction and Overview of the Strategic Cost Management Process
- Cost concepts in decision-making; relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.
- Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and non-technical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process
- Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.
- Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

References:

- Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
- Charles T. Horngren and George Foster, Advanced Management Accounting
- Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
- Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher
- N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.

Subject:	**Composite Materials (MEPBTO5)**	**Credits**			
Type:	Open Elective	L	T	P	Total
Teaching Scheme:	Lectures: 3 hours/week	3	0	0	3
Course outcomes:	**At the end of the course, students will be able to**				
1	Explain and also implement the composite materials for the required performance based on the characteristics.				

2	Adopt the composite materials as reinforcements.
3	Implement the methods of manufacturing of metal matrix composites
4	Adopt the methods of manufacturing of polymer matrix composites
5	Evaluate the strength of laminates.

Syllabus Contents:

- INTRODUCTION: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.
- REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.
- Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.
- Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.
- Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations

References:

- Material Science and Technology – Vol 13 – Composites by R. W. Cahn – VCH, West Germany.
- Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R.
- Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.
- Hand Book of Composite Materials-ed-Lubin.
- Composite Materials – K.K.Chawla.
- Composite Materials Science and Applications – Deborah D.L. Chung.
- Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi.

Subject:	**Waste to Energy (CHPBTO6)**	**Credits**			
Type:	Open Elective	L	T	P	Total
Teaching Scheme:	Lectures: 3 hours/week	3	0	0	3
Course outcomes:	**At the end of the course, students will be able to**				
1	Classify the waste for fuel and identify the devices for conversion of waste to energy.				

2	Implement the Biomass Pyrolysis
3	Evaluate the methods of Biomass Gasification and implement their applications.
4	To design, construct and operation the Biomass Combustion devices.
5	Classify biomass, apply the bio energy systems design and construction.

Syllabus Contents:

- Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors
- Biomass Pyrolysis: Pyrolysis – Types, slow, fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.
- Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.
- Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.
- Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

References:

- Non-Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
- Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.
- Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
- Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

Subject:	**Internet of Things (IoT) (ECPBTO7)**	**Credits**			
Type:	Open Elective	L	T	P	Total
Teaching Scheme:	Lectures: 3 hours/week	3	0	0	3
Course outcomes:	**At the end of the course, students will be able to**				
1	Understand the concepts of Internet of Things.				
2	Analyze basic protocols in wireless sensor network.				

3	Design IoT applications in different domain and be able to analyze their performance
4	Elaborate the need for Data Analytics and Security in IoT.
5	Understand the concepts of Internet of Things.

Syllabus Contents:

Review of computer communication concepts (OSI layers, components, packet communication, Networks, TCP-IP, subnetting, IPV4 addressing and challenges). IPV6 addressing. IoT architecture reference layer. Characteristics IoT sensor nodes, Edge computer, cloud and peripheral cloud, single board computers, open source hardware, Examples of IoT infrastructure.

IoT and M2M

Software defined networks, network function virtualization, difference between SDN and NFV for IoT, Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER.

IOT protocols and Communication Technologies

MQTT, UDP, MQTT brokers, publish subscribe modes, HTTP, COAP,XMPP and gateway protocols, IoT Communication Pattern, IoT Protocol Architecture, Selection of Wireless technologies (6LoWPAN, Zigbee, WIFI, BT, BLE,SIG,NFC, LORA, Lifi, Widi).

Data and Analytics for IoT

An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT, A Brief History of IOT Security, Common Challenges in IOT Security, How IT and OT Security Practices and Systems Vary, Formal Risk Analysis Structures: OCTAVE and FAIR, The Phased Application of Security in an Operational Environment.

IoT Physical Devices and Endpoints: Introduction to Arduino and Raspberry Pi-Installation, Interfaces (serial, SPI, I2C), Programming – Python program with Raspberry PI with focus on interfacing external gadgets, controlling output, reading input from pins.

IoT Physical Servers and Cloud Offerings: Introduction to Cloud Storage models and communication APIs WebServer: Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API.

IoT application and its Variants: Case studies: IoT for smart cities, smart grid, health care, agriculture, smart meters.M2M, Web of things, Cellular IoT, Industrial IoT, Industry 4.0,IoT standards.

References:

- "Internet of Things - A Hands-on Approach", ArshdeepBahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
- "Internet of Things", Srinivasa K G, CENGAGE Leaning India, 2017.
- " IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry1stEdition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978-9386873743)
- "Getting Started with Raspberry Pi", Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759.
- "From Machine to Machine to Internet of Things", Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stamatis Karnouskos, Stefan Avesand, David Boyle, Elsevier Publications, 2014.

AUDIT 1 and 2: ENGLISH FOR RESEARCH PAPER WRITING

Course objectives:

Students will be able to:

1. Understandthathowtoimproveyourwritingskillsandlevelofreadability
2. Learn about what to write in eachsection
3. Understand the skills needed when writing a Title

Ensurethegoodqualityofpaperatveryfirst-timesubmission

Syllabus

Units	CONTENTS	Hours
1	PlanningandPreparation,WordOrder,Breakinguplongsentences, Structuring Paragraphs and Sentences, Being Concise andRemoving Redundancy, Avoiding Ambiguity and Vagueness	4

2	Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising,ParaphrasingandPlagiarism,SectionsofaPaper,Abstracts. Introduction	4
3	ReviewoftheLiterature,Methods,Results,Discussion,Conclusions,The Final Check.	4
4	key skills are needed when writing a Title, key skills are needed when writinganAbstract,keyskillsareneededwhenwritinganIntroduction, skills needed when writing a Review of the Literature,	4
5	skillsareneededwhenwritingtheMethods,skillsneededwhenwriting the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions	4
6	useful phrases, how to ensure paper is as good as it could possibly be the first- time submission	4

Suggested Studies:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on GoogleBooks)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge UniversityPress
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book.
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London,2011

AUDIT 1 and 2: STRESS MANAGEMENT BY YOGA

Course Objectives

1. Toachieveoverallhealthofbodyandmind
2. To overcomestress

Syllabus

Unit	***Content***	***Hours***
1	• DefinitionsofEightpartsofyog.(Ashtanga)	8
2	• Yam and Niyam. Do`sandDon't'sinlife. i) Ahinsa, satya, astheya, bramhacharya andaparigraha ii) Shaucha, santosh, tapa, swadhyay,ishwarpranidhan	8
3	• Asan andPranayam i) Variousyogposesandtheirbenefitsformind&body ii)Regularizationofbreathingtechniquesanditseffects-Types ofpranayama	8

Suggested reading

1. 'YogicAsanasforGroupTarining-Part-I":JanardanSwamiYogabhyasiMandal,Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, AdvaitaAshrama (Publication Department),Kolkata

Course Outcomes:

Students will be able to:

1. Develophealthymindinahealthybodythusimprovingsocialhealthalso
2. Improveefficiency

AUDIT 1 and 2: DISASTER MANAGEMENT

Course Objectives: -Students will be able to:

1. learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarianresponse.
2. critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflictsituations.
4. critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home countryor the countries they work in

Syllabus

Units	CONTENTS	Hours
1	**Introduction** Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.	4
2	**Repercussions Of Disasters And Hazards**: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts AndFamines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.	4
3	**Disaster Prone Areas In India** Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics	4
4	**Disaster Preparedness And Management** Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.	4
5	**Risk Assessment** Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.	4
6	**Disaster Mitigation** Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.	4

SUGGESTED READINGS:

1. R.Nishith,SinghAK,"DisasterManagementinIndia:Perspectives,issuesandstrategies"'New Royal bookCompany.
2. Sahni, Pardeep Et.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, NewDelhi.
3. Goel S. L. , Disaster Administration And Management Text And Case Studies" ,Deep &Deep Publication Pvt. Ltd., NewDelhi.

AUDIT 1 and 2: CONSTITUTION OF INDIA

Course Objectives:

Students will be able to:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indiannationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the IndianConstitution.

Syllabus

Units	Content	Hours
1	• **History of Making of the Indian Constitution:** History Drafting Committee, (Composition & Working)	4
2	• **Philosophy of the Indian Constitution:** Preamble Salient Features	4
3	• **Contours of Constitutional Rights &Duties:** • FundamentalRights • Right toEquality • Right toFreedom • Right againstExploitation • Right to Freedom ofReligion • Cultural and EducationalRights • Right to ConstitutionalRemedies • Directive Principles of StatePolicy • FundamentalDuties.	4
4	• **Organs ofGovernance:** • Parliament • Composition • Qualifications andDisqualifications • Powers andFunctions • Executive • President • Governor • Council ofMinisters • Judiciary, Appointment and Transfer of Judges,Qualifications • Powers andFunctions	4

5	• **LocalAdministration:** • District's Administration head: Role andImportance, • Municipalities: Introduction, Mayor and role of Elected Representative CEO of MunicipalCorporation. • Pachayati raj: Introduction, PRI: ZilaPachayat. • Elected officials and their roles, CEO Zila Pachayat: Position androle. • Block level: Organizational Hierarchy (Different departments), • Village level: Role of Elected and Appointedofficials, • Importance of grass rootdemocracy	4
6	• **ElectionCommission:** • Election Commission: Role andFunctioning.	4

	• Chief Election Commissioner and ElectionCommissioners. • State Election Commission: Role andFunctioning. • Institute and Bodies for the welfare of SC/ST/OBC andwomen.	

Suggested reading

1. TheConstitutionofIndia,1950(BareAct),GovernmentPublication.
2. Dr.S.N.Busi,Dr.B.R.AmbedkarframingofIndianConstitution,1stEdition,2015.
3. M.P.Jain,IndianConstitutionLaw,7thEdn.,LexisNexis,2014.
4. D.D.Basu,IntroductiontotheConstitutionofIndia,LexisNexis,2015.

Course Outcomes:

Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indianpolitics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualizationofsocialreformsleadingtorevolutioninIndia.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct electionsthroughadultsuffrageintheIndianConstitution.
4. DiscussthepassageoftheHinduCodeBillof1956.

Semester: - III

S.No	Course Code	SUBJECT	Internal Assessment	Credits
1.	**CSPCLT1**	Seminar on Dissertation	100	4
2.	**CSPCLT2**	Dissertation- Interim Evaluation	100	10
		Total	**200**	**14**

Total Credits = 14 Total Marks=200

Semester: - IV

S.No.	Course Code	SUBJECT	Internal Assessment	ESE (External)	Credits
1.	**CSPDLT1**	Dissertation- Open Defence	100	**----**	6
2.	**CSPDLT2**	Dissertation- Evaluation*	100	100	10
		Total	**200**	**100**	**16**

Total Credits = 16 Total Marks=200