Scheme of Instruction & Examination
B. E. - Computer Science and Engineering

CSE Semester - V

S. No.	Course Code	Course Title	L	T	P/D	Contact Hours/ week	CIE	SEE	Credits
			Scheme of Instruction				**Scheme of Examination**		
		Theory Courses							
1	3PC507CS	Artificial Intelligence	3	1	0	4	40	60	4
2	3ES501CS	Digital Image Processing	3	0	0	3	40	60	3
3	3PC508CS	Software Engineering	3	0	0	3	40	60	3
4	3PE5 (01 TO 05)CS	Professional Elective – I	3	0	0	3	40	60	3
5	OE	Open Elective – I	3	0	0	3	40	60	3
6	3MC503HS	Indian Constitution	3	0	0	3	40	60	0
		Practical / Laboratory Courses							
7	3PC559CS	Artificial Intelligence Lab	0	0	2	2	40	60	1
8	3ES551EC	Digital Image Processing Lab	0	0	2	2	40	60	1
9	3PW560CS	Skill Development Course– III	0	0	2	2	40	60	1
10	3HS553HS	Soft Skills Lab - I	0	0	2	2	40	60	1
		Total Credits				27	400	600	20

Professional Elective – I

1	3PE501CS	Information Security
2	3PE502CS	Information Retrieval Systems
3	3PE503CS	Agile Methodologies
4	3PE504CS	Principles of Programming Languages
5	3PE505CS	DevOps

Open Elective - I

3OE50XXX	Open Elective - I	Offered by
1	Disaster Mitigation	CIVIL
2	Oops using JAVA	CSE
3	Artificial Intelligence	AI&DS
4	Renewable Energy Systems	EEE
5	Basics of Electronic Communication	ECE
6	Energy Science and Engineering	MECH

Course Code	Course Title						Core/Elective
3PC507CS	ARTIFICIAL INTELLIGENCE						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
ATD	3	1	-	-	40	60	4

COURSE OBJECTIVES:

The objective of this course is to make the student to

1. Understand the importance of the field of AI by discussing its history and various.
2. Learn about one of the basic applications of A.I, search state formulations.
3. Learn methods of expressing knowledge by a machine with appropriate reasoning and different mathematics involved behind it.
4. Learn how to reason when an agent has only uncertain in formation about its task.
5. Know various supervised and unsupervised learning algorithms.

COURSE OUTCOMES :

After the completion of course the students will be able to:

1. Formalize a problem in the language/framework of different AI methods.
2. Illustrate basic principles of AI insolutions that require problem solving, search, Inference
3. Represent natural language/English using Predicate Logic to buildknowledge through various representation mechanisms.
4. Demonst rate understanding of steps involved in building of intelligent agents, expert systems, Bayesian networks.
5. Differentiate between learning paradigms to be applied for an application.

UNIT - I

Problem Solving & Search : Introduction-introduction to intelligence Foundations of artificial intelligence (AI). History of AI, Structure of Agents.

Problem Solving - Formulating problems, problemtypes, states and operators, statespace.

Search Strategies - Informed Search Strategies - Best first search, A* algorithm, heuristic functions, Iterative deepening A*.

Adversarial Search/Game playing - Perfect decision game, imperfect decision game, evaluation function, alpha - beta pruning.

UNIT - II

Knowledge, Reasoning & Planning : Reasoning - Knowledgebasedagent, Propositional Logic, Inference, Predicate logic (firstorder logic), Resolution.

Structured Knowledge Representation - Frames, Semantic Nets.

Planning - A Simple Planning Agent, Form Problem Solving to Planning, Basic representation of plans, partial order planning, hierarchical planning.

UNIT - III

Expert Systems, Reasoning with Uncertainty : Expert System and Applications: Introduction, Phases in Building Expert Systems, Expert System Architecture, Applications. **Uncertainty -** Basicprobability, Bayes rule, Belief networks, Inference in Bayesian

Networks, Fuzzy sets, and fuzzylogic : Fuzzylogic system architecture, membership function.

Decision Making - Utilitytheory, utilityfunctions.

UNIT - IV

Learning : Machine-Learning Paradigms: Introduction, Machine Learning Systems, Supervised and Unsupervised Learning, Inductive Learning, Learning Decision Trees **Artificial Neural Networks :** Introduction, Artificial Neural Networks, Single - Layer Feed-Forward Networks, Multi-Layer Feed-Forward Networks.

Reinforcement learning : Learning from rewards, Passive and Active reinforcement learning, Applications.

UNIT - V

Communicating & Perceiving : Introduction to NLP - Progress & applications of NLP, Components of NLP, Grammars, Parsing.

Automatic Speech Recognition (ASR) - Speech Processing, Ex : DRAGON, HARPY, Machine Vision - Applications, Basic Principles of Vision, Machine vision techniques: Low, Middleand High-level vision.

AI Today & Tomorrow - Achievements, ubiquitous AI.

TEXT BOOKS

1. Artificial Intelligence - A Modern Approach, Stuart Russell and Peter Norvig., III Edition, Pearson Education Press, 2009.

2. Artificial Intelligence, Kevin Knight, Elaine Rich, B. Nair, III Edition, McGraw Hill, 2008.

REFERENCE BOOKS

1. TheQuest forArtificial Intelligence,Nils J.Nilsson, Cambridge UniversityPress, 2009

2. Artificial Intelligence, Patrick Henny Winston, III Edition., Pearson Education

3. Introduction to Artificial Intelligence and Expert Systems, Dan W Patterson, Pearson.

Course Code	Course Title						Core/Elective
3ES501CS	DIGITAL IMAGE PROCESSING						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
ATD	3	-	-	-	40	60	3

COURSE OBJECTIVES :

The objective of this course is to make the student to

1. To provide an approach towards image processing and introduction about 2D transforms.
2. To expertise about enhancement methods in time and frequency domain.
3. To expertise about segmentation and compression techniques.
4. To understand the Morphological operations onan image.

COURSE OUTCOMES :

After the completion of course the students will be able to:

1. Explore the fundamental relations between.
2. pixels and utility of 2-D transforms in image.
3. processer.
4. Implement the various Morphological operations on an image.
5. Describe different techniques employed for the enhancement of images.
6. Understand different causes for image degradation and overview of image restoration techniques.
7. Understand the need for image compression and to learn the spatial and frequency domain techniques of image compression.

UNIT - I

Digital Image Fundamentals & Image Transforms : Digital Image Fundamentals, Sampling and Quantization, Relationship between Pixels.

Image Transforms : 2-D FFT, Properties, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Haar Transform, Slant Transform, Hotelling Transform.

UNIT - II

Image Enhancement (Spatial Domain): Introduction, Image Enhancement in Spatial Domain, Enhancement through Point Processing, Types of Point Processing, Histogram Manipulation, Linear and Non - Linear Gray Level Transformation, Local or Neighborhood criterion, Median Filter, Spatial Domain High-Pass Filtering.

Image Enhancement (Frequency Domain): Filtering in Frequency Domain, Low Pass (Smoothing) and High Pass (Sharpening) Filters in Frequency Domain.

UNIT - III

Image Restoration : Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

UNIT - IV

Image Segmentation : Detection of Discontinuities, Edge Linking And Boundary Detection, thresholding, Region Oriented Segmentation.

Morphological Image Processing : Dilation and Erosion: Dilation, Structuring Element Decomposition, Erosion, Combining Dilation and Erosion, Opening and Closing, Hit or Miss Transformation.

UNIT - V

Image Compression : Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Huffman and Arithmetic Coding, Error Free Compression, Lossy Compression, Lossy and Lossless Predictive Coding, Transform Based Compression, JPEG 2000 Standards.

TEXTBOOKS

1. Digital Image Processing - Rafael C. Gonzalez, Richard E. Woods, III Edition, Pearson, 2008.

2. Digital Image Processing- S Jayaraman, S Esakkirajan, T Veerakumar- TMH, 2010, II Edition.

3. Fundamentals of Digital Image Processing: A. K. Jain, PHI.

REFERENCE BOOKS

1. Digital Image Processing and Analysis-Human and Computer Vision Application with using CVIP Tools - ScotteUmbaugh, II Edition, CRC Press, 2011.

2. Digital Image Processing using MATLAB – Rafael C. Gonzalez, Richard E Woods and Steven L. Eddings, II Edition, TMH, 2010.

3. Digital Image Processing and Computer Vision – Somka, Hlavac, Boyle-Cengage Learning (Indian edition) 2008.

4. Introductory Computer Vision Imaging Techniques and Solutions- Adrian low, II Edition, BS Publication, 2008.

Course Code	Course Title						Core/Elective
3PC508CS	SOFTWARE ENGINEERING						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
ATD	3	-	-	-	40	60	3

COURSE OBJECTIVES :

The objective of this course is to make the student to

1. Describe and compare various software development methods and understand the context in which each approach might be applicable.
2. To impart knowledge on various phases, methodologies and practices of software development.
3. To apply the project management and analysis principles to software project development.
4. To understand the importance of testing in software development, study various testing strategies along with its relationship with software quality and metric
5. Toapplythedesign&testingprinciplestosoftwareprojectdevelopment.

COURSE OUTCOMES :

After the completion of course the students will be able to:

1. Acquired working knowledge of alternative approaches and techniques for each phase of SDLC.
2. Judge an appropriate process model(s) for software project attributes and analyze requirements for project development.
3. Acquire skills necessary as an independent or as part of a team for architecting a complete software project by identifying solutions for recurring problems exerting
4. Concede product quality through testing techniques employing appropriate metrics by understanding the practical challenges associated with the development of a significant software system
5. Apply the software engineering principles in real time project development.

UNIT - I

Introduction to Software : What is software? Types of software, Characteristics of Software Attributes of good software.

Software Engineering: What is software engineering, Software engineering costs? What are the key challenges facing software engineering, Systems engineering & software Engineering, SDLC.

Software Development Process Models : Prescriptive Models, Waterfall Model, Incremental Process Models, Evolutionary Process Models, Specialized Process Models, The Unified Models, Personal and Team Process Models, Process Technology, Product and Process.

UNIT - II

Software Engineering Principles : SE Principles, Communication Principles, Planning Principles, Modelling Principles, Construction Principles, Deployment.

Software Requirement Analysis and Specification : System and software requirements, Types of software requirements, Elicitation and analysis of requirements, Requirement validation, Requirement specification, Feasibility.

UNIT - III

Building the Analysis Model : Data Modeling Concepts, Object-Oriented Analysis, Scenario-based Modeling, Flow-oriented Modeling, Class-based Modeling.

Design Engineering : Design Process and Quality, Design Concepts, the Design Model,

Performing User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Design Evaluation.

UNIT - IV

Creatingan Architectural Design: Software Architecture, Data Design, Architectural Styles and Patterns, Architectural Design.

Coding : Programming languages and development tools, Selecting languages and tools Good programming practices, Coding Standards.

UNIT - V

SoftwareTestingandQualityAssurance: Verification and validation Techniques of testing Black-box and White-box testing Inspections Levels of testing Unit testing, Integration Testing, Interface testing, System testing, Alpha and beta testing, Regression testing Design of test cases, Quality management activities: Product and process quality Standards, ISO900, Capability Maturity Model (CMM), Risk management

Debugging : Debugging Techniques, The Art of Debugging.

Current trends in Software Engineering Software Engineering for projects and products.

TEXTBOOKS

1. Software Engineering : A Practitioner's Approach, Roger S. Pressman, VII Edition, McGraw Hill, 2009

2. Software Engineering. Ian Sommerville, VII edition, Addison - Wesley.

3. Fundamentals of Software Engineering Rajib Mall, V Edition, PHI.

REFERENCE BOOKS

1. Software Engineering Fundamentals, Ali Behforooz and Frederick J. Hudson, Oxford University Press, 1996.

2. An Integrated Approach to Software Engineering, Pankaj Jalote, III Edition, Narosa Publishing House, 2000.

3. Software Engineering, an Engineering approach- James F. Peters, WitoldPedrycz,VIII Edition, John Wiley.

Course Code	Course Title						Core/Elective
3PE501CS	INFORMATION SECURITY						Elective
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
ATD	3	-	-	-	40	60	3

COURSE OBJECTIVES:

The objective of this course is to make the student to

1. Explain the importance and application of each of confidentiality, integrity, Authentication and availability.

2. Understand the various cryptographic algorithms.

3. Understand the basic categories of threats to computers and networks

4. Describe the enhancements made to IPv4 by IPSec.

5. Discuss Web security and Firewalls

COURSE OUTCOMES :

After the completion of course the students will be able to:

1. Understand basic cryptographic algorithms, message and web authentication and security issues.

2. Identify information system requirements for both of them such as client and server

3. Understand the current legal issues towards information

4. Distinguish and explain different protocol like SSL, TLS and their applications

5. Comprehend and explain security services and mechanisms

UNIT - I

Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security. Classical Encryption Techniques, DES, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of operation, Blowfish, Placement of Encryption Function, Traffic Confidentiality, key Distribution, Random Number Generation.

UNIT - II

Public key Cryptography Principles, RSA algorithm, Key Management, Diffie-Hellman Key Exchange, Elliptic Curve Cryptography. Message authentication and Hash Functions, Authentication Requirements and Functions, Message Authentication, Hash Functions and MACs Hash and MAC Algorithms SHA-512, HMAC.

UNIT - III

Digital Signatures, Authentication Protocols, Digital signature Standard, Authentication Applications, Kerberos, X.509 Directory Authentication Service. Email Security: Pretty Good Privacy (PGP) and S/MIME.

UNIT - IV

IP Security: Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management. Web Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET).

UNIT - V

Intruders, Viruses and Worms Intruders, Viruses and related threats Firewalls: Firewall Design Principles, Trusted Systems, Intrusion Detection Systems.

TEXTBOOKS

1   "Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Edu

2   Cryptography and Network Security: AtulKahate, Mc Graw Hill, 3rd Edition

REFERENCE BOOKS

1   Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, I Edition.

2   Cryptography and Network Security: ForouzanMukhopadhyay, Mc Graw Hill, III Edition.

3   Information Security, Principles, and Practice: Mark Stamp, Wiley India.

4   Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH.

Course Code	Course Title						Core/Elective
3PE502CS	INFORMATION RETRIEVAL SYSTEMS						Elective
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
ATD	3	-	-	-	40	60	3

COURSE OBJECTIVES :

The objective of this course is to make the student to

1. To learn the different models for information storage and retrieval.

2. To learn about the various retrieval utilities.

3. To understand indexing and querying in information retrieval systems.

4. To expose the students to the notions of structured and semi structured data

5. To learn about web search.

COURSE OUTCOMES :

After the completion of course the students will be able to:

1. Understands to store and retrieve textual documents using appropriate models

2. Uses the various retrieval utilities for improving search.

3. Understands the indexing and compressing documents to improve space and time efficiency.

4. Formulates SQL like queries for unstructured data.

5. Understands issues in web search.

UNIT - I

Introduction, Retrieval Strategies: Vector space model, Probabilistic retrieval strategies: Simple term weights, Non binary independence model, Language Models.

UNIT - II

Retrieval Utilities: Relevance feedback, Clustering, N-grams, Regression analysis, Thesauri.

UNIT-III

Retrieval Utilities : Semantic networks, Parsing

Cross-Language Information Retrieval: Introduction, Crossing the language barrier.

UNIT - IV

Efficiency: Inverted index, Query processing, Signature files, Duplicate document detection.

UNIT - V

Integrating Structured Data and Text: A Historical progression, Information retrieval as a relational application, Semi-structured search using a relational schema.

Distributed Information Retrieval: A Theoretical model of distributed retrieval, Web search.

TEXT BOOKS

1. Information Retrieval – Algorithms and Heuristics, Springer, David A. Grossman, Ophir Frieder, II Edition (Distributed by Universities Press).

2. Information Storage and Retrieval Systems, Gerald J Kowalski, Mark T Maybury, II Edition, Springer, 2000.

REFERENCE BOOKS

1. Mining the Web: Discovering Knowledge from Hypertext Data, SoumenChakrabarti, Morgan-Kaufmann Publishers, 2002

2. An Introduction to Information Retrieval, Christopher D. Manning, PrabhakarRaghavan, HinrichSchütze, Cambridge University Press, Cambridge, England, 2009.

3. Modern Information Retrieval By Yates and Neto ,IV Edition, Pearson Education.

Course Code	Course Title						Core/Elective
3PE503CS	AGILE METHODOLOGIES						Elective
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
ATD	3	-	-	-	40	60	3

COURSE OBJECTIVES :

The objective of this course is to make the student to

1. To introduce good practices for requirements engineering.
2. To understand requirements elicitation and elicitation techniques.
3. To learn the usage of analysis models and software quality attributes.
4. To acquire knowledge on software estimation, size estimation, effort, schedule and cost estimation.

COURSE OUTCOMES :

After the completion of course the students will be able to:

1. Gain knowledge about software requirements, requirements management, their principles and practices.
2. Analyze requirement elicitation techniques and prototyping.
3. Analyze use-case modelling and different data diagrams.
4. Estimate software in terms of size, cost, effort and schedule.

UNIT - I

Software Requirements: What and Why: Essential Software requirement, Good practices for requirements engineering, Improving requirements processes, Software requirements and risk management.

Software Requirements Engineering: Requirements elicitation, requirements analysis documentation, review, elicitation techniques, analysis models, Software quality attributes, risk reduction through prototyping, setting requirements priorities, verifying requirements quality.

UNIT - II

Software Requirements Management: Requirements management Principles and practices, Requirements attributes, Change Management Process, Requirements Traceability Matrix, Links in requirements chain.

Software Requirements Modeling: Use Case Modeling, Analysis Models, Dataflow diagram, state transition diagram, class diagrams, Object analysis, Problem Frames.

UNIT - III

Software Estimation: Components of Software Estimations, Estimationmethods, Problems associated with estimation, Key project factors thatinfluenceestimation.

Size Estimation: Two views of sizing, Function Point Analysis, Mark IIFPA, Full Function Points, LOC Estimation, Conversion between sizemeasures.

UNIT - IV

Effort, Schedule and Cost Estimation: What is Productivity? Estimation Factors, Approaches to Effort and Schedule Estimation, COCOMO II, Putnam Estimation Model, Algorithmic models, Cost Estimation.

UNIT - V

Tools for Requirements Management and Estimation

Requirements Management Tools : Benefits of using a requirements management tool, commercial requirements management tool, Rational Requisite pro, Caliber – RM, implementing requirements management automation.

Software Estimation Tools: Desirable features in software estimation tools, IFPUG, USC's COCOMO II, SLIM (Software Life Cycle Management) Tools.

TEXT BOOKS
1. Software Requirements and Estimation, Swapna Kishore, Rajesh Naik, I Edition,Tata Mc Graw Hill, 2001.
2. Software Requirements, KarlE.Weigers, II Edition, Microsoft Press,2003

REFERENCE BOOKS
1. Managing Software Requirements, Dean Leffingwell & Don Widrig, Pearson Education, 2003.
2. Mastering the requirements process, II Edition, Suzanne Robertson & James Robertson, Pearson Education, 2006.
3. Estimating Software Costs, II Edition, Capers Jones, TMH, 2007.
4. Practical Software Estimation, M.A. Parthasarathy, Pearson Education, 2007.

Course Code	Course Title						Core/Elective
3PE504CS	PRINCIPLES OF PROGRAMMING LANGUAGES						Elective
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
ATD	3	-	-	-	40	60	3

COURSE OBJECTIVES :

The objective of this course is to make the student to

1. To understand the fundamental concepts of principles of language design, formal syntax and semantic, BNF.
2. To understand different data types, variables, expressions, types of statements, different types of control statements and iterations.
3. To understand the concept of Sub programs and blocks, operator overloading, and coroutines.
4. To understand the concept of Abstract data types, concurrency, exception handling of different programming languages and logic programming languages
5. To understand Functional Programming Languages like FPL, LISP, ML languages.

COURSE OUTCOMES :

After the completion of course the students will be able to:

1. Ability to express syntax and semantics in formal notation.
2. Ability to apply suitable programming paradigm for the application.
3. Gain Knowledge and comparison of the features programming languages
4. Program in different language paradigms and evaluate their relative benefits.
5. Identify and describe semantic issues associated with variable binding, scoping rules, parameter passing, and exception handling.

UNIT - I

Preliminary Concepts: Reasons for studying, concepts of programming languages, Programming domains, Language Evaluation Criteria, influences on Language design, Language categories, Programming Paradigms – Imperative, Object Oriented, functional Programming, Logic Programming. Programming Language

Implementation – Compilation and Virtual Machines, programming environments. Syntax and Semantics: general Problem of describing Syntax and Semantics, formal methods of describing syntax- BNF, EBNF for common programming languages features, parse trees, ambiguous grammars, attribute grammars, denotation semantics and axiomatic semantics for common programming language features.

UNIT - II

Data types : Introduction, primitive, character, user defined, array, associative, record, union, pointer and reference types, design and implementation uses related to these types. Names, Variable, concept of binding, type checking, type compatibility, named constants, variable initialization. Expressions and Statements: Arithmetic relational and Boolean expressions, Short circuit evaluation mixed mode assignment, Assignment Statements, Control Structures – Statement Level, Compound Statements, Selection, Iteration, Unconditional Statements, guarded commands.

UNIT - III

Software Estimation: Components of Software Estimations, Estimationmethods, Problems.

Subprograms Blocks and Fundamentals of sub-programs: Scope and lifetime of variable, static and dynamic scope, Design issues of subprograms, local referencing environments, parameter passing methods, overloaded sub-programs, generic sub-programs, parameters that are subprogram names, design issues for functions user defined overloaded operators, co routines.

UNIT - IV

Abstract Data Types: Abstractions and Encapsulation, Introduction to Data Abstraction, Design Issues, Object Oriented Programming in C++, Java,Ada 95.

Exception Handling: Exceptions, Exception Propagation, Exception Handler in Ada, C++ and Java.

Logic Programming Language: Introduction and Overview of Logic Programming, Basic Elements of Prolog, Application of Logic Programming.

UNIT - V

Functional Programming Languages: Introduction, fundamentals of FPL, LISP,ML application of Functional Programming Languages and comparison of functional and imperative Languages. Key Concepts, Case Study: Python – Values and Types, Variables, Storage and Control, Bindings and Scope, Procedural Abstraction, Data Abstraction, Separate Compilation, Module Library.

TEXTBOOKS

1. Concepts of Programming Languages Robert.W. Sebesta 8/e, Pearson Education, 2008.

2. Programming Languages Design Concepts, D. A. Watt, Wiley Dreamtech, rp - 2007.

REFERENCE BOOKS

1. Programming languages, 2nd   Edition A. B. Tucker, R E Noonan, TMH.

2. Programming Languages, K C Louden, 2nd   Edition, Thomson, 2003.

3. LISP Patric Henry Winston and Paul Horn Pearson Education.

4. Programming in PROLOG W F Clocksin& C S Mellish, V Edition, Springer

Course Code	Course Title						Core/Elective
3PE505CS	DevOps						Elective
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
ATD	3	-	-	-	40	60	3

COURSE OBJECTIVES :

The objective of this course is to make the student to

1. Describe the agile relationship between development and IT operations.

2. Understand the skill sets and high-functioning teams involved in DevOps and related methods.

3. Implement automated system update and DevOps lifecycle. To understand concepts of Devops maturity and assessment.

COURSE OUTCOMES :

After the completion of course the students will be able to:

1. Identify components of Devops environment.

2. Describe Software development models and architectures of DevOps.

3. Apply different project management, integration, testing and code deployment tool.

4. Investigate different DevOps Software development models.

5. Assess various Devops practices.

UNIT - I

Introduction: Introduction, Agile development model, DevOps, and ITIL. DevOps process and Continuous Delivery, Release management, Scrum, Kanban, delivery pipeline, bottlenecks, examples.

UNIT - II

Software development models and DevOps: DevOps Lifecycle for Business Agility, DevOps, and Continuous Testing. DevOps influence on Architecture: Introducing software architecture, The monolithic scenario, Architecture rules of thumb, The separation of concerns, Handling database migrations, Micro services, and the data tier, DevOps, architecture, and resilience.

UNIT - III

Introduction to project management: The need for source code control, The history of source code management, Roles and code, source code management system and migrations, Shared authentication, Hosted Git servers, Different Git server implementations, Docker intermission, Gerrit, The pull request model, GitLab.

UNIT - IV

Integrating the system : Build systems, Jenkins build server, Managing build dependencies, Jenkins plugins, and file system layout, The host server, Build slaves, Software on the host, Triggers, Job chaining and build pipelines, Build servers and infrastructure as code, Building by dependency order,Build phases, Alternative build servers, Collating quality measures.

UNIT V

Testing Tools and automation: Various types of testing, Automation of testing Pros and cons, Selenium - Introduction, Selenium features, JavaScript testing, Testing backend integration points, Test-driven development, REPL-driven development

Deployment of the system: Deployment systems, Virtualization stacks, code execution at the client,Puppet master and agents, Ansible, Deployment tools: Chef, Salt Stack and Docker.

TEXTBOOKS

1. Practical Devops, Joakim Verona. II Edition. (2018). ISBN- 10: 1788392574.
2. DevOps Tools from Practitioner's Viewpoint, Deepak Gaikwad, Viral Thakkar Wiley publications. ISBN: 9788126579952.

REFERENCE BOOKS

1. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley; ISBN-10.
2. Efffective DevOps, Jennifer Davis &Ryn Daniels, IV Edition, O'Reilly.
3. The DevOps Handbook, Gene Kim, Jez Humble, Patrick Debois, John Willis, First Edition, IT Revoultion Press, LLC.

Course Code	Course Title						Core/Elective
3OE501CS	OOPS USING JAVA						Elective
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
ATD	3	-	-	-	40	60	3

COURSE OBJECTIVES :

The objective of this course is to make the student to

1. The Java programming language: its syntax, idioms, patterns and styles.

2. Object oriented concepts in Java and apply for solving the problems.

3. How exception handling and multithreading makes Java robust.

4. Explore java Standard API library such as io, util, applet, awt.

5. Building of applications using Applets and Swings.

COURSE OUTCOMES :

After the completion of course the students will be able to:

1. Understand the concept of OOP and analyze relationships among classes, objects.

2. Develop programs using concepts like inheritance, packages, interfaces, Java I/O streams and strings.

3. Utilize exception handling and Multithreading concepts to develop Java programs.

4. Interpret the Java Collection API, Java utility classes, concept of files and serialization.

5. Design GUI applications using concepts like AWT controls and Swings and client server programs using networking concepts.

UNIT - I

Object Oriented Programming: Principles, Benefits of Object Oriented Programming.

Introduction to Java: Java buzzwords, bytecode. Java Programming Fundamentals: Applet and Application program using simple java program, data types, variables, arrays, operators, expressions, control statements, type conversion and casting, concepts of classes, objects, constructors, methods, access control, this keyword,

garbage collection, overloading methods and constructors, introducing access control, static, final, nested and inner classes, exploring string class, using command-linear arguments.

Inheritance: Inheritance concept, types of inheritance, Member access rules, use of super and final.

Polymorphism - dynamic binding, method overriding, abstract classes and methods.

UNIT-II

Interfaces: Defining an interface, implementing interfaces, extending interface.

Packages: Defining, Creating and Accessing a Package, importing packages

Exception handling: Benefits of exception handling, classification, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, rethrowing exceptions, built in exceptions, creating own exception sub classes

Multithreading: Java Thread Model, The Main Thread, creating a Thread, creating multiple threads, using is Alive() and join(), thread priorities, synchronization, inter thread communication, deadlock.

UNIT-III

Collections: Overview of Java Collection frame work, commonly used Collection classes - Array List, Linked List, Hash Set, Tree Set, Collection Interfaces - Collection, List, Set. Accessing Collection via iterator, working with Map. Legacy classes and interfaces – Vector, Hashtable, Stack, Dictionary, Enumeration interface.

Other Utility classes: String Tokenizer, Date, Calendar, Gregorian Calendar, Scanner Java Input/Output: exploring java.io, Java I/O classes and interfaces, File, Stream classes, byte stream, character stream, serialization.

UNIT-IV

GUI Programming with java: The AWT class hierarchy, MVC architecture.

Applet Revisited: Basics, architecture and skeleton, simple applet program.

Event Handling: Delegation Event Model, Event Classes, Source of Events, Event Listener Interfaces. Handling mouse and keyboard events, Adapter classes.

Database Programming using JDBC: Introduction to JDBC, JDBC Drivers & Architecture, CURD operation Using JDBC, Connecting to non-conventional Databases.

UNIT - V

Exploring Swing : JLabel, ImageIcon, JTextField, the Swing buttons, JTabbedpane, JScrollPane, JList, JComboBox.

Servlet: Life cycle, using tomcat, simple servlet, servlet API, javax.servlet package, reading servlet parameters, javax.servlet.http package, handling HTTP requests and responses.

TEXTBOOKS

1. Java: The Complete Reference, X Edition, Herbert Schildt, McgrawHill.
2. Java Fundamentals: A Comprehensive Introduction, Herbert Schildt and Dale Skrien, TMH.
3. Java for Programming, P.J.Dietel X Edition, PearsonEducation

REFERENCE BOOKS

1. TheJavaProgramming Language, Ken Arnold, David Holmes, James Gosling, Prakash Goteti, III Edition, Pearson 2008.
2. An Introduction to OOP, T. Budd, IIIEdition, Pearson Education.
3. Introduction to Java Programming, Y. Daniel Liang, X Edition, Pearson Education.

Course Code	Course Title						Core/Elective
3PC559CS	ARTIFICIAL INTELLIGENCE LAB						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
ATD	-	-	-	2	40	60	1

COURSE OBJECTIVES :

The objective of this course is to make the student to

1. To apply programming skills to formulate the solutions for computational problems.
2. To study implementation first order predicate calculus using Prolog.
3. To familiarize with basic implementation of NLP with the help of Python libraries NLTK.
4. To understand python library scikit-learn for building machine learning models
5. To enrich knowledge to select and apply relevant AI tools for the given problem.

COURSE OUTCOMES :

After the completion of course the students will be able to:

1. Design and develop solutions for informed and uninformed search problems in AI.
2. Demonstrate reasoning in first order logic using Prolog.
3. Demonstrate and enrich knowledge to select and applypython libraries to synthesize information and develop supervised learning models
4. Utilize advanced package like NLTK for implementingnatural language processing.
5. Develop a case study in multidisciplinary areasto demonstrate use of AI

List of Programs

1. Write a program for water jug problem.
2. Write program to solve 5-queens problem.
3. Write a program to implement Hangman game using python.
4. Write a program to implement Uninformed search techniques:
   a. BFS
   b. DFS

5. Design and implement solution for 8-puzzle problem using Greedy Best First Search.

6. Find the shortest path between a starting location and destination location in a graph using A* search algorithm.

7. Implement MiniMax algorithm for finding an optimal decision in a tic-tac toe game

8. Study of Prolog, its facts, and rules.

    a. Write simple facts for the statements and querying it.

    b. Write a program for Family-tree.

9. Write a python program to implement the methods of numpy.

10. Write a python program to create the following using pandas.

    a. Create a dataframe from the dictionary

    b. List the top and bottom 10 rows from the dataframe

    c. Display the dimensions

    d. Access the data at index 3

11. Write a program to train and validate the following classifiers for given data (scikit-learn):

    a. Decision Tree

    b. Multi-layer Feed Forward neural network

12. Text processing using NLTK

    a. Remove stop words

    b. Implement stemming

    c. POS (Parts of Speech) tagging

In addition to the above programs, students should be encouraged to study implementations of one of the following

- Game bot (Tic Tac toe, 7 puzzle)

- Expert system (Simple Medical Diagnosis)

- Text classification

- Chat bot

Course Code	Course Title						Core/Elective
3ES551CS	DIGITAL IMAGE PROCESSING LAB						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
ATD	-	-	-	2	40	60	1

COURSE OBJECTIVES :

The objective of this course is to make the student to

1. To introduce the concepts of image processing and basic analytical methods to be used in image processing.
2. To familiarize students with image enhancement and restoration techniques,
3. To explain different image compression techniques.
4. To introduce segmentation and morphological processing techniques

COURSE OUTCOMES :

After the completion of course the students will be able to:

1. Understand how the images are read as grayscale and RGB.
2. Understand how the images are getting converted in different forms.
3. Understand the processing and implement different image filtering techniques
4. Implement Edge detection.
5. Compare the different DFT, DCT and DWT techniques.

List of Programs:

1. OpenCV installation.
2. Reading, Writing and Storing Images.
3. Reading an Image as Grayscale.
4. Reading Image as RGB.
5. Image Conversion - Colored Images to GrayScale.
6. Image Conversion - Colored Image to Binary.
7. Processing – Blur – Averaging, Gaussian.
8. Image Filtering - Bilateral Filter, Box Filter, Erosion.
9. Thresholding – Simple, Adaptive.
10. Sobel Operator.
11. DFT, DCT, DWT.
12. Edge Detection.

Course Code	Course Title						Core/Elective
3PW560CS	SKILL DEVELOPMENT COURSE III						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
ATD	-	-	-	2	40	60	1

COURSE OBJECTIVES :

The objective of this course is to make the student to

1. Able to identify the basic components of an Android app, such as activities, layouts, and views.

2. Be able to use layouts to arrange your user interface elements in a logical and efficient way.

3. Be able to store data in the app's internal storage, or in a cloud-based storage service.

4. Able to add that feature to an existing Android app.

5. Able to deploy that app to the Google Play Store.

COURSE OUTCOMES :

After the completion of course the students will be able to:

1. Understand the basics of Android development, including the Android Studio IDE, the Android SDK, and the AndroidManifest.xml file..

2. Create an app with multiple activities that can communicate with each other using intents..

3. Create a variety of user interface elements, such as buttons, text fields, and checkboxes.

4. Use layouts to arrange their user interface elements in a logical and efficient way.

5. Understand how to store data in Android apps, using both local and remote storage options.

List of Programs :

1. Portable Devices Overview

    1.1. Introduction to SW development for portable devices

    1.2. Overview of Portable Devices

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7.8. Using Telephony

7.9. Introducing SMS and MMS

8. Hardware Support and Devices (AUDIO, VIDEO, AND USING THE CAMERA)

8.1. Using Sensors and the Sensor Manager

8.2. Monitoring a Device's Movement and Orientation

8.3. Introducing the Environmental Sensors

8.4. Playing Audio and Video

8.5. Using Audio Effects

8.6. Using the Camera

8.7. Recording Video

8.8. Adding Media to the Media Store

TEXTBOOKS

1. Professional Android 4 Application Development, by Reto Meier, WROX Press, Wiley Publishing.

REFERENCE BOOKS

1. Android Application Development, Programming with the Google SDK, by, Rick Rogers, John Lombardo, Zigurd Mednieks, Blake Meike, SPD, Oreilly, ISBN10: 81-8404-733-9, ISBN13:978-81-8404-733-2

2. Hello Android, Introducing Google's Mobile Development Platform, 3rd Edition, by Ed Burnette, Pragmatic Programmers, LLC.ISBN-10: 1-934356-56-5, ISBN-13: 978-1-934356-56-2.

Course Code	Course Title						Core/Elective
1OE501AD	ARTIFICIAL INTELLIGENCE						Elective
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
ATD	3	-	-	-	40	60	3

COURSE OBJECTIVES:

The objective of this course is to make the student to

1. To introduce the AI techniques to solveproblems and search strategies to find optimal solution paths from start to goal state.
2. To introduces different knowledge representation methods in AI Programs.
3. To introduce different design techniquesfor Game Playing Programs.
4. To introduce the AI Agents their design,planning and learning techniques.
5. To introduce the natural languageprocessing and expert systems.

COURSE OUTCOMES:

After the completion of course the students will be able to:

1. Understand fundamental AI concepts and identify a range of symbolic and non symbolicAI techniques.
2. Demonstrate an understanding of varioussearching algorithms such as adversarial search and game-playing commonly used inartificial intelligence software.
3. Use different knowledge representationtechniques used in AI Applications.
4. Demonstrate an understanding of agentbased AI architectures, Planning and logic based agents.
5. Exploring Expert systems options.

UNIT-I

Introduction: Artificial Intelligence and its applications, Artificial Intelligence Techniques. **Problem solving techniques:** State space search, control strategies, heuristic search, problem characteristics, production system characteristics., Generate and test, Hill climbing, best first search, A* search, AO* search, Constraint satisfaction problem, Agenda Driven Search, Mean-end analysis, Min- Max Search, Alpha-Beta Pruning, Iterative Deepening.

UNIT - II

Knowledge representation: Mapping between facts and representations, Approaches to knowledge representation, procedural vs declarative knowledge, Forward vs. Backward reasoning, Matching, conflict resolution, Weak and Strong filler structures.

UNIT - III

Non Monotonic and Statistical Reasoning: on monotonic Logic, Default Logic,

Circumscription, Bayes Theorem, Bayesian Network, Dempster Shafer Theory, Fuzzy sets, Fuzzy Logic, Defuzzification.

UNIT - IV

Planning and Learning Agents: Intelligent Agents, Nature and structure of Agents, Learning Agents, Introduction to different Forms of Learning, The Planning problem, planning with state space search, partial order planning, planning graphs, planning with propositional logic, Analysis of planning approaches, Hierarchical planning, conditional planning, Continuous and Multi Agent planning.

UNIT - V

Introduction to Learning and Expert system : Expert systems, Expert system examples, Expert System Architectures, Rule base Expert systems, Non Monotonic Expert Systems, Decision tree base Expert Systems.

TEXT BOOKS

1. AI: A Modern Approach Stuart J. Russel, Peter Norvig Pearson Education Latest Edition, 2012
2. Artificial Intelligence Elaine Rich, Knight McGraw Hill Third Edition2010
3. Artificial Intelligence, Saroj Kaushik Cengage Learning, First Edition2011

REFERENCES

1. Artificial Intelligence, Partick Henry Winston Addison Wesley Latest Edition 2012.
2. Artificial Intelligence George Luger Pearson Education Latest Edition 2010.

Course Code	Course Title						Core/Elective
OE501CE	Disaster Mitigation						Elective
					CIE	SEE	Credits
	L	T	D	P			
ATD	3	-	-	-	40	60	3

COURSE OBJECTIVES :

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

1. Define disaster and explain the different types of disasters.

2. Describe the disaster management cycle and the role of NDMA in disaster management.

3. Analyze the legal aspects of disaster management.

4. Develop disaster mitigation plans.

5. Participate in disaster response and recovery activities.

COURSE OUTCOMES :

After the completion of course the students will be able to:

After completion of the course, the student will be able to.

CO 1. Demonstrate the concepts of disaster management.

CO 2. Identify different types of disasters.

CO 3. Explain the disaster management cycle.

CO 4. Illustrate the role of NDMA in disaster management.

CO 5. Explain the development of disaster mitigation plan.

UNIT - I

Introduction to Disaster Management: Definition of disaster, Types of disasters, History of disaster management in India, National Disaster Management Authority (NDMA) and its role in disaster management, Disaster management cycle. Case studies of disasters in India and the world.

UNIT - II

Disaster Mitigation: Mitigation measures for different types of disasters, Use of technology in disaster mitigation, Disaster risk assessment, Disaster preparedness, Exercises and simulations on disaster mitigation.

UNIT - III

Disaster Response: Search and rescue operations, Medical relief, Food and shelter, Restoration of essential services, Rehabilitation and reconstruction,

UNIT - IV

Disaster Law and Policy: Disaster management acts of India, Disaster management policies of India, Legal aspects of disaster management

UNIT - V

Disaster Communication and Public Awareness: Importance of communication in disaster management,Methods of disaster communication, Public awareness programs, Case studies of disaster communication and public awareness in India and the world.

TEXT BOOKS :

T1. R.Subramanian, Disaster Management, Vikas Publishing House, 2018.T2. M. M. Sulphey, Disaster Management, PHI Learning, 2016.

REFERENCE BOOKS:

R1. S. C. Sharma, Disaster Management: Concepts, Approaches and Techniques, Khanna Book Publishing House, 2017.

R2. G. K. Ghosh, Disaster Management: Theory and Practice, APH Publishing Corporation, 2018.

Course Code	Course Title						Core/Elective
5OE501EC	Basics of Electronic Communication						Elective
Prerequisite	ContactHoursperWeek				CIE	SEE	Credits
	L	T	D	P			
BEE	3	-	-	-	40	60	3

COURSE OBJECTIVES:

1. To provide an introduction to fundamental concepts in the understanding of communications systems.

2. To describe the network model and some of the network layers including physical layer, data link layer, network layer and transport layer.

3. To discuss the evolution of wireless systems and current wireless technologies.

COURSE OUTCOMES:

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

1. Understand the working of analog and digital communication systems.

2. Explain the OSI network model and the working of data transmission.

3. describe the evolution of communication technologies from traditional telephony systems to modern wireless communication systems.

4. Differentiate between analog and digital modulation techniques

5. Understand the optical fibre communication link, structure, propagation and transmission properties.

UNIT-I

Introduction to Communication systems: Electromagnetic Frequency Spectrum, Signal and its representation, Elements of Electronic Communications System, Types of Communication Channels.

Signal Transmission Concepts: Baseband transmission and Broadband transmission, Communication Parameters: Transmitted power, Channel bandwidth and Noise, Need for modulation **Signal Radiation and Propagation:** Principle of electromagnetic radiation, Types of Antennas, Antenna Parameters and Mechanisms of Propagation.

UNIT - II

Analog and Digital Communications: Amplitude modulation and demodulation, FM modulation and demodulation, Digital converters, Digital modulation schemes – ASK,FSK, PSK, QPSK, Digital demodulation.

UNIT - III

Data Communication and Networking: Network Models, OSI Model, Data Link Layer – Media Access control, Ethernet, Network Layer – Internet Protocol (IPv4/IPv6), Transport Layer – TCP, UDP. UNIT-IV

Telecommunication Systems: Telephones, Telephone system, Optical Communications: Optical Principles, Optical Communication Systems, Fiber –Optic Cables, Optical Transmitters & Receivers, Wavelength Division Multiplexing.

UNIT - V

Wireless Communications : Evolution of Wireless Systems: AMPS, GSM, CDMA, WCDMA, OFDM. Current Wireless Technologies: Wireless LAN, Bluetooth, PAN and ZigBee, Infrared wireless, RFID communication, UWB, Wireless mesh networks, Vehicular adhoc networks.

TEXT BOOKS :

1. Louis E. Frenzel, "Principles of Electronic Communication Systems", 3rd edition, McGraw Hill, 2008.

2. George Kennedy, Bernard Davis, "Electronic Communication systems", 4th edition, McGraw Hill, 1999.

REFERENCE BOOKS :

1. Behrouz A. Forouzan, "Data Communications and Networking", 5th edition, TMH, 2012.

2. Rappaport T.S., "Wireless communications", 2nd edition, Pearson Education, 2010.

3. Wayne Tomasi, "Advanced Electronic Communications Systems", 6th edition, PearsonEducation

Course Code	Course Title	Core/Elective				
4OE501EE	RENEWABLE ENERGY SYSTEMS (OPEN ELECTIVE – I)	Elective				
		L	P/DT	Credits	CIE	SEE
		3	0	3	40	60

COURSE OBJECTIVES :

The objectives of this course is to impart knowledge of

1. To understand the concepts and Importance of renewable energy sources such as solar, wind, biomass, tidal power.

2. To make the students understand the advantages and disadvantages of different renewable energy sources.

COURSE OUTCOMES:

At the end of the course students will be able to

1. Explain the advantages, disadvantages and applications of different conventional and non- conventional sources.

2. Acquire the knowledge of various components, principle of operation and present scenario of different conventional and non-conventional sources.

UNIT - I

Review of Conventional and Non-Conventional energy sources - Need for non-conventional energy sources Types of Non- conventional energy sources - Fuel Cells - Principle of operation with special reference to H2 °2Cell - Classification and Blockdiagram of fuel cell systems - Ion exchange membrane cell - Molten carbonate cells - Solid oxide electrolyte cells - Regenerative system- Regenerative Fuel Cell - Advantages and disadvantages of Fuel Cells - Polarization - Conversion efficiency and Applications of Fuel Cells.

UNIT - II

Solar energy - Solar radiation and its measurements - Solar Energy collectors -Solar Energy storage systems - Solar Pond - Application of Solar Pond - Applications of solar energy, V-I and P-V curves and the concept of MPPT.

UNIT - III

Wind energy- Principles of wind energy conversion systems - Nature of wind - Power in the Wind-Basic components of WECS - Classification of WECS - Site

selection considerations - Advantages and disadvantages of WECS - Wind energy collectors - Wind electric generating and control systems - Applications of Wind energy - Environmental aspects.

UNIT - IV

Energy from the Oceans - Ocean Thermal Electric Conversion (OTEC) methods - Principles of tidal power generation - Advantages and limitations of tidal power generation -Ocean waves - Wave energy conversion devices -Advantages and disadvantages of wave energy - Geo-thermal Energy - Types of Geo-thermal Energy Systems - Applications of Geo-thermal Energy.

UNIT - V

Energy from Biomass - Biomass conversion technologies / processes - Photosynthesis - Photosynthetic efficiency - Biogas generation - Selection of site for Biogas plant - Classification of Biogas plants - Details of commonly used Biogas plants in India - Advantages and disadvantages of Biogas generation -Thermal gasification of biomass -Biomass gasifiers.

TEXT BOOKS :

1. Rai G.D, Non-Conventional Sources of Energy, Khandala Publishers, New Delhi, 2011.
2. David M Buchla and Thomas E Kissell , Renewable Energy Systems, 1st Edition by, Pearson India.

REFERENCES/SUGGESTEDREADING:

1. M.M.El-Wakil, Power Plant Technology, McGraw Hill, 1984.
2. John Twidell, Tony Weir, Renewable Energy R73esources, 3rd Edition, Taylor and Francis.

Course Code	Course Title						Core/Elective
6OE501ME	START-UP ENTREPRENEUR SHIP						Elective
Prerequisite	Contact Hoursper Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	40	60	3

COURSE OBJECTIVES :

Students should be able to understand

1. To motivate students to take up entrepreneurship in future.

2. To learn nuances of starting an enterprise & project management.

3. To understand project formulation and choice Technology in Enterprise.

4. To understand Intellectual properties, patents, Start-ups.

COURSE OUTCOMES :

After the completion of course the students will be able to:

1. Understand Entrepreneurship and Economic growth, Small and Large ScaleIndustries, Types and forms of enterprises.

2. Identify the characteristics of entrepreneurs, Emergence of first generation entrepreneurs, Conception and evaluation of ideas and their sources.

3. Practice the principles of project formulation, Analysis of market demand, Financialand profitability analysis and Technical analysis.

4. Understand the concept of Intellectual Property Rights and Patents

5. Comprehend the aspects of Start-Ups.

UNIT -1

Entrepreneurship : Definition, functions of Entrepreneurship, Characteristics and qualities ofentrepreneurs, Entrepreneur vs. intrapreneur, need of innovation, Economic growth. Small Scale Industry in India, Linkage among small, medium and heavy industries.

UNIT – II

Indian Industrial Environment: Competence, Opportunities and Challenges, Emergence of First generation entrepreneurs, women entrepreneurs. Conception and evaluation of ideas and their sources. Types of enterprises. Collaborative interaction for Technology development. Corporate Social Responsibility.

Unit - III

Project formulation: Introduction, Elements of Business Plan and its salient features, Analysis of market demand, Financial and profitability analysis and Technical analysis.

UNIT - IV

Intellectual Property Rights: Meaning, Nature, Classification and protection of Intellectual Property, the main forms of Intellectual Property, Concept of Patent, Patent document, Invention protection, Granting of patent, Rights of a patent, Licensing, Transfer of technology.

UNIT - V

Aspects of Start-Up: What is Start-Up, Start-up Policy, start-up strategy, Progress of startups in India, Principles of future organizations, start-up sectors and action plan for start-ups by Govt. of India.

TEXT BOOKS:

1. Vasant Desai, "Dynamics of Entrepreneurial Development and Management", HimalayaPublishing House,

2. Prasanna Chandra, "Project-Planning, Analysis, Selection, Implementation and Review",Tata McGraw-Hill Publishing Company Ltd.

3. Ajit Parulekar and Sarita D'Souza, Indian Patents Law – Legal & Business Implications,MacmillanIndia Ltd.

REFERENCE BOOKS:

1. Stephen R. Covey and A. Roger Merrill, "First Things First", Simon and SchusterPublication.

2. G.S. Sudha, "Organizational Behaviour".

3. Robert D.Hisrich, Michael P. Peters, "Entrepreneurship", Tata Me Graw Hill PublishingCompany Ltd., 5lh Ed.

4. G.B. Reddy, Intellectual Property Rights and the Law 5th Ed. Gogia Law Agency.

VI SEMESTER