VEER MADHO SINGH BHANDARI UTTARAKHAND TECHNICAL UNIVERSITY
Dehradun, Uttarakhand- 248007, INDIA

Course Structure
& Evaluation
Scheme for

MASTER IN COMPUTER APPLICATION (MCA) PROGRAMMES

(w.e.f. 2022-23 and onwards)

Proposed Scheme of Examination of M.C.A.2 Year Programme

MCA3rdSemester

S.No.	Sub.Code	SubjectName	MaximumMarksAllotted					TotalMarks	Contact Hours/Week			TotalCredits
			Theory			Practical						
			End Sem.	MidSem.	TeachersAssessments	End Sem.	Lab Work &Sessional		L	T	P	
		Theory										
1	CAT-014	Graph Theory	100	30	20			150	3	1		4
2	CAT-015	Software Engineering	100	30	20			150	3	1		4
3	CAT-0XX	Program Elective 1	100	30	20			150	3	1		4
4	AHT-31X	Open Elective 1	100	30	20			150	3	1		4
5	AHT - 310	Universal Human Values	100	30	20			150	3			3
		PRACTICALS										
6	CAP-008	Software Engineering				30	20	50			2	1
7	CAP-009	Seminar					100	100			4	2
8	CAP-010	Minor Project				50	50	100			4	2
							Total	1000				24

List of Program Elective 1:
CAT 016 Big Data Analytics
CAT 017 Soft Computing
CAT 018 Interne of Things
CAT 019 Compiler Design
CAT 020 Cloud Computing
CAT 021 Multimedia
Tentative Open Elective list: (to be float by other department)
AHT311 Entrepreneurship
AHT312 Startup
AHT313 Principal of Management

MCA 4th Semester

S.No.	Sub.Code	SubjectName	Maximum Marks Allotted					TotalMarks	ContactHours Per Week			TotalCredits
			Theory			Practical						
			End Sem.	MidSem.	Teachers Assessmen	End Sem.	Lab Work &Sessional		L	T	P	
		Theory										
1	CAT-017	Network Security	100	30	20			150	3	1		4
2	AHT-41X	Open Elective 2	100	30	20			150	3	1		4
3	CAT-0XX	Program Elective 2	100	30	20			150	3	1		4
4	CAT-0XX-	Program Elective 3	100	30	20			150	3	1		4
		Practical										
5	CAP-011	Network Security				30	20	50			2	1
6	CAP-012	Open Elective 2				30	20	50			2	1
7	CAP-013	Major Project				200	100	300			12	6
							Total	**1000**				**24**

Open Elective 2 : Tentative Open Elective list: (to be floated by other department)
   AHT 411 Digital Marketing
   AHT 412 Self Employment and Entrepreneurship Development

List of Program Elective 2:

CAT023 Simulation & Modeling
CAT024 Neural Networks
CAT025 Advanced Java
CAT 026 Data Science
CAT 027Machine Learning

List of Program Elective 3:

CATE028 Digital Image Processing
CATE029 Multimedia& Applications
CATE030Software Testing & Quality Assurance
CATE031 Block Chain Architecture
CATE032 Natural Language Processing

Semester – III
CAT – 014 Graph Theory

L	**T**	**P**
3	**1**	**0**

Graph theoretic algorithms must be provided wherever required to solve the problems.

Unit- I

Graphs, Sub graphs, some basic properties, various example of graphs & their sub graphs, walks, trails, path & circuits, connected graphs, disconnected graphs and component, various operation on graphs, Euler graphs, Hamiltonian paths and circuits, the traveling salesman problem, directed graphs, some types of directed graphs, directed paths and connectedness, Hamiltonian and Euler digraphs.

Unit- II

Trees and fundamental circuits, distance diameters, radius and pendent vertices, rooted and binary trees, on counting trees, spanning trees, fundamental circuits, finding all spanning trees of a graph and a weighted graph, trees with directed edges, fundamental circuits in digraph, algorithms of Prim, Kruskal and Dijkstra.

Unit -III

Cuts sets and cut vertices, some properties, all cut sets in a graph, fundamental circuits and cut sets, connectivity and separability, network flows, planer graphs, Euler's formula and its corollaries, Kuratowski's theorem and its application to planarity detection of graphs, combinatorial and geometric dual, some more criterion of planarity, thickness and crossings.

Unit -IV

Incidence matrix of graph, sub matrices of A (G), circuit matrix, cut set matrix, fundamental circuit matrix and rank of B, path matrix and relationships among & adjacency matrices, adjacency matrix of a digraph, matrices A, B and C of digraphs, rank- nullity theorem, coloring and covering and partitioning of a graph, chromatic number, chromatic partitioning, chromatic polynomials, matching, covering, enumeration, types of enumeration, counting of labeled and unlabeled trees.

References:

1. Deo, N: Graph theory, PHI

2. Bondy and Murthy: Graph theory and application. Addison Wesley.

3. John M. Aldous and Robin J. Wilson: Graphs and Applications-An Introductory Approach, Springer

4. Robin J, Wilson: Introduction to Graph Theory, Addison Wesley

MCA Semester –III
CAT- 015 Software Engineering

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	3	1	0

Course Objectives:
- To understand the nature of software development and software life cycle models
- To understand methods of capturing, specifying, visualizing and analyzing software requirements.
- To know basics of testing and understanding concept of software quality assurance and
  software configuration management process.

Course Outcomes: At the end of the course, student will be able to
- Define various software application domains and remember different process model used
  in software development.
- Explain needs for software specifications also they can classify different types of software
  requirements and their gathering techniques.
- Convert the requirements model into the design model and demonstrate use of software
  and user interface design principles.
- Distinguish among SCM and SQA and can classify different testing strategies and tactics
  and compare them.
- Justify role of SDLC in Software Project Development.

UNIT-I: Introduction Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.	5
UNIT-II: Software Requirement Specifications (SRS) Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS.	5

UNIT-III: Software Design Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.	5
UNIT-IV: Software Testing Testing Objectives, UNIT Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products.	5
UNIT-V: Software Maintenance and Software Project Management Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.	5

Text Books:
1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.

Reference Books:
1. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
2. Pankaj Jalote, Software Engineering, Wiley.
3. Carlo Ghezzi, M. Jarayeri, D. Manodrioli, Fundamentals of Software Engineering, PHI

MCA Semester –III
List of Program Elective
CAT 016 – Big DATA Analytics

L	**T**	**P**
2	**1**	**0**

Course Objectives: The main objective of this course is to
- Provide an overview of an exciting growing field of Big Data analytics
- Introduce the tools required to manage and analyze big data like Hadoop, MapReduce etc.,

Course Outcomes(COs): At the end of the course, student will be able to
- Understand the programming requirements viz., generic types and methods to perform data analysis
- Understand the existing technologies and the need of distributed files systems to analyze
  the big data
- To understand and analyze Map-Reduce programming model for better optimization
- Collect, manage, store, query, and analyze big data; and identify the need of interfaces to
  perform I/O operations in Hadoop
- Identify the need based tools, viz., Pig and Hive and to handle

UNIT I: : Introduction to core concepts and technologies: Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications. Introduction to Big Data- Evolution of Big data, Best Practices for Big data Analytics, Big data characteristics, Validating, The Promotion of the Value of Big Data, Big Data Use Cases, Characteristics of Big Data Applications, Perception and Quantification of Value, Understanding Big Data Storage, A General Overview of High, Performance Architecture, HDFS, MapReduce and YARN, Map Reduce Programming Model	6
UNIT II: Frameworks-Applications on Big Data Using Pig and Hive, Data processing operators in Pig, Hive services, HiveQL, Querying Data in Hive, fundamentals of HBase and Zoo Keeper, IBM InfoSphere Big Insights and Streams	6
UNIT III: Clustering and Classification-Advanced Analytical Theory and Methods: Overview of Clustering, K-means, Use Cases - Overview of the Method, Determining the Number of Clusters, Diagnostics, Reasons to Choose and Cautions. Classification: Decision Trees, Overview of a Decision Tree, The General Algorithm, Decision Tree Algorithms, Evaluating a Decision Tree, Decision Trees in R, Naïve Bayes,	6

Baye'sTheorem, Naïve Bayes Classifier.	
UNIT IV: Stream Memory and Spark- Introduction to Streams Concepts, Stream Data Model and Architecture, Stream Computing, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Introduction to Spark Concept, Spark Architecture and components, spark installation, spark RDD(Resilient Distributed Dataset), spark RDD operations.	6
UNIT V: NOSQL Data Management for Big Data and Visualization- NoSQL Databases: Schema-less Models: Increasing Flexibility for Data Manipulation, Key Value Stores, Document Store, Tabular Stores, Object Data Stores, Graph Databases Hive, Sharding, Hbase, Analyzing big data with twitter, Big data for ECommerce Big data for blogs, Review of Basic Data Analytic Methods using R. Formulate an effective strategy to implement a successful Data analytics project	6

Text Books:
1. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.
2. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Morgan Kaufmann/El sevier Publishers, 2013
3. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk from The Frontline. O'Reilly.
4. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press.

Reference Books:
1. Michael Berthold,David J.Hand,"IntelligentDataAnalysis",Springer,2007.
2. Tom White "Hadoop: The Definitive Guide"Third Edition,O'reilly Media 2012.
3. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGraw Hill Publishing,2012
4. BillFranks,"TamingtheBigDataTidalWave:FindingOpportunitiesinHugeData Streams with Advanced Analytics", John Wiley& sons,2012.
5. GlennJ.Myatt,"MakingSenseofData",JohnWiley&Sons,2007.
6. Pete Warden, "Big Data Glossary", O'Reilly,2011.
7. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", 2nd Edition, Elsevier

CAT 017 – Soft Computing

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	2	1	0

Course Objectives:

This course aims to develop students' abilities in using some contemporary approaches in solving problems in automation.

Learning Outcomes:

1. Appreciate the advantages and limitations of fuzzy systems and their potential impacts and applications in intelligent control and automation;

2. Appreciate the advantages and limitations of neural networks and their potential impacts and applications in intelligent automation; and

3. Develop an understanding of generic algorithms and their potential applications.

Course Content:

Unit-1: Basics of Soft Computing - Introduction, Fuzzy Computing, Neural Computing, Genetic Algorithms, Associative Memory, Adaptive Resonance Theory, Applications. Fundamental of Neural Networks-Introduction, Model of Artificial Neuron, Architectures, Learning Methods, Taxonomy of NN Systems, Single-Layer NN System, Applications.

Unit-2: Back-propagation Networks - Background, Back-Propagation Learning, Back- Propagation Algorithm. Associative Memory - Description, Auto-associative Memory, Bi- directional Hetero-associative Memory.

Unit-3: Adaptive Resonance Theory -Recap supervised, unsupervised, backprop algorithms; Competitive Learning; Stability-Plasticity Dilemma (SPD), ART Networks, Iterative Clustering, Unsupervised ART Clustering. Fuzzy Set Theory – Introduction, Fuzzy set : Membership, Operations, Properties; Fuzzy Relations.

Unit-4: Fuzzy Systems– Introduction, Fuzzy Logic, Fuzzification, Fuzzy Inference, Fuzzy Rule Based System, Defuzzification. Genetic algorithms & Modeling- Introduction, Encoding, Operators of Genetic Algorithm, Basic Genetic Algorithm.

Unit-5: Integration of Neural Networks, Fuzzy Logic and Genetic Algorithms - GA Based Back Propagation Networks, Fuzzy Back Propagation Networks, Fuzzy Associative Memories, Simplified Fuzzy ARTMAP.

Text Book

1. Rajasekaran, G.A. Vijayalakshmi Pai , Neural Networks, Fuzzy Logic, and Genetic Algorithms, Prentice-Hall of India Private Ltd.

2. J. S. R. Jang, C. T. Sun, E. Mizutani, Neuro-Fuzzy And Soft Computing, Pearson Education.

3. Horia-Nicolai Teodorescu, Abraham Kandel, Lakhmi C. Jain , Soft Computing in Human-Related Science, CRC Press.

4. David E. Goldberg, Genetic Algorithms, Pearson Education.

CAT 018 – Internet of Things

Course Objectives:
Students will understand the concepts of Internet of Things and can able to build IoT applications.

Learning Outcomes:

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. Implement basic IoT applications on embedded platform

Course Content:

Unit-1: Overview and Introduction: Internet of Things (IoT) and Web of Things (WoT): What's WoT?, The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet, of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics

Unit-2: M2M to IoT A Basic Perspective: Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven, global value chain and global information monopolies. M2M to IoT-An Architectural Overview: Building architecture, Main design, principles and needed capabilities, An IoT architecture outline, standards considerations.

Unit-3: IoT Architecture -State of the Art: Introduction, State of the art, Architecture Reference Model-Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.

Unit-4: IoT Applications for Value Creations: Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value, Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and Gas, Industry, Opinions on IoT Application and Value for Industry, Home Management, eHealth.

Unit-5: Internet of Things Privacy, Security and Governance: Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoTData-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach.

Text Book

1. Jan Holler, Vlasios Tsiatsis, et.al., Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, 1st Edition, Academic Press, 2014.

2. ijay Madisetti and Arshdeep Bahga, Internet of Things (A Hands-on-Approach), 1st Edition, VPT, 2014.

3. Francis daCosta, Rethinking the Internet of Things: A Scalable Approach to Connecting Everything, 1st Edition, Apress Publications, 2013.

CAT 019 – Compiler design

Course Objectives:
1. This course is designed to provide a comprehensive knowledge of Compiler Construction.
2. To learn how to construct compiler to translate High Level Languages to Machine Language.
3. To learn different phases of compiler and how to implement them.
4. To learn efficient machine Language Code Generation using the techniques of Optimization.

Course Learning Outcomes:
1. Understands compiler and various phases in compilation.
2. Understands Lexical Analysis and implement it using LEX tool.
3. Understands LL, LR, and SLR parsing techniques.
4. Implement parsing using YACC tool.
5. Understands Syntax Directed Translation, Symbol Tables and their applications.
6. Understands Intermediate Code Generation and Code Optimization.

Unit-I Introduction to compiling & Lexical Analysis
Introduction of Compiler, Major data Structure in compiler, types of Compiler, Front-end and Back- end of compiler, Compiler structure: analysis-synthesis model of compilation, various phases of a compiler, Lexical analysis: Input buffering, Specification & Recognition of Tokens, Design of a Lexical Analyzer Generator, LEX.

Unit-II Syntax Analysis &Syntax Directed Translation
Syntax analysis: CFGs, Top down parsing, Brute force approach, recursive descent parsing, transformation on the grammars, predictive parsing, bottom up parsing, operator precedence parsing, LR parsers (LR(0), SLR(1), LR(1), LALR(1)),Parser generation. Syntax directed definitions: Construction of Syntax trees, Bottom up evaluation of S-attributed definition, L-attribute definition, Top down translation, Bottom Up evaluation of inherited attributes Recursive Evaluation, Analysis of Syntax directed definition.

Unit-III Type Checking & Run Time Environment
Type checking: type system, specification of simple type checker, equivalence of expression, types, type conversion, overloading of functions and operations, polymorphic functions. Run time Environment: storage organization, Storage allocation strategies, parameter passing, dynamic storage allocation, Symbol table, Error Detection & Recovery, Ad-Hoc and Systematic Methods.

Unit –IV Code Generation
Intermediate code generation: Declarations, Assignment statements, Boolean expressions, Case statements, Back patching, Procedure calls Code Generation: Issues in the design of code generator, Basic block and flow graphs, Register allocation and assignment, DAG representation of basic blocks, peephole optimization, generating code from DAG.

Unit –V Code Optimization
Introduction to Code optimization: sources of optimization of basic blocks, loops in flow graphs, dead code elimination, loop optimization, Introduction to global data flow analysis, Code Improving transformations ,Data flow analysis of structure flow graph Symbolic debugging of optimized code.

References:
1. A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools , Pearson Education
2 Raghavan, Compiler Design, TMH Pub.
3. Louden. Compiler Construction: Principles and Practice, Cengage Learning
4. A. C. Holub. Compiler Design in C , Prentice-Hall Inc., 1993.
5. Mak, writing compiler & Interpreters, Willey Pub.

CAT 020 – Cloud Computing

Course Objectives:

☐ To explain the evolving computer model called cloud computing.

☐ To introduce the various levels of services that can be achieved by cloud.

☐ To describe the security aspects in cloud.

Learning Outcomes:

1. use public and private cloud solutions for computational science and engineering applications

2. discuss key concepts of cloud computing services, such as Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS);

3. asses the suitability of cloud computing infrastructures for different scientific applications;

4. implement software for cloud-based distributed computing using the technology presented in the course;

5. Critically analyze and present solutions and implementations in writing and orally.

Course Content:

UNIT- I : Systems Modeling, Clustering and Virtualization: Distributed System Models and Enabling Technologies, Computer Clusters for Scalable Parallel Computing, Virtual Machines and Virtualization of Clusters and Data centers.

UNIT- II : Foundations: Introduction to Cloud Computing, Migrating into a Cloud, Enriching the ‗Integration as a Service' Paradigm for the Cloud Era, The Enterprise Cloud Computing Paradigm.

UNIT- III : Infrastructure as a Service (IAAS) & Platform and Software as a Service (PAAS / SAAS): Virtual machines provisioning and Migration services, On the Management of Virtual machines for Cloud Infrastructures, Enhancing Cloud Computing Environments using a cluster as a Service, Secure Distributed Data Storage in Cloud Computing. Aneka, Comet Cloud, T-Systems‗, Workflow Engine for Clouds, Understanding Scientific Applications for Cloud Environments.

UNIT- IV : Monitoring, Management and Applications: An Architecture for Federated Cloud Computing, SLA Management in Cloud Computing, Performance Prediction for HPC on Clouds, Best Practices in Architecting Cloud Applications in the AWS cloud, Building Content Delivery networks using Clouds, Resource Cloud Mashups.

UNIT – V : Governance and Case Studies: Organizational Readiness and Change management in the Cloud age, Data Security in the Cloud, Legal Issues in Cloud computing, Achieving Production Readiness for Cloud Services.

Text Book

1. K. Hwang, G. Fox and J. Dongarra, ―Distributed and Cloud Computing‖, Morgan Kaufmann Publishers, 2012.

2. Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, ―Cloud Computing: Principles and Paradigms‖, Wiley, 2011.

CAT 021 – Multimedia

Unit-I: Introduction

Introduction to Multimedia, Multimedia Information, Multimedia Objects, Multimedia in business and work. Convergence of Computer, Communication and Entertainment products Stages of Multimedia Projects: Multimedia hardware, Memory & storage devices, Communication devices, Multimedia software's, presentation tools, tools for object generations, video, sound, image capturing, authoring tools, card and page based authoring tools.

Unit-II: Multimedia Building Blocks Text, Sound MIDI, Digital Audio, audio file formats, MIDI under windows environment Audio & Video Capture.

Unit-III: Speech Compression & Synthesis Digital Audio concepts, Sampling Variables, Loss less compression of sound, loss compression, silence compression & Speech Synthesis.

Unit-IV: Images

Multiple monitors, bitmaps, Vector drawing, lossy graphic compression, image file formatic animations Images standards, JPEG Compression, Zig Zag Coding, Multimedia Database.Content based retrieval for text and images,Video:Video representation, Colors, Video Compression, MPEG standards, MHEG Standard Video Streaming on net, Video Conferencing, Multimedia Broadcast

Services, Indexing and retrieval of Video Database, recent development in Multimedia.

Books:
1. Buford "Multimedia Systems" Addison Wesley.
2. Agrawal & Tiwari "Multimedia Systems" Excel.
3. Mark Nelson "Data Compression Book" BPB.
4. Sleinreitz "Multimedia System" Addison Wesley.

AHT- 310 Universal Human Values

L   **T**   **P**
3   **0**   **0**

COURSE OBJECTIVES: The objectives of the course are to:

 1. Development of a holistic perspective based on self- exploration about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

COURSE OUTCOMES: On successful completion of the course, the student will be able to:
 1. Expected to become more aware of themselves, and their surroundings (family, society, nature)
 2. Become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
3. Have better critical ability.
4. Become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
 5. Able to apply what they have learnt to their own self in different day-to- day settings in real life, at least a beginning would be made in this direction.

COURSE TOPICS: The course has 28 lectures and 14 practice sessions in 5 modules:

Module 1: Introduction - Value Education
Universal human values; self exploration, natural acceptance an experimental validation; Human aspirations, right understanding, relationship and physical facility, current scenario; Understanding and living in harmony at various levels.

Module 2: Harmony in the Human Being
Understanding human being, needs of self(I) and body; body as an instrument of 'I'; characteristics and activities of 'I' and harmony in 'I'; harmony of I with the Body: Sanyam and Health, Physical needs an prosperity; Programs to ensure Sanyam and Health.

Module 3: Harmony in the Family and Society
 Values in human-human relationship; nine universal values in relationships; justice, truth, respect, trust; Difference between intention and competence; Respect and differentiation, Harmony in society: resolution, prosperity, fearlessness and coexistence; Universal harmonious order in society.

Module 4: Harmony in the Nature and Existence
Harmony in the nature. Four orders of nature; existence as co-existence, harmony at all levels of existence.

Module 5: Harmony in the Professional Ethics
 Natural acceptance of human values, Definitiveness of Ethical Human Conduct; Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order; Competence in professional ethics; Case studies; transition from the present state to Universal Human Order: at individual level

and societal level.

TEXT BOOK
1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

REFERENCE BOOKS

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karam chand Gandhi.
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
 8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English) 13. Gandhi - Romain Rolland (English)

MCA Semester - 3
CAP – 008 Software engineering LAB

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0	0	2

Course Objective: To Develop Ability to:
- Understand, Analyze and Model User's Requirements
- Select Appropriate Process Model Apply it to All Stages of Software Development Life Cycle(SDLC)
- Select and Apply Appropriate Design Methodology
- Decide the Feasibility of Using and Applying Agile Development Process
- Assure Software Quality, Select and Apply Appropriate Testing Strategies
- Select and Apply Appropriate Metrics to Estimate Software Size, Effort, and Cost
- Prepare Project Schedule, and Monitor the Project Progress
- Project, Mitigate, Monitor, and Manage Risk
- Understand the Characteristics and Applicability of Various Software Tools

Course Outcomes:
- Ability to translate end-user requirements into system and software requirements, using e.g. UML, and structure the requirements in a Software Requirements Document (SRD)
- Identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices.
- Will have experience and/or awareness of testing problems and will be able to develop a simple testing report

List of Practicals:
1. Problem Analysis and Project Planning Thorough study of the problem- identify project scope, infrastructure.
2. Software Requirement Analysis- Describe the individual Phases/modules of the projectdeliverables.
3. Data Modeling Use work products – data dictionary, use case diagrams and activity
4. diagrams, build and test lass diagrams, sequence diagrams and add interface to class diagrams.
5. Software Developments and Debugging.
6. Software Testing – Prepare test plan, perform validation testing coverage analysis,
7. Memory leaks, develop test case hierarchy, Site check and site monitor.
8. Describe: Relevance of CASE tools, high – end and low – end CASE tools, automated
   support for data dictionaries, DFD, ER diagrams.

Mini Project Case study:
1. Course Registration System
2. Online ticket reservation system
3. Students marks analyzing system
4. Platform assignment system for the trains in a railway station

MCA Semester-III
CAP 009 : Seminar

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	0	**0**	**4**

Prerequisites: General knowledge of computer systems design, both software and hardware, is necessary.

Objectives: To increase participants' familiarity with recent and important research results in computer systems; to improve participants' skills in presenting computer systems research.

- In the Seminar participants discuss recent and important results in the area of computer systems research.

- For a typical meeting, attendees will read and discuss one paper chosen from recent systems, networking, security conference or other Computer Applications related topics.

- Papers are selected for discussion according to the semester's focus topic, the papers' relevance to participants' own research, and/or the papers' relevance to upcoming technologies.

- Each meeting has one or more designated "facilitators" who are responsible for leading the discussion.

MCA Semester-III
CAP 010: Project I

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	0	0	4

The objective of Project I is to conduct a preliminary analysis, propose alternative solutions, describe costs and benefits and submit a preliminary plan with recommendations.

The student will:

1. Conduct the preliminary analysis: in this step, you need to find out the organization's objectives and the nature and scope of the problem under study. Even if a problem refers only to a small segment of the organization itself, you need to find out what the objectives of the organization itself are. Then you need to see how the problem being studied fits in with them.

2. Propose alternative solutions: In digging into the organization's objectives and specific problems, you may have already covered some solutions. Alternate proposals may come from interviewing employees, clients, suppliers, and/or consultants. You can also study what competitors are doing. With this data, you will have three choices: leave the system as is, improve it, or develop a new system.

3. Describe the costs and benefits.

MCA Semester-III
AHT- 311: Open Elective 1
Entrepreneurship

	L	T	P
	3	1	0

Course Objectives:

• Think critically and creatively about the nature of business opportunities, resources, and industries.
• Describe the processes by which innovation is fostered, managed, and commercialized.
• Spot new business opportunities in the environment, whether by recognition, development, or creation.
• Effectively and efficiently evaluate the potential of new business opportunities.
• Assess the market potential for a new venture, including customer need, competitors, and industry attractiveness.
• Develop a business model for a new venture, including revenue, margins, operations, working capital, and investment.
• Develop pro forma financial statements that reflect business model decisions and that can be used to determine future funding requirements.
• Write a clear, concise, and compelling business plan for a new venture.
• Identify appropriate sources of financing for an entrepreneurial business plan.
• Develop a compelling sales pitch to acquire financing necessary to a new venture.
• Explain the operational implications of common terms and conditions for earlystage investment deals. • Describe the process by which new ventures are created and launched.

Course Learning Outcomes:

1. Comprehend the role of bounded rationality, framing, causation and effectuation in entrepreneurial decision making.
2. Demonstrate an ability to design a business model canvas.
3. Evaluate the various sources of raising finance for startup ventures.
4. Understand the fundamentals of developing and presenting business pitching to potential investors.

Course Content:

Unit I: Introduction to Entrepreneurship: Entrepreneurs; entrepreneurial personality and intentions - characteristics, traits and behavioral; entrepreneurial challenges.

Unit II: Entrepreneurial Opportunities: Opportunities. Discovery/ creation, Pattern identification and recognition for venture creation: prototype and exemplar model, reverse engineering.

Unit III: Entrepreneurial Process and Decision Making: Entrepreneurial ecosystem, Ideation, development and exploitation of opportunities; Negotiation, decision making process and approaches, Effectuation and Causation.

Unit IV: Crafting business models and Lean Start-ups: Introduction to business models; Creating value propositions-conventional industry logic, value innovation logic; customer focused innovation; building and analyzing business models; Business model canvas, Introduction to lean startups, Business Pitching.

Unit V: Organizing Business and Entrepreneurial Finance: Forms of business organizations; organizational structures; Evolution of Organization, sources and selection of venture finance options and its managerial implications. Policy Initiatives and focus; role of institutions in promoting entrepreneurship.

Text/Reference Books:

1. Ries, Eric(2011), The lean Start-up: How constant innovation creates radically successful businesses, Penguin Books Limited.
2. Blank, Steve (2013), The Startup Owner's Manual: The Step by Step Guide for Building a Great Company, K&S Ranch.
3. S. Carter and D. Jones-Evans, Enterprise and small business- Principal Practice and Policy, Pearson Education (2006)
4. T. H. Byers, R. C. Dorf, A. Nelson, Technology Ventures: From Idea to Enterprise, McGraw Hill (2013).

MCA – Semester IV
CAT – 017 Network Security

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Course Objectives:
The main objectives of this course are toexplore the working principles and utilities of variouscryptographic algorithms including secret key cryptography, hashes and message digests, publickey algorithms, design issues and working principles of various authentication protocols andvarious secure communication standards including Kerberos, IPsec, and SSL/TLS.

Course Outcomes(COs): At the end of the course, student will be able to
- Explain different security threats and countermeasures and foundation course of cryptography mathematics.
- Classify the basic principles of symmetric key algorithms and operations of some symmetric key algorithms and asymmetric key cryptography
- Revise the basic principles of Public key algorithms and Working operations of some
- Asymmetric key algorithms such as RSA, ECC and some more
- Design applications of hash algorithms, digital signatures and key management techniques
- Determine the knowledge of Application layer, Transport layer and Network layer security Protocols such as PGP, S/MIME, SSL,TSL, and IPsec .

UNIT – I: Introduction to security attacks, services and mechanism, Classical encryption technique substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers. Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard (DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES.	**6**
UNIT-II : Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm, Advanced Encryption Standard (AES) encryption and decryption Fermat's and Euler's theorem, Primality testing, Chinese Remainder theorem, Discrete Logarithmic Problem, Principals of public key crypto systems, RSA algorithm, security of RSA.	**6**
UNIT-III : Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, Secure hash algorithm (SHA) Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), proof of digital signature algorithm.	**6**

UNIT-IV : Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure. Authentication Applications: Kerberos Electronic mail security: pretty good privacy (PGP), S/MIME.	**6**
UNIT-V : IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Introduction to Secure Socket Layer, Secure electronic transaction (SET). System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, Firewalls.	**6**

Text Books:
1. William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson Education.

Reference Books:
1. Behrouz A. Frouzan: Cryptography and Network Security, TMH
2. Bruce Schiener, "Applied Cryptography". John Wiley & Sons
3. Bernard Menezes," Network Security and Cryptography", Cengage Learning.
4. Atul Kahate, "Cryptography and Network Security", TMH

Open Elective 2

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Self Employment and Entrepreneurship Development
AHT412

Course Outcomes

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

1. Study self-employment and entrepreneurship development.

2. Know registration process/ procedure for enterprise and explore new enterprise.

3. Understand process of product selection and stages of product development.

4. Describe marketing and management of the critical resources

5. Know strategies to overcome risk areas

6. Analyze success and failures of entrepreneur & self-employer and integrate positive conclusions.

Unit-1 Introduction to Self-Employment & Entrepreneurship Development: (No. of lectures: 6)

Concept and need of self-employment, Characteristics of self-employment, Creativity, Innovativeness, Scope in local and global market, Concept of productivity and its quality,

Parameter affected to customer satisfaction, Classification of enterprise.

Unit-2 Entrepreneurial Support Agencies: (No. of lectures: 7)

Concept of micro, small and medium scale industries, Rules and regulation of government to

register the agencies, Sources of information, Financial assistance, Technical assistance, Training, State & national level promotional schemes for establishment of new enterprise.

Unit-3 Project Set Up Planning: (No. of lectures: 7)

Product selection, Concept and importance, Product development stages, Concept and importance of process selection, Factor affecting process selection, Life cycle, Flexibility, Productivity-concept & importance, Capacity planning, Methods to access estimate capacity,

Selection and location of layout, Factor affecting Selection of location, Objectives, Factor affecting

plant layout.

Unit-4 Project Proposal Planning: (No. of lectures: 7)

Concept of 7-M sources, Importance of marketing, 4Ps channel, Need of enterprise, Market-

survey, Needs and method, Idea about financial management and its classification, Terminology used in financial management, Project report preparation for product, Cost,

Volume and profit analysis.

Unit-5 Enterprise And Risk Management: (No. of lectures: 5)

Strategies to overcome risk possibilities, Uncertainty and certainty of project element, Capability of decision making under risk, Different methods of risk management, SWOT analysis.

Text/Reference Books:

1. "Developing Entrepreneurship" Pub: Pareek & Co. Learning systems,Delhi..

2. Clifford and Bombak, Joseph R. Momanso, "Entrepreneurship & Venture"

3. Karmakar M.B., "Small Industries management"

4. Entrepreneurship development and Management, R.K.Singal, Pub.: S.K.Kataria and Sons.

List of Learning Websites

i. http://www.ediindia.org

ii. http://niesbud.nic.in/docs/SelfEmploymentBook.pdf

iii. http://smallb.in/

iv. http://www.msme.gov.in/

v. http://nimsme.org/

vi. http://www.nsic.co.in/

Digital Marketing Course Syllabus (AHT-411)

Unit 1
Introduction to Digital Marketing
Evolution of digital marketing. Importance of digital marketing. Difference between traditional
and digital marketing. Recent trends and current scenario of digital marketing. Digital marketing
as a tool of success for companies. Use of Digital Marketing to increase sales. Conducting a
competitive analysis using Digital Marketing. Case studies on digital marketing strategies

Unit 2

Website Planning and Creation and Search Engine Optimisation (SEO)
Understanding the functionality of WordPress, Development of a website, Installation and
Activation of plug-ins, Functionality of different plug-ins, Introduction to Search Engine
Optimization, Working of search engine, On-page SEO: content research, keyword research,
meta tags, Off-page SEO: link building, Factors affecting the rank of a webpage, Web Analytics,
Google Analytics, Optimal use of Google Analytics Concepts of bounce rate, page view, session
time, Behavior and acquisition reports.

Unit 3
Search Engine Marketing and Web Remarketing
Features of the Google Ads platform and its algorithm, Creating campaigns, Search volume,
Google Adwords, Ad creation, Site & Keyword Targeting, CPC, CPA & CPM-based Accounts,
Demographic Targeting, Google Keyword Planner, Concept of CPM, CLV and other such
metrics, Basics of remarketing, creating a remarketing list on Google Ads, Using Google Ads
tag, Building subscriber list, Finessing email marketing tools and software, Designing email
copies & automating emails, extracting information from email campaign analytics.

Unit 4

Social Media Marketing, Content Marketing, Mobile Marketing & Strategy

Understanding working of SMM, Targeting Demographics through social media, Social Media
Analytics, Social Media Advertising, Content bucketing, Creating a social media content
calendar for a brand, Content marketing tools, Guest Blogging, Characterstics of an ad, Creating
attractive creative, Understanding design tools: aesthetics, typography, colours and themes, In-
app messaging, Push notifications, App Store optimization, App metrics analysis.

Unit 5
E-Commerce Management and Web Rema
Essentials of e-commerce, Product keyword research, Inventory management, Supply chain
management, Packaging & Shipping, Selling on online platforms, Uploading products to an
online marketplace, Concepts of Media buying and its types, Adsense, Blogging, Affiliate
Marketing, Understanding tools like Google Adsense and Youtube Adsense, Understanding the
concept of Online Reputation Management, Tackling negative reviews, Crisis management
References:
Digital Marketing for Dummies Ryan Deiss and Russ Henneberry
The Lean Startup Eric Ries
Contagious: Why Things Catch On Jonah Berger
Influence: The Psychology of Persuasion Robert Cialdini

Program Elective – 2
(CAT-0023 to CAT- 027)

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Modeling and Simulation

Course Objectives:
• Grasp modeling concepts with emphasis on performance analysis.
• Build simulation models and their parameterization.
• Analyze simulation output data to evaluate performance criteria.

Course Learning Outcomes:
1. Demonstrate basic programming skills – functions, arrays, loops, conditional statements, procedures.
2. Demonstrate technical communication skills
3. Explain the Role of Modeling
4. Utilize the Modeling Process to identify the key parameters of a model, estimate model outcomes, utilize a computational tool, e.g., Matlab to implement the mathematical representation of the model, convey the results of the simulation accurately, validate the model with data, and discuss the quality and sources of errors in the model.
5. Construct difference-based computer models.
6. Complete a capstone modeling project that identifies a problem, develops a mathematical representation and transforms it to a computational model. Document the development and implementation of the model and present in oral and written form.

Course Contents:
UNIT-I
Introduction: Systems, models, discrete event simulation and continuous simulation.
Discrete Event Simulation: Time-advance mechanisms, event modeling of discrete dynamic systems, single-server single queue model, event graphs, Monte Carlo simulation.
UNIT-II
GPSS: Model structure, entities and transactions, blocks in GPSS, process oriented programming, user defined functions, SNA, logic switches, save locations, user chains, tabulation of result, programming examples.
UNIT-III
Random Number Generation: Congruence generators, long period generators, uniformity and independence testing
UNIT - IV
Random Variate Generation: Location, scale and shape parameters, discrete and continuous probability distributions; Inverse transform method, composition and acceptance rejection methods
UNIT-IV
Queuing Models: Little's theorem, analytical results for M/M/1, M/M/1/N, M/M/c, M/G/1 and other queuing models.
Books:
1. Karian, Z.A. and Dudewicz, E.J., ―Modern Statistical Systems and GPSS Simulation‖,2ndEd., CRC Press. 1999
2. Banks, J., Carson, L.S., Nelson, B.L. and Nicol, D.M., ―Discrete Event SystemSimulation‖, 3rdEd., Pearson Education. 2002

Law, A.M. and Kelton, W.D., ―Simulation, Modeling and Analysis‖, 3rd Ed., TataMcGraw-Hill. 2003

Advance Java

UNIT 01

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, V-Semester Departmental Elective

BCST- 504 (C) Internet and Web Technology

Introduction: Concept of WWW, Internet and WWW, HTTP Protocol: Request and Response, Web browser and Web servers, Features of Web 2.0 Web Design: Concepts of effective web design, Web design issues including Browser, Bandwidth and Cache, Display resolution, Look and Feel of the Web site, Page Layout and linking, User centric design, Sitemap, Planning and publishing website, Designing effective navigation.

UNIT 02

HTML: Basics of HTML, formatting and fonts, commenting code, color, hyperlink, lists, tables, images, forms, XHTML, Meta tags, Character entities, frames and frame sets, Browser architecture and Web site structure. Overview and features of HTML5

UNIT 03

Style sheets: Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2, Overview and features of CSS3 JavaScript : Client side scripting with JavaScript, variables, functions, conditions, loops and repetition, Pop up boxes, Advance JavaScript: JavaScript and objects, JavaScript own objects, the DOM and web browser environments, Manipulation using DOM, forms and validations, DHTML : Combining HTML, CSS and JavaScript, Events and buttons

UNIT 04

XML: Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Using XML with application. Transforming XML using XSL and XSLT PHP: Introduction and basic syntax of PHP, decision and looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, string, Form processing, Files, Advance Features: Cookies and Sessions, Object Oriented Programming with PHP

UNIT 05

PHP and MySQL: Basic commands with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names, creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP MyAdmin and database bugs

Reference Books:

1. Developing Web Applications, Ralph Moseley and M. T. Savaliya, Wiley-India

2. Web Technologies, Black Book, dreamtech Press

3. HTML 5, Black Book, dreamtech Press

4. Web Design, Joel Sklar, Cengage Learning

5. Developing Web Applications in PHP and AJAX, Harwani, McGrawHill

6. Internet and World Wide Web How to program, P.J. Deitel& H.M. Deitel , Pearson

Course Outcome

After completion of the course students will be able to

1. Describe the concepts of WWW including browser and HTTP protocol.

2. List the various HTML tags and use them to develop the user friendly web pages.

3. Define the CSS with its types and use them to provide the styles to the webpages at variouslevels.

4. Develop the modern web pages using the HTML and CSS features withdifferent layouts asper need of applications.

5. Use the JavaScript to develop the dynamic web pages.

6. Use server side scripting with PHP to generate the web pages dynamically using thedatabase connectivity.

7. Develop the modern Web applications using the client and server sidetechnologies and theweb design fundamentals.

Data Science

Course Objectives:

This course will introduce students to this rapidly growing field and equip them with some of its basic principles and tools as well as its general mindset. Students will learn concepts, techniques and tools they need to deal with various facets of data

Science practice, including data collection and integration, exploratory data analysis, predictive modeling, descriptive modeling, data product creation, evaluation, and effective communication.

Learning Outcomes:

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

Students will develop relevant programming abilities.

Students will demonstrate proficiency with statistical analysis of data. Students will develop the ability to build and assess data-based models. Students will execute statistical analyses with professional statistical software. Students will demonstrate skill in data management.

Students will apply data science concepts and methods to solve problems in real- world contexts and will communicate these solutions effectively

Course Content:

UNIT-I:

DESCRIPTIVE STATISTICS: Probability Distributions, Inferential Statistics, Inferential Statistics through hypothesis tests Regression & ANOVA, Regression ANOVA(Analysis of Variance)

UNIT-II:

INTRODUCTION TO BIG DATA: Big Data and its Importance, Four V's of Big Data, Drivers for Big Data, Introduction to Big Data Analytics, Big Data Analytics applications. BIG DATA TECHNOLOGIES: Hadoop's Parallel World, Data discovery, Open source technology for Big Data Analytics, cloud and Big Data, Predictive Analytics, Mobile Business Intelligence and Big Data, Crowd Sourcing Analytics, Inter- and Trans-Firewall Analytics, Information Management.

UNIT-III:

PROCESSING BIG DATA: Integrating disparate data stores, Mapping data to the programming framework, Connecting and extracting data from storage, Transforming data for processing, subdividing data in preparation for Hadoop Map Reduce.

UNIT-IV:

HADOOP MAPREDUCE: Employing Hadoop Map Reduce, Creating the components of Hadoop Map Reduce jobs, Distributing data processing across server farms, Executing Hadoop Map Reduce jobs, monitoring the progress of job flows, The Building Blocks of Hadoop Map Reduce Distinguishing Hadoop daemons, Investigating the Hadoop Distributed File System Selecting appropriate execution modes: local, pseudo-distributed, fully distributed.

UNIT-V:

BIG DATA TOOLS AND TECHNIQUES: Installing and Running Pig, Comparison with Databases, Pig Latin, User- Define Functions, Data Processing Operators, Installing and Running Hive, Hive QL, Querying Data, User-Defined Functions, Oracle Big Data.

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REFERENCES:

1. Michael Minelli, Michehe Chambers, ―Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business‖, 1st Edition, AmbigaDhiraj, Wiely CIO Series, 2013.

2. ArvindSathi, ―Big Data Analytics: Disruptive Technologies for Changing the Game‖, 1st Edition, IBM Corporation, 2012.1. Rajaraman, A., Ullman, J. D., Mining of Massive Datasets, Cambridge University Press, United Kingdom, 2012

3. Berman, J.J., Principles of Big Data: Preparing, Sharing and Analyzing Complex Information, Morgan Kaufmann, 2014

4. Barlow, M., Real-Time Big Data Analytics: Emerging Architecture, O Reilly, 2013

5. Schonberger, V.M., Kenneth Cukier, K., Big Data, John Murray Publishers, 2013

6. Bill Franks, ―Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics‖, 1st Edition, Wiley and SAS Business Series, 2012.

Machine Learning

Machine Learning
Course Objectives:
In this course we will study the basic component of an intelligence system i.e. machine learning, their functions, mechanisms, policies and techniques used in their implementation and examples.
Course Learning Outcomes:
1. List various approaches of Machine Learning.
2. Describe machine learning algorithms to solve the real world problems
3. Develop Hypothesis and machine learning models
4. Identify appropriate models for solving machine learning problems.
5. Apply learning techniques to solve real world machine learning problems.
6. Evaluate and interpret the results of the algorithms.

COURSE CONTENTS:
Unit –I
Introduction to machine learning, scope and limitations, regression, probability, statistics and linear algebra for machine learning, convex optimization, data visualization, hypothesis unction and testing, data distributions, data preprocessing, data augmentation, normalizing data sets, machine learning models, supervised and unsupervised learning.
Unit –II
Linearity vs non linearity, activation functions like sigmoid, ReLU, etc., weights and bias, loss function, gradient descent, multilayer network, backpropagation, weight initialization, training, testing, unstable gradient problem, auto encoders, batch normalization, dropout, L1 and L2 regularization, momentum, tuning hyper parameters,
Unit –III
Convolutional neural network, flattening, subsampling, padding, stride, convolution layer, pooling layer, loss layer, dance layer 1x1 convolution, inception network, input channels, transfer learning, one shot learning, dimension reductions, implementation of CNN like tensor flow, keras etc.
Unit –IV
Recurrent neural network, Long short-term memory, gated recurrent unit, translation, beam search and width, Bleu score, attention model, Reinforcement Learning, RL-framework, MDP, Bellman equations, Value Iteration and Policy Iteration, , Actor-critic model, Q learning, SARSA
Unit –V
Support Vector Machines, Bayesian learning, application of machine learning in computer vision, speech processing, natural language processing etc, Case Study: ImageNetCompetition

TEXT BOOKS RECOMMENDED:

1. Christopher M. Bishop, ―Pattern Recognition and Machine Learning‖, Springer-Verlag

2. New York Inc., 2nd Edition, 2011.

3. Tom M. Mitchell, ―Machine Learning‖, McGraw Hill Education, First edition, 2017.

4. Ian Goodfellow and YoshuaBengio and Aaron Courville, ―Deep Learning‖, MIT Press,2016

REFERENCE BOOKS:

1. Aurelien Geon, ―Hands-On Machine Learning with Scikit-Learn and

Tensorflow:Concepts, Tools, and Techniques to Build Intelligent Systems‖, Shroff/O'Reilly; Firstedition (2017).

2. Francois Chollet, "Deep Learning with Python", Manning Publications, 1_{st} Ed. 2018.

3. Andreas Muller, "Introduction to Machine Learning with Python: A Guide for DataScientists", Shroff/O'Reilly; First edition (2016).

4. Russell, S. and Norvig, N. ―Artificial Intelligence: A Modern Approach‖, Prentice HallSeries in Artificial Intelligence. 2003.

List of Program elective -3
Digital Image Processing

Course Objectives:

☐ Develop a theoretical foundation of fundamental Digital Image Processing concepts.

☐ Provide mathematical foundations for digital manipulation of images; image acquisition; preprocessing; segmentation; Fourier domain processing; and compression.

☐ Gain experience and practical techniques to write programs using MATLAB language for digital manipulation of images; image acquisition; preprocessing; segmentation; Fourier domain processing; and compression.

Learning Outcomes:

1. Have a good understanding of the mathematical foundations for digital manipulation of images.
2. Be able to write programs for digital manipulation of images.
3. Learn and understand the Image Enhancement in the Spatial Domain.
4. Be able to use different digital image processing algorithms.
5. Be able to design, code and test digital image processing applications.
6. Analyze a wide range of problems and provide solutions related to the design of image processing systems through suitable algorithms, structures, diagrams, and other appropriate methods.

Course Content:

UNIT I : Digital Image Fundamentals: What is Digital Image Processing?, Origins of Digital Image Processing, Examples of fields that use DIP, Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships Between Pixels, Linear and Nonlinear Operations.

UNIT II: Spatial Domain: Some Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters.

UNIT III : Frequency Domain: Preliminary Concepts, The Discrete Fourier Transform (DFT) of Two Variables, Properties of the 2-D DFT, Filtering in the Frequency Domain, Image Smoothing and Image Sharpening Using Frequency Domain Filters, Selective Filtering.

Unit IV : Restoration: Noise models, Restoration in the Presence of Noise Only using Spatial Filtering and Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering.

UNIT V : Color Image Processing: Color Fundamentals, Color Models, Pseudocolor Image Processing.
Wavelets: Background, Multiresolution Expansions. Morphological Image Processing: Preliminaries, Erosion and Dilation, Opening and Closing, The Hit-or-Miss Transforms, Some Basic Morphological Algorithms.

UNIT V : Segmentation: Point, Line, and Edge Detection, Thresholding, Region-Based Segmentation, Segmentation Using Morphological Watersheds. **Representation and Description:** Representation, Boundary descriptors.

Text Book

1. R. C. Gonzalez and R. E. Woods, ―Digital Image Processing‖, Third Edit on, Pearson-Prentice-Hall, 2008.

2. R. C. Gonzalez, R. E. Woods, S. L. Eddins, ―Digital Image Processing using Matlab‖, Second Edit on, Pearson-Prentice-Hall, 2004.

3. Al Bovik (ed.), ―Handbook of Image and Video Processing‖, Academic Press, 2000.

4. A.K. Jain, ―Fundamentals of Digital Image Processing‖, Prentice-Hall, Addison- Wesley, 1989.

5. M. Petrou, P. Bosdogianni, ―Image Processing, The Fundamentals―, Wiley, 1999.

6. P.Ramesh Babu, Digital Image Processing. Scitech Publications., 2003.

7. Bernd Jähne, Digital Image Processing, Springer-Verlag Berlin Heidelberg 2005.

8. B. Jähne, ―Practical Handbook on Image Processing for Scientific Applications―, CRC Press, 1997.

<div align="center">**Software Testing & Quality Assurance**</div>

Course Objectives:

The course has the basic scope to provide the students with theoretical knowledge about concepts of software quality, about the quality- models, - standards and – methodologies used in the software industry. The theory is supported and supplemented by the lecturer's 10 years experience in software quality management. Understanding and usage of the theory are consolidated by the case studies and exercises.

Course Learning Outcomes:

1. List various principles Software Quality Management.

2. Describe the real world problems that may arise during software development and affects the quality.

3. Develop an appropriate plan for software quality management.

4. Explore key contributors / metrics for effective quality control.

5. Identify appropriate international standard for real life software project for controlling and managing the quality of product.

6. Demonstrate and present the learning of course on real life problems.

Course Content:

UNIT I: Introduction to Software Quality Engineering: what is software quality, who cares for software quality, benefits of software quality, phases in software development, views of quality, hierarchical models of quality, types of defects, cost of fixing defects, cost of poor quality, definitions used in software quality engineering, software quality assurance, quality control, software configuration management.

UNIT II: Software Testing: guiding principles of testing, composition of a testing team, skills of a tester, types of testing, evaluating the quality of test cases, techniques for reducing number of test cases, requirements for effective testing, test oracle, economics of software testing, handling defects, risk in software testing, requirement traceability matrix.

UNIT III: Metrics for Software Quality: categories of software metrics, metrics program, goal question metric method, types of metrics, commonly used software metrics, process metrics, product metrics, metrics for resources.

UNIT IV: Tools for Quality Improvement: basic quality control tools, check sheet, cause and effect diagram, pareto diagram, histogram, scatter plot, run chart, control chart, orthogonal defect classification.

UNIT V: Software Quality Measurement: Measuring quality, software metrics, problems with metrics, an overall measure of software quality. Developments in Measuring Quality: The work of Gilb, the COQUAMO project.

UNIT VI: The ISO9000 series of quality management standards: The purpose of standards, the ISO9000 series: a generic quality management standard, ISO9000-3: notes for guidance on the application of ISO9001 in software development, the impact of ISO9000 and TickIT. Models and standards for process improvement: The Capability Maturity Model, individual levels of CMM, the role of the CMM, SPICE modeling.

Text Book:

1. ―Software Quality: Theory and Management‖ by Alan C Gillies, CENGAGE Learning, Second edition.

2. ―Software Quality Assurance, Testing and Metrics‖ by Anirban Basu, PHI Publication.

References:

1. Agile and Iterative Development: A Manager's Guide, Craig Larman.

2. Practical Guide to Software Quality Management, John W. Horch.

3. Introduction to the Team Software Process(SM),Watts Humphrey.

4. Software Engineering, R.S. Pressman, McGraw Hill.

Block Chain Architure

COURSE OBJECTIVES

By the end of the course, students will be able to □ Understand how blockchain systems (mainly Bitcoin and Ethereum) work, □ To securely interact with them, □ Design, build, and deploy smart contracts and distributed applications, □ Integrate ideas from blockchain technology into their own projects.

COURSE OUTCOMES 1. Explain design principles of Bitcoin and Ethereum. 2. Explain Nakamoto consensus. 3. Explain the Simplified Payment Verification protocol. 4. List and describe differences between proof-of-work and proof-of-stake consensus. 5. Interact with a blockchain system by sending and reading transactions. 6. Design, build, and deploy a distributed application. 7. Evaluate security, privacy, and efficiency of a given blockchain system.

SYLLABUS

Unit I: Basics: Distributed Database, Two General Problem, Byzantine General problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete. • Cryptography: Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof. Digital Cash

Unit II: Blockchain: Introduction, Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Private and Public blockchain.

Unit III: Distributed Consensus: Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate.

Unit IV: Cryptocurrency: History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin

Unit V: Cryptocurrency Regulation: Stakeholders, Roots of Bit coin, Legal Aspects-Crypto currency Exchange, Black Market and Global Economy. Applications: Internet of Things, Medical Record Management System, Domain Name Service and future of Blockchain.

Text Book 1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).

Reference Books

1. Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies

2. Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System

3. DR. Gavin Wood, ―ETHEREUM: A Secure Decentralized Transaction Ledger,‖Yellow paper.2014.

4. Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli, A survey of attacks on Ethereum smart contracts

Multimedia & Application
UNIT1: Introduction to Multimedia

- Define what is multimedia.
- Discuss the effects of multimedia in your daily life.
- Identify five multimedia components.
- Explain why multimedia is so powerful to encrease human-computer interaction.
- Examine multimedia applications in several areas.

Multimedia Hardware and Software

- Understand analog and digital conversion process
- Discuss the hardware requirement of multimedia system
- Classify multimedia software based on its function

UNIT-IIText and Graphics

- Describe how to use text-related element in multimedia design correctly.
- Compare and contrast between bitmap and vector graphic.
- Examine how to find graphics and about editing software.

UNITIII:Audio, Video and Animation

- Discuss about audio digitization, audio file format and audio software.
- Explain about digital video standards, formats and technology.

- Examine basic principles behind animation and techniques

Multimedia Project Development

- Discuss 4 main steps in multimedia project development.
- Discuss 7 Processes of Making Multimedia.
- Create a storyboard for the animation project.

UNIT-IV: Multimedia Authoring and Scripting

- Understand about multimedia authoring, paradigm and tools
- Discuss about multimedia scripting and programming

Web-based Multimedia Applications

- Describe about the characteristics of web-based system
- Examine the examples of web-based multimedia applications.
- Discuss online issues such as copyrights and cybercrime.

UnitV: Multimedia Communications and Compressions

- Describe the development in multimedia communication.
- List out five basic type of communication networks.
- Examine technological advancement and challenges in communication.
- Discuss why do we need compression.
- Differentiate between lossy and lossless compression.
- Explain several image and video compression techniques.

Emerging Multimedia Research

- Identify how multimedia research has contributed to our lives.

Multimedia Future

- Identify the future multimedia computing technologies.
- Discuss how we will interact with the future computers.

Natural Language Processing

Course Objectives:
1. To familiarize the concepts and techniques of Natural language Processing for analyzing words based on Morphology and CORPUS.
2. Torelate mathematical foundations, Probability theory with Linguistic essentials such as syntactic and semantic analysis of text.
3. To apply the Statistical learning methodsand cutting-edge research models from deep learning.

Course Outcome:.
 1. Apply the principles and Process of Human Languages such as English and other Indian Languages using computers.
2. Realize semantics and pragmatics of English language for text processing
3. Create CORPUS linguistics based on digestive approach (Text Corpus method)
4. Check a current methods for statistical approaches to machine translation.
5. Perform POS tagging for a given natural language and Select a suitable language modelling technique based on the structure of the language.
6. Demonstrate the state-of-the-art algorithms and techniques for text-based processing of natural language with respect to morphology.
7. Develop a Statistical Methods for Real World Applications and explore deep learning based NLP.

UNIT:1 Introduction to NLP 4hours Introduction to NLP - Various stages of NLP –The Ambiguity of Language: Why NLP Is DifficultParts of Speech: Nouns and Pronouns, Words: Determiners and adjectives, verbs, Phrase Structure. Statistics Essential Information Theory : Entropy, perplexity, The relation to language, Cross entropy

UNIT:2 Text Preprocessing and Morphology 6 hours Character Encoding, Word Segmentation, Sentence Segmentation, Introduction to Corpora, Corpora Analysis. Inflectional and Derivation Morphology, Morphological analysis and generation using Finite State Automata and Finite State transducer. Module:3 Language Modelling 6 hours Words: Collocations- Frequency-Mean and Variance –Hypothesis testing:The t test, Hypothesis testing of differences, Pearson's chi-square test, Likelihood ratios. Statistical Inference: n -gram Models over Sparse Data: Bins: Forming Equivalence Classes- N gram model - Statistical Estimators- Combining Estimators

UNIT:4 Word Sense Disambiguation 6hours Methodological Preliminaries, Supervised Disambiguation: Bayesian classification, An informationtheoretic approach, Dictionary-Based Disambiguation: Disambiguation based on sense, Thesaurusbased disambiguation, Disambiguation based on translations in a second-language corpus.

UNIT:5 Markov Model and POS Tagging 7hours Markov Model: Hidden Markov model, Fundamentals, Probability of properties, Parameter estimation, Variants, Multiple input observation. The Information Sources in Tagging: Markov model taggers, Viterbi algorithm, Applying HMMs to POS tagging, Applications of Tagging

Text Book(s) and Journals
1. Christopher D. Manning and Hinrich Schutze, " Foundations of Natural Language Processing" , 6 th

Edition, The MIT Press Cambridge, Massachusetts London, England, 2003

2. Daniel Jurafsky and James H. Martin "Speech and Language Processing", 3rd edition, Prentice Hall, 2009.

Reference Books

1. NitinIndurkhya, Fred J. Damerau "Handbook of Natural Language Processing", Second Edition, CRC Press, 2010.

2. James Allen "Natural Language Understanding", Pearson Publication 8th Edition. 2012.

3. Chris Manning and HinrichSchütze, "Foundations of Statistical Natural Language Processing", 2nd edition, MITPress Cambridge, MA, 2003.

4. Hobson lane, Cole Howard, Hannes Hapke, "Natural language processing in action" MANNING Publications, 2019.

5. Alexander Clark, Chris Fox, Shalom Lappin, "The Handbook of Computational Linguistics and Natural Language Processing", Wiley-Blackwell, 2012

6. Rajesh Arumugam, Rajalingappa Shanmugamani "Hands-on natural language processing with python: A practical guide to applying deep learning architectures to your NLP application". PACKT publisher, 2018.

MCA Semester –IV
CAP -011 Network Security Lab

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Course Objective:

The main objectives of this course are to explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, public key algorithms, design issues and working principles of various authentication protocols and various secure communication standards including Kerberos, IPsec, and SSL/TLS.

Course Outcomes(COs): At the end of the course, student will be able to

- Explain different security threats and countermeasures and foundation course of cryptography mathematics.
- Classify the basic principles of symmetric key algorithms and operations of some symmetric key algorithms and asymmetric key cryptography
- Revise the basic principles of Public key algorithms and Working operations of some
- Asymmetric key algorithms such as RSA, ECC and some more
- Design applications of hash algorithms, digital signatures and key management techniques
- Determine the knowledge of Application layer, Transport layer and Network layer security Protocols such as PGP, S/MIME, SSL,TSL, and IPsec .

List of Practicals :

1. Implementation of DES and IDEA Algorithms
2. Implementation of AES and Asymmetric RSA algorithm.
3. Implementation of Key Exchange using Diffie-Hellman Approach and Elliptic Curves.
4. Implementation of the hash code using SHA-1 and hash code using MD5.
5. Authentication using Digital Signature Algorithm - Configure a mail agent to support Digital Certificates, send a mail and verify the correctness of this system using the configured parameters.
6. Simulation of ECC
7. Simulation of DSA using RSA and ECC
8. Simulation of Blind Signature
9. Simulation of E-Voting
10. Simulation of Smartcard
11. Implementation of new protocols in NS2

CAP – 012 Open Elective – II Lab

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Digital Marketing lab(CAP012) P2 C1
List of Experiments:
1. Digital Marketing Implementation in Business Scenario
2. Create the Digital Marketing Webpage
3. Conducting the Search Engine Optimization and Search Engine Marketing
4. Using Google Analytics to analyze website performance
5. Creating Promotional banner through Canva
6. Facebook Promotion using banners
7. Creating YouTube Channel for Marketing
8. Twitter Marketing
9. Instagram Marketing
10. Email Marketing
11. Digital Marketing Final Analysis and Repo

MCA Semester –IV

CAP 013 – Major Project

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The objective of Major Project is to conduct **:**

- **Integration and testing**: Brings all the pieces together into a special testing environment, then checks for errors, bugs and interoperability.

- **Acceptance, installation, deployment**: The final stage of initial development, where the software is put into production and runs actual business.