ACADEMIC REGULATIONS,

COURSE STRUCTURE

AND

DETAILED SYLLABI

A20 Regulation

FOR

B. Tech. CSE- Artificial Intelligence and Machine Learning III to IV Year

(Applicable for the Batches admitted in the year 2021-2022)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

SREENIDHI INSTITUTE OF SCIENCE AND TECHNOLOGY

(An Autonomous Institution approved by UGC and affiliated to JNTUH)

Yamnampet, Ghatkesar, Hyderabad - 501 301

March 2023

B. Tech. CSE- Artificial Intelligence and Machine Learning

Course Structure Regulation A20

I Year I Semester

Sl.No.	Dept. Course	Course Code	Course	L	T	P	C	Max. Marks	
								CIE	SEE
1	S&H	8HC07	Engineering Physics	3	1	0	4	30	70
2	IT	8FC01	Problem Solving using C	3	0	0	3	30	70
3	S&H	8HC10	Linear Algebra and Calculus	2	1	0	3	30	70
4	ME	8BC01	Workshop/Manufacturing Processes	1	0	0	1	30	70
5	S&H	8HC02	Written Communication Skills	1	0	0	1	30	70
6	S&H	8HC08	Basic Mathematics, Analysis and Reasoning	2	1	0	3	30	70
7	S&H	8HC66	Engineering Physics Lab	0	0	2	1	30	70
8	IT	8FC61	Problem Solving using C Lab	0	0	2	1	30	70
9	ME	8BC61	Workshop/Manufacturing Processes Lab	0	0	2	1	30	70
10	S&H	8HC62	Written Communication Skills Lab	0	0	2	1	30	70
11	CSE	8L176	Comprehensive Test and Viva –Voce – I(2 Mids (Viva) and End Semester(Test and Viva) = 30+70)	1	0	0	1	30	70
12	CSE	8L184	Technical Seminar – I	0	0	2	1	100	--
13	S&H	8HC18	Orientation Course*	1	0	0	0	Marks and Grade will be given at the end of I year II Semester	
			Total	14	3	10	21	430	770

HS - Humanities and Social Sciences
K/S/N – Knowledge Course/ Skill Based Course / Value Added Course
BS – Basic Science courses   **CIE – Continuous Internal Evaluation**
ES – Engineering Sciences Courses   **SEE – Semester End Evaluation**
PC – Professional Core courses   **L – Theory**
PE – Professional Elective Courses   **T – Tutorial**
OE – Open Electives   **P/D – Practical / Drawing**
PS – Project Work, Seminar and Internship   **C – Credits**
MC – Mandatory Courses
* a) Orientation Course for B. Tech I year I Semester Students take place for 3 weeks
    duration covering the first Two Units
   b) Orientation Course for B. Tech I year II Semester Students take place for covering the
     remaining Four Units (Units III, IV, V, and VI).

B.Tech. CSE- Artificial Intelligence and Machine Learning

Course Structure Regulation A20

I Year II Semester

Sl. No.	Dept. Course	Course Code	Course	L	T	P	C	Max. Marks	
								CIE	SEE
1	S&H	8HC04	Engineering Chemistry	4	0	0	4	30	70
2	CSE	8EC01	Data Structures and C++	3	0	0	3	30	70
3	S&H	8HC13	Differential Calculus and Numerical Methods	2	1	0	3	30	70
4	S&H	8BC02	Engineering Graphics	1	0	4	3	30	70
5	S&H	8HC01	Oral Communication Skills	1	0	0	1	30	70
6	IT	8FC02	Python Programming	2	1	0	3	30	70
7	IT	8F262	IT Workshop and Python Programming Lab	0	0	4	2	30	70
8	S&H	8HC64	Engineering Chemistry Lab	0	0	2	1	30	70
9	CSE	8EC61	Data Structures (C/C++) Lab	0	0	2	1	30	70
10	S&H	8HC61	Oral Communication Skills Lab	0	0	2	1	30	70
11	CSE	8L277	Comprehensive Test and Viva –Voce – II (2 Mids (Viva) and End Semester (Test and Viva) = 30+70)	1	0	0	1	30	70
12	CSE	8L285	Technical Seminar – II	0	0	2	1	100	--
13	S&H	8HC18	Orientation Course*	2	0	0	0	30	70
								Grade evaluation	
			Total	**16**	**2**	**16**	**24**	**460**	**840**

* a) Orientation Course for B. Tech I year I Semester Students take place for 3 weeks duration covering the first Two Units

   b) Orientation Course for B. Tech I year II Semester Students take place for covering the remaining Four Units (Units III, IV, V, and VI)

B. Tech. CSE- Artificial Intelligence and Machine Learning

Course Structure Regulation A20

II Year I Semester

Sl. No.	Dept. Course	Course Code	Course	L	T	P	C	Max. Marks	
								CIE	SEE
1	S&H	8HC16	Probability and Statistics	3	0	0	3	30	70
2	ECE	8AC48	Elements of Electrical and Electronics Engineering	2	0	0	2	30	70
3	CSE	8EC02	Object Oriented Programming through Java	2	1	0	3	30	70
4	CSE	8F303	Discrete Mathematics	2	0	0	2	30	70
5	ECM	8DC10	Computer Organization and Architecture	2	0	0	2	30	70
6	IT	8D310	Software Engineering	2	0	0	2	30	70
7	S&H	8HC17	Universal Human values	2	1	0	3	30	70
8	CSE	8EC62	Object Oriented Programming through Java Lab	0	0	2	1	30	70
9	IT	8EC77	Software Engineering and Computer Organization Lab	0	0	2	1	30	70
10	ECE	8AC77	Elements of Electrical and Electronics Engineering Lab	0	0	2	1	30	70
11	CSE-AI&ML	8L378	Comprehensive Test and Viva-voce – III	1	0	0	1	30	70
12	CSE-AI&ML	8L386	Technical Seminar - III	0	0	2	1	100	--
			Total	**16**	**2**	**8**	**22**	**430**	**770**

B. Tech. CSE- Artificial Intelligence and Machine Learning
Course Structure Regulation A20

II Year II Semester

Sl. No.	Dept Course	Course Code	Course	L	T	P	C	Max. Marks	
								CIE	SEE
1	CSE	8EC16	Introduction to Data Science	3	0	0	3	30	70
2	CSE	8EC06	Operating Systems	2	1	0	3	30	70
3	IT	8FC05	Design and Analysis of Algorithms	2	1	0	3	30	70
4	CSE	8EC03	Database Management Systems	2	1	0	3	30	70
5	ECE	8CC55	Digital Electronics	2	0	0	2	30	70
6	MBA	8ZC01	Economics, Accountancy and Management Science	2	0	0	2	30	70
7	S&H	8HC03	Soft Skills	1	0	0	1	30	70
8	S&H	8HC63	Soft Skills Lab	0	0	2	1	30	70
9	CSE	8EC63	Database Management Systems Lab	0	0	2	1	30	70
10	CSE	8EC66	Operating Systems Lab	0	0	2	1	30	70
11	CSE-DS	8MC61	R Programming Lab & Design and Analysis of Algorithms Lab	0	0	2	1	30	70
12	CSE-AI&ML	8L479	Comprehensive Test and Viva –Voce – IV(2 Mids (Viva) and End Semester(Test and Viva) = 30+70)	1	0	0	1	30	70
13	CSE-AI&ML	8L487	Technical Seminar - IV	0	0	2	1	100	--
			Total	**15**	**3**	**10**	**23**	**460**	**840**

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Course Structure Regulation A20
III Year I Semester

Sl. No.	Dept. Course	Course Code	Course	L	T	P	C	Max. Marks	
								CIE	SEE
1	MBA/ME		Open Elective-I	2	0	0	2	30	70
2	CSE-AI&ML		Professional Elective - I	3	0	0	3	30	70
3	CSE	8EC05	Data Communications and Networks	3	0	0	3	30	70
4	CSE-AI&ML	8LC01	Introduction to Artificial Intelligence	2	0	0	2	30	70
5	CSE	8EC17	Machine Learning	3	0	0	3	30	70
6	CSE	8EC04	Data Warehousing and Data Mining	2	1	0	3	30	70
7	S&H	8HC05	Environmental Science and Ecology	2	0	0	2	30	70
8	CSE-AI&ML	8LC61	Data Mining Lab & Machine Learning using Python Lab	0	0	2	1	30	70
9	CSE-AI&ML	8LC62	Computer Networks Lab &Artificial Intelligence Lab	0	0	2	1	30	70
10	CSE-AI&ML	8L591	Summer Industry Internship-I Evaluation of Summer Internship (2-Internal Reviews & 1-External Evaluation)	0	0	0	1	30	70
			Total	**17**	**1**	**4**	**21**	**300**	**700**

B. Tech. CSE- Artificial Intelligence and Machine Learning
Course Structure Regulation A20

III Year II Semester

Sl. No.	Dept Course	Course Code	Course	L	T	P	C	Max. Marks	
								CIE	SEE
1	MBA/ME		Open Elective – II	2	0	0	2	30	70
2	CSE-AI&ML		Professional Elective – II	3	0	0	3	30	70
3	IT	8FC07	Automata Theory and Compiler Design	2	1	0	3	30	70
4	IT	8FC08	Cyber Security and Cyber Laws	3	0	0	3	30	70
5	CSE	8EC07	Web Technologies	2	1	0	3	30	70
6	CSE	8EC18	Big Data Analytics	2	1	0	3	30	70
7	CSE-DS	8MC66	Big Data Analytics Lab	0	0	2	1	30	70
8	CSE-AI&ML	8LC63	Web Technologies Lab and Compiler Design Lab	0	0	2	1	30	70
9	CSE-AI&ML	8L680	Comprehensive Test and Viva Voce – V	0	0	0	1	30	70
10	CSE-AI&ML	8L694	Group Project	0	0	2	1	30	70
			Total	14	3	6	21	300	700

B.Tech. CSE- Artificial Intelligence and Machine Learning

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IV Year I Semester

Sl. No	Dept. Course	Course Code	Course	L	T	P	C	Max. Marks	
								CIE	SEE
1	CSE/IT		Professional Elective – III	3	0	0	3	30	70
2	CSE-AI&ML		Professional Elective-IV	3	0	0	3	30	70
3	IT	8FC18	Image Processing	2	1	0	3	30	70
4	CSE-AI&ML	8LC03	Advanced AI and Deep Learning	2	1	0	3	30	70
5	IOT	8IC07	Introduction to Linux Programming	2	0	0	2	30	70
6	S&H	8GC49	Intellectual Property Rights	1	0	0	1	30	70
7	CSE	8EC20	Cloud Computing	3	0	0	3	30	70
8	CSE-AI&ML	8LC64	Cloud Computing Lab and Deep Learning Lab	0	0	4	2	30	70
9	CSE-AI&ML	8LC65	Linux Programming Lab& PE-IV Lab	0	0	2	1	30	70
10	CSE-AI&ML	8L792	Summer Industry Internship – II Evaluation of Summer Internship (2-Internal Reviews & 1-External Evaluation)	0	0	0	1	30	70
			Total	**16**	**2**	**6**	**22**	**300**	**700**

B Tech CSE- Artificial Intelligence and Machine Learning

Course Structure Regulation A20

IV Year II Semester

Sl. No.	Dept Course	Course Code	Course	L	T	P	C	Max. Marks	
								CIE	SEE
1	MBA/ EEE		Open Elective- III	2	0	0	2	30	70
2	CSE-AI&ML		Professional Elective – V	3	0	0	3	30	70
3	CSM-AI&ML	8L896	Major Project	-	-	10	5	30	70
			Total	5	0	10	10	90	210

B.Tech .CSE- Artificial Intelligence and Machine Learning

LIST OF PROFESSIONAL & OPEN ELECTIVES

Professional Electives	Sl. No.	List of Subjects	Open Electives	Sl. No.	List of Subjects
Professional Elective -1	8LC11	Software Testing Methodologies	Open Elective -I	8ZC22	Basics of Entrepreneurship
	8MC03	Data Visualization Techniques		8ZC25	Basics of Indian Economy
	8LC13	Design Thinking		8ZC05	Banking Operations, Insurance and Risk Management
	8LC14	Human Computer Interaction		8BC51	Introduction to Additive Manufacturing Process
Professional Elective - II	8LC15	Cryptography and Network Security	Open Elective -II	8BC53	Principles of Operations Research
	8FC13	Software Project Management		8ZC23	Advanced Entrepreneurship
	8JC03	Information Retrieval Systems		8ZC19	Entrepreneurship Project Management and Structured Finance
	8IC45	Introduction to Internet of Things		8ZC26	Basics of Polity and Ecology
Professional Elective- III	8EC13	Blockchain Technologies	Open Elective -III	8AC45	Fundamentals of Renewable Energy Sources
	8LC16	Unified Modeling Language		8ZC24	Product and Services
	8FC20	Augmented and Virtual Reality		8ZC10	Entrepreneurship & Business Design
	8LC18	Natural Language Processing		8ZC15	Financial Institutions, Markets and Services
Professional Elective- IV	8JC05	Scripting Languages			
	8FC15	Agile Software Development			
	8LC20	Mobile Application Development			
	8LC17	Dev Ops			
Professional Elective- V	8JC02	Ethical Hacking			
	8EC19	Business Intelligence			
	8LC21	Quantum Computing			
	8LC22	Parallel and Distributed Computing			

Syllabus for B. Tech. III Year I-Semester
Computer Science and Engineering (AI&ML)
BASICS OF ENTREPRENEURSHIP
(Open Elective –I)

Code: 8ZC22

Prerequisite: Economics, Accountancy and Management Science

L	T	P	C
2	0	0	2

Course Objectives:
The objective of the course is to make students understand the nature of Entrepreneurship, and its importance to business to the engineering students, which will allow them to get the required intuition and interest in starting their own start-up's.

Course Outcomes:
At the end of this course, the students will be able to
1. The students will acquire basic knowledge on Skills of Entrepreneurship.
2. The students will understand the techniques of selecting the customers through the process of customer segmentation and Targeting
3. The students understand business Models and their validity.
4. The students understand the basic cost structure, Revenue Streams and the pricing strategies.
5. The students will acquire knowledge about the project management and its techniques.
6. The students get exposure on marketing strategies and business regulations for the Start up.

UNIT – I:
Introduction to Entrepreneurship & Self Discovery: - Define Entrepreneurship, Entrepreneurship as a Career option, Find your Flow, Stock of Your Means, Characteristics, Qualities and Skills of Entrepreneurship, Effectuation, Principles of Effectuation, Life as an Entrepreneur, Stories of Successful Entrepreneurs.

UNIT – II:
Opportunity & Customer Analysis: - Identify your Entrepreneurial Style, Methods of finding and understanding Customer Problems, Run Problem Interview, Process of Design Thinking, Identify Potential Problems worth Solving, Customer Segmentation, Niche Marketing and Targeting, Craft your Values Proportions, Customer-driven Innovation.

UNIT – III:
Business Model & Validation: - Introduction to Business Models, Lean approach to Business Model Canvas, Blue and Red Ocean Strategies, the Problem-Solution Fit, Build your Solution Demo, Solution Interview Method, Identify Minimum Viable Product (MVP), Product-Market fit test.

UNIT – IV:
Economics & Financial Analysis: - Revenue Analysis, Identify different Revenue Streams and Costs Analysis – Startup Cost, Fixed Cost and Variable Cost, Break Even Analysis, Profit Analysis, Introduction to Pricing, different Pricing Strategies, Sources of Finance, Bootstrapping and Initial Financing, Practice pitching to Investors and Corporate.

UNIT – V:
Team Building & Project Management: - Leadership Styles, Shared Leadership Model, Team Building in Venture, Roles and Responsibilities of team in venture, Explore collaboration tools and techniques, Brainstorming, Introduction to Project Management, Project Life Cycle, Create a Project Plan.

UNIT – VI:
Marketing & Business Regulations: - Positioning, Positioning Strategies, Branding, Branding Strategies, Selecting and Measuring Channels , Customer Acquisition, Selling Process, Selling Skills, Sales Plans. Business regulations – List of Required Registrations, Compliance Check List, Business Structures and Legal Entities.

TEXT BOOKS:
1. Robert D Hisrich, Michael P Peters, Dean A Shepherd, Entrepreneurship, Sixth Edition, New Delhi, 2006.
2. Thomas W. Zimmerer, Norman M. Scarborough, Essentials of Entrepreneurship And Small Business Management, Fourth Edition, Pearson, New Delhi, 2006

REFERENCES:
1. Alfred E. Osborne, Entrepreneur's Toolkit, Harvard Business Essentials, HBS Press, USA, 2005.
2. MadhurimaLall, ShikhaSahai, Entrepreneurship, Excel Books, First Edition, New Delhi, 2006.
3. S.S. Khanka, Entrepreneurial Development, S. Chand and Company Limited, New Delhi, 2007.
4. H. Nandan, Fundamentals of Entrepreneurship, Prentice Hall of India, First Edition, New Delhi, 2007.
5. S.R. Bhowmik, M. Bhowmik, Entrepreneurship-A tool for Economic Growth   And A key to Business Success, New Age International Publishers, First Edition, (formerly Wiley Eastern Limited), New Delhi, 2007.
6. https://www.wfglobal.org/
7. https://www.learnwise.org/#/IN/en/home/login,

Syllabus for B. Tech. III Year I-Semester
Computer Science and Engineering (AI&ML)
BASICS OF INDIAN ECONOMY
(Open Elective –I)

Code: 8ZC25

L	T	P	C
2	0	0	2

Course Objectives:
To provide basic knowledge relating to the Indian Economy thus making the students aware of the current aspects taking place in the Indian and world economy.

Course Outcomes:
At the end of this course, the students will be able to
1. Gain knowledge relating to Economics, various sectors and its growth
2. Will gain knowledge relating to various concepts of National income and related aggregates
3. Students will learn about Indian Industrial policy and benefits of LPG to India
4. Comprehend knowledge relating to Fiscal policy & Taxation system in India
5. Learn about inflation & business cycles.

UNIT- I:
Introduction to Economics: Definition, Economics and economy, back ground of economy, sectors of the economy, types of economy, growth of economy, primary moving force of Economic growth in India, mixed economy.

UNIT-II
National Income and related aggregates: Aggregates related to National Income: Gross National Product (GNP), Net National Product (NNP), Gross and Net Domestic Product (GDP and NDP) - at market price, at factor cost; National Disposable Income (gross and net), Private Income, Personal Income and Personal Disposable Income; Real and Nominal GDP.

UNIT-III
Industrial policy & Liberalization of Economy: Industrial policy in India, its objectives, Review of Industrial policies up to 1986, Industrial policy 1991 - causes of its implementation, benefits of Liberalization, privatization & Globalization to the Indian economy.

UNIT -IV:
Fiscal policy & Taxation system: Fiscal policy- Definition, objectives, importance, setbacks, recent fiscal policy of India, Reforms to strengthen the fiscal policy in India. Taxation system in India, methods of taxation, a good tax system, VAT, GST, Reforms in taxation.

UNIT-V
Inflation & Business Cycles: Inflation – Definition, types, effects of inflation on various segments of the population and sectors of the economy, measures to control inflation, Business cycles: Introduction, Depression, Recovery, Boom, and Recession.

UNIT-VI
Balance of Payments: Balance of payments account - meaning and components; balance of payments deficit-meaning. Foreign exchange rate - meaning of fixed and flexible rates and managed floating. Determination of exchange rate in a free market

TEXT BOOKS:

1. Indian Economy, Datt& Mahajan, 70th Edition, Sultan Chand publishers.
2. Indian Economy, Misra&Puri, 33rd Edition, Himalaya publishing house.

REFERENCES:

1. Latest Budget document by Ministry of Finance.
2. Latest Economic survey.
3. 12th Five year plan News articles in The Hindu, The Business Line.

Syllabus for B. Tech. III Year I-Semester
Computer Science and Engineering (AI&ML)
BANKING OPERATIONS, INSURANCE AND RISK MANAGEMENT
(Open Elective –I)

Code: 8ZC05

L T P C
2 0 0 2

Course Objectives:

To make the students understand the concepts and principles of Indian Banking Business, Insurance Business and Capital market business products and services, which facilitate them to understand the nature of market.

Course Outcomes:

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

1. Describe the new dimensions and products served by the banking system in INDIA.
2. Explain the credit control system and create awareness on NPA's
3. Apply the knowledge of Insurance concepts in real life scenarios
4. Recognize the importance of regulatory and legal frame work of IRDA
5. Identify the risk management process and methods.
6. Calculate the diversity of risk and return.

UNIT-I

Introduction to Banking Business: Introduction to financial services - History of banking business in India, Structure of Indian banking system: Types of accounts, advances and deposits in a bank. KYC norms, New Dimensions and products- E-Banking: Mobile-Banking, Net Banking, Digital Banking, Negotiable Instruments: Cheque system.

UNIT –II:

Banking Systems and Its Regulation: Banking Systems: Branch Banking, Unit Banking, Correspondent Banking, Group Banking, Deposit Banking, Mixed Banking and Investment Banking - Banking Sector Reforms with special reference to Prudential Norms, Capital Adequacy Norms, Classification of Assets and NPA's, Functions of RBI, Role of RBI in regulating Indian Banking. Banking Ombudsman scheme.

UNIT-III

Introduction to Insurance: Introduction to insurance, Need and importance of Insurance, principles of Insurance, characteristics of insurance contract, branches of insurance and types of insurance: Life insurance and its products, General Insurance and its variants.

UNIT –IV:

Insurance Business Environment: Procedure for issuing an insurance policy –Nomination - Surrender Value - Policy Loans – Assignment - Revivals and Claim Settlement; Insurance as a tax mitigation tool, Role of IRDA in Insurance Regulation.

UNIT-V

Financial Markets and Risk Management: Introduction to Financial Markets: Money Market – Capital market; Introduction to Risk Management, meaning and classification of risks, Risk management process, Risk Management Approaches and Techniques.

UNIT-VI

Derivatives as a Risk Management Tool: Introduction to Financial Derivatives, Advantages of Derivatives - types of Derivative Contracts - Forwards, Futures, Options and Swaps - Differences among Forwards, Futures and Option Contracts.

TEXT BOOKS:

1. Varshney, P.N., Banking Law and Practice, Sultan Chand & Sons, New Delhi.
2. General Principles of Insurance Harding and Evantly.

REFERENCES:

1. Mark S. Dorfman: Risk Management and Insurance, Pearson, 2009.
2. Scott E. Harringam Gregory R. Nichanus: Risk Management & Insurance, TMH, 2009.
3. Geroge E. Rejda: Principles of risk Management & Insurance, 9/e, pearson Education. 2009.
4. G. Koteshwar: Risk Management Insurance and Derivatives, Himalaya, 2008.

Syllabus for B. Tech. III Year I-Semester
Computer Science and Engineering (AI&ML)
INTRODUCTION TO ADDITIVE MANUFACTURING PROCESS
(Open Elective –I)

Code: 8BC51

L T P C
2 0 0 2

Course Objectives:

To teach students the fundamental concepts of Additive Manufacturing, techniques involved and their advantages and limitations and various applications of these technologies in relevant fields such as mechanical, Bio-medical, Aerospace, electronics etc.

Course Outcomes:

1. Understand the Additive manufacturing processes and their relationship with subtractive manufacturing.
2. Demonstrate comprehensive knowledge of the broad range of liquid based rapid prototype processes, devices, capabilities and materials that are available.
3. Apply the principles of casting in Additive manufacturing processes
4. Articulate the various tradeoffs of Additive manufacturing software's/data format that must be made in selecting advanced/additive manufacturing processes, devices and materials to suit particular product requirements.
5. Learn various applications of additive manufacturing, such as in architecture art, health care direct part production and mass customization.

UNIT-I
Introduction:
Development of AM, Fundamentals of AM, Classification of AMS, Advantages, Standards on AM, commonly used terms, AM process chain

UNIT-II
Liquid-based Additive Manufacturing Systems: Stereo lithography Apparatus (SLA), process, working principle, photopolymers, photo polymerization, Layering technology, laser and laser scanning, Applications, Advantages and Disadvantages, 3D bio printing.
Solid-based Additive manufacturing Systems:, Laminated Object Manufacturing (LOM): process, working principle, Applications, Advantages and Disadvantages, Fused Deposition Modeling (FDM): working principle, Applications, Advantages and Disadvantages.

UNIT-III
Powder Based Additive Manufacturing Systems: Selective laser sintering (SLS): working principle, Applications, Advantages and Disadvantages, Color Jet printing, working principle, Applications, Advantages and Disadvantages, **Build time calculations –** SLA, FDM**,** Problems.

UNIT-IV
Additive manufacturing Data Formats: STL Format, STL File Problems, Consequence of Building Valid and Invalid Tessellated Models, STL file Repairs: Generic Solution, Features

of various AM software's like Magics, Mimics, Solid View, View Expert, 3 D View, Velocity 2, Rhino, STL View 3 Data Expert and 3 D doctor.
Design for AM – Basic Principles and Practices.

UNIT-V

Rapid Tooling: Introduction to Rapid Tooling (RT), Conventional Tooling Vs RT, Need for RT. Rapid Tooling Classification, Spray Metal Deposition, Silicone rubber molds, , Casting-Sand Casting ,Investment Casting, evaporative Casting
Reverse engineering – What is RE, Why use RE, RE Generic process, Overview of RE-Software and Hardware, CMMs-applications and types

UNIT-VI

Applications and examples: Application - Material Relationship, Application in Design, Application in Engineering, Analysis and Planning, Aerospace Industry, Automotive Industry, Jewelry Industry, Coin Industry, Arts and Architecture. Medical and Bioengineering Applications: Planning and simulation of complex surgery, Customized Implants and Prosthesis, Design and Production of Medical Devices, Bionic ear, dentistry

TEXT BOOKS:

1. Chua C.K., Leong K.F. and LIM C.S, Rapid prototyping; Principles and Applications, World Scientific Publications , Third Edition, 2010.
2. Reverse Engineering: An Industrial Perspective, Springer- Verlag, 2008. ISBN: 978-1-84628-855-5.

REFERENCES:

1. Ian_Gibson David_Rosen, Brent_Stucker, AdditiveManufacturingTechnologies3D Printing, Rapid Prototyping, and Direct Digital Manufacturing,Springer.
2. PaulF.Jacobs, Rapid Prototyping and Manufacturing ASME Press, 1996.

Syllabus for B. Tech. III Year I-Semester
Computer Science and Engineering (AI&ML)
SOFTWARE TESTING METHODOLOGIES
(Professional Elective-I)

Code: 8LC11

L	T	P	C
3	0	0	3

Course Objectives:

To Understand the Basic concepts in Software testing, concepts of flow graphs, path testing and data flow testing, understand the concept of metrics and their types. Understand and implement various testing techniques and to make a thorough study on various testing tools. Set a strategy for testing environment and to learn the testing methodologies in detail.

Course Outcomes:

After completing this course, student shall be able to

1. Describe concepts of software testing.
2. Describe and apply the concepts Flow graphs, Path testing and Data Flow Testing.
3. Practice Software testing strategy and Environment with economics and apply Software Metrics useful in software development and maintenance.
4. Software Testing Methodology, finding defects hard to find, Verification and validation, Functional and structural, Workbench concept, Eight Consideration of software testing methodology, checklist. Describe Agile computing with agile testing.
5. Demonstrate Software Testing Techniques such as JADs, Pareto Analysis , Regression Tasting, Structured walkthroughs, Thread testing , Performance testing and White box testing.
6. Describe Graph matrices and applications, and practice and apply automated testing tools such load Runner, UFT and QTP.

UNIT-I
What is Testing, Characteristics of Test Engineers, Software Testing Life Cycle, Levels of Testing, Testing Approaches, Test Cases: Format for Writing Test Case, Test plan: Format to prepare Test plan, Purpose of testing, Dichotomies, Consequences of bugs.

UNIT-II
Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, application of path testing. Data Flow Testing: Basics of Data Flow Testing Logic Based Testing, Decision Tables.

UNIT-III
Software testing strategy and Environment, establishing testing policy, structured approach to testing, Test factors, Economics of SDLC testing.
Software Metrics: Software Quality, Metrics for Analysis Model, Metrics for Design Model, Metrics for source code, Metrics for testing, Metrics for maintenance.

UNIT-IV
Software Testing Methodology, Defects hard to find, Verification and validation, Functional and structural, Defects and Failures, testing that parallels the software Development process, Workbench concept, Eight Consideration of software testing methodology, testing tactics checklist. Importance of Agility, Building an Agile Testing Process.

UNIT-V
Software Testing Techniques, Black-box, Boundary value, Branch coverage, Cause Effect graphing, CRUD, Database, Histogram, Gray box, Inspections, JADs, Pareto Analysis, Prototyping, Random Testing, Risk based testing, Regression Testing, Structured walkthroughs, Thread testing, Performance testing, Stress Testing, Accepting Testing, White box testing, Alpha and Beta Testing.

UNIT-VI
Graph matrices and application: Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm.
Need for Automated testing tools, Taxonomy of Testing Tools, Exposure to Software Testing Tools: Load Runner, UFT and QTP.

TEXT BOOKS:
1. Software testing techniques – Boris Beizer, Dreamtech, Second Edition.(Unit 1,2,6)
2. Software testing tools – by Dr. K.V.K.K Prasad Dreamtech (Unit 1,6)
3. Effective Methods for Software Testing, 2nd Edition by William E.Perry, Wiley publications.(Unit 3,4)
4. Software Testing and continuous Quality Improvement, by William E.Lewis,Gunasekaran,2nd Edition Auerbach publications (Unit 5,Refer Internet)

REFERENCES:

1. Software Testing Techniques ,by BoriesBeizer, Second Edition, Dreamtech Press.
2. Testing and Quality Assurance for Component based software ,byGao,Tsao and Wu, Artech House Publishers.
3. Managing the Testing Process,by Rex Black,Wiley.

Syllabus for B. Tech. III Year I-Semester
Computer Science and Engineering (AI & ML)
DATA VISUALIZATION TECHNIQUES
(Professional Elective -I)

Code:8MC03

Course Objectives:

L T   P   C
3 0   0   3

1. To understand various data visualization techniques.
2. To understand various Interaction Concepts and Techniques

Course Outcomes:

1. Visualize the objects in different dimensions.
2. Design and process the data for Virtualization.
3. Apply the visualization techniques in physical sciences, computer science, applied mathematics and medical science.
4. Apply the virtualization techniques for research projects. (K1,K3).

UNIT – I
Introduction and Data Foundation: Basics - Relationship between Visualization and Other Fields - The Visualization Process - Pseudocode Conventions - The Scatter plot. Data Foundation - Types of Data - Structure within and between Records - Data Pre-processing - Data Sets.

UNIT – II
Foundations for Visualization: Visualization stages - Semiology of Graphical Symbols - The Eight Visual Variables - Historical Perspective - Taxonomies - Experimental Semiotics based on Perception Gibson's Affordance theory – A Model of Perceptual Processing.

UNIT -–III
Visualization Techniques: Spatial Data: One-Dimensional Data - Two-Dimensional Data – Three- Dimensional Data-Dynamic Data-Combining Techniques.
Geospatial Data: Visualizing Spatial Data - Visualization of Point Data -Visualization of Line Data - Visualization of Area Data - Other Issues in Geospatial Data Visualization

UNIT – IV
Multivariate Data: Point-Based Techniques - Line- Based Techniques - Region-Based Techniques - Combinations of Techniques – Trees Displaying Hierarchical Structures – Graphics and Networks- Displaying Arbitrary Graphs/Networks.

UNIT – V
Interaction Concepts and Techniques: Text and Document Visualization: Introduction - Levels of Text Representations - The Vector Space Model - Single Document Visualizations -Document Collection Visualizations-Extended Text Visualization **Interaction Concepts**: Interaction Operators- Interaction Operands and Spaces - A Unified Framework. **Interaction Techniques**: Screen Space - Object-Space-Data Space-Attribute Space-Data Structure Space-Visualization Structure-Animating Transformations –Interaction Control

UNIT–VI
Research Directions in Virtualizations: Steps in designing Visualizations – Problems in designing effective Visualizations- Issues of Data. Issues of Cognition, Perception, and Reasoning. Issues of System Design Evaluation, Hardware and Applications.

TEXT BOOKS:
1. Matthew Ward, Georges Grinstein and Daniel Keim, "Interactive Data Visualization Foundations, Techniques, Applications", 2010.
2. Colin Ware, "Information Visualization Perception for Design", 2nd edition, Margon Kaufmann Publishers, 2004.

REFERENCES:
1. Robert Spence "Information visualization – Design for interaction", Pearson Education, 2nd Edition, 2007.
2. Alexandru C. Telea, "Data Visualization: Principles and Practice," A. K. Peters Ltd, 2008.

Syllabus for B. Tech. III Year I-Semester
Computer Science and Engineering (AI&ML)
DESIGN THINKING
(Professional Elective –I)

Code: 8LC13

L T P C
3 0 0 3

Course Objective:

1. To understand the fundamental concepts of design thinking.
2. To familiarize with product design process .
3. To ideate new products and services.

Course Outcomes:

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

1. Gain the knowledge on the inputs required for design thinking and also gain familiarity on concepts related to design thinking.
2. Understand the techniques of idea generation
3. Classify different phases of design thinking
4. Realize the product design process.
5. Understand design thinking for service design.
6. Gain knowledge on various case studies related to design thinking.

UNIT – I
Design Thinking – Introduction to Design thinking, Principles of design thinking, Benefits of design thinking, Applications of Design thinking, Social Innovation, Impact of Design thinking, Design thinking tools and techniques. Innovation and Design thinking.

UNIT – II
Idea Generation: New Idea generation methods - Principles of Idea Generation, Techniques, Creativity thinking techniques and tools, types of creative thinking, select ideas from ideation methods.

UNIT – III
Design Thinking Foundations: The Design Double Diamond: Discover-Define-Develop-Deliver, User-centric design approaches: Importance of user-centricity for design, Empathisation, Empathy Maps, Data collection from users and for users, Data Validation Responsible Innovation and Ethical Design:

UNIT – IV
Product Design Process: Identification of opportunities, Problem Statement, Product planning, Characteristics of Successful product Development, New product development process, Stanford design thinking iterative model

UNIT – V
Design Thinking for Service Design: Attributes of a good service design, service design tools – blueprint, customer journey mapping Identifying the user needs in a service-driven economy; Process Flows and Customer Experience considerations for designing and improving services; 5 Whys; Service Delivery Pathways

UNIT – VI
Case Studies on Design thinking: Case 1: Arcturus IV by John E.Arnold, Case – 2: How can we make AI to make things better for humans. Case – 3: User Centered Helmet Design by Prof. B.K. Chakravarthy- Part 1 and Part 2; Case – 4: Challenges of Reaching a Million Users by Prof. Chetan Solanki and Prof Jayendran V.

TEXT BOOKS:
1. Brown, T. (2008). Design thinking. Harvard business review, 86(6), 84.
2. "Innovation by Design", Gerald H. (Gus) Gaynor, AMACOM {American Management Association), NYC, 2002.
3. Ansell, C., & Torfing, J. (2014). Collaboration and design: new tools for public innovation. In Public innovation through collaboration and design (pp. 19-36). Routledge.
4. Lewrick, M., & Link, P. (2015). Design thinking tools: Early insights accelerate marketers' success. Marketing Review St. Gallen, 32(1), 40-51.

REFERENCES:
1. Mæhlum, A. R. (2017). Extending the TILES Toolkit-from Ideation to Prototyping (Master's thesis, NTNU).
2. Norman, D. (2013). The design of everyday things: Revised and expanded edition. Basic books.
3. Design Thinking – A primer,Prof: Dr. BalaRamadurai, Indian Institute of Technology, Madras.

Syllabus for B. Tech. III Year I-Semester
Computer Science and Engineering (AI&ML)
HUMAN COMPUTER INTERACTION
(Professional Elective-I)

Code: 8LC14

L T P C
3 0 0 3

Course Objectives:

1. To understand the importance of the design for any software that acts as an interface between Man and Machine
2. To make the students should also consider the characteristics of the humans while designing the Software /Hardware.
3. To teach the students to understand the characteristics required to build an effective GUI.
4. To understand the significance of the software tools and learn about different interaction devices.

Course Outcomes:

After completing this course, students should able to

1. Explain role of user Interface, its importance and Benefits of good design.
2. Describe the concept of direct manipulation, graphical system, web user role and Principles of user interface.
3. Describe Human interaction with computers, importance of human characteristics human consideration in Design and relate business functions.
4. Apply and explain Screen Designing formalities such as Screen planning, purpose, organizing screen elements, ordering of screen content, screen navigation, focus and emphasis and Technological considerations in interface design.
5. Explain Windows–Navigation schemes and screen based controls. Apply Components – text and messages, Icons and increases – Multimedia, colors, uses problems and choosing colors in real time application.
6. Develop applications with the aid of Software tools, interface Building Tools and use Interaction Devices.

UNIT- I:
Introduction: Importance of user Interface – definition, importance of good design, Benefits of good design –A brief history of Screen design.

UNIT-II
The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, Characteristics-Principles of user interface.

UNIT-III
Design process – Human interaction with computers, importance of human characteristics human consideration in Design, Human interaction speeds, understanding business functions.

UNIT-IV
Screen Designing: Design goals Screen planning and purpose , organizing screen elements ,ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information

simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

UNIT-V
Windows – New and Navigation schemes selection of window, selection of devices based and screen based controls.
Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.
Case studies: windows GUI.

UNIT-VI
Software tools – Specification methods, interface – Building Tools.
Interaction Devices – Key board and function keys – pointing devices-speech recognition digitization and generation – image and video displays – Printers.

TEXT BOOKS:
1. The essential guide to user interface design, Wilbert OGalitz, Wiley Dreama Tech.
2. Designing the user interface.3rd Edition Ben Shneidermann, Pearson Education Asia.

REFERENCES:
1. Human – Computer Interaction .ALANDIX, JANETFINCAY,GREGORYD, ABOWD, RUSSELLBEALG,PEARSON.
2. Interaction Design PRECE, ROGERS, SHARPS. Wiley Dream tech.
3. User Interface Design, Soren Lauesen, Pearson Education.

Syllabus for B.Tech. III Year I-Semester
Computer Science and Engineering (AI&ML)
DATA COMMUNICATIONS AND NETWORKS

Code: 8EC05

L	T	P	C
3	0	0	3

Course Objectives:
1. To Study in detail about various analog and digital modulation and demodulation techniques.
2. To have a thorough knowledge of various multiplexing schemes and Data communication protocols,
3. To learn flow control, error control and access control mechanisms.
4. To learn routing and congestion control algorithms, internet protocols.
5. To understand Transport layer entities such as DNS and HTTP.

Course Outcomes:

At the end of this course the student will be able to
1. Understand concepts of different networks, network models and transmission medias.
2. Classify various data conversion techniques, Multiplexing, De-multiplexing techniques.
3. Summarize the design issues of Datalink layer and solve problems on Error and Flow control.
4. Infer MAC layer protocols, various connecting devices, IP addressing concepts and design a network(using sub netting and super netting techniques)
5. Analyze various routing algorithms and outline the concepts of Internet control protocols and congestion control techniques.

UNIT-I:
Introduction: Data Communications, Network Topologies, PAN, LAN, MAN, WAN. The Internet, Protocols and Standards. Network Models: The OSI Model, Layers in the OSI Model, TCP/IP Protocol Suite.
Physical layer & Media: Guided Media, Unguided Media.

UNIT-II
Data and Signals: Analog and Digital, Digital Transmission: Digital-to-Digital Conversion, Analog-to-Digital Conversion, Analog Transmission: Digital-to-Analog Conversion, Analog-to-Analog Conversion. Bandwidth utilization: Multiplexing and De-multiplexing.

UNIT-III
Switching: Circuit-Switched Networks, Packet Switching, Message Switching.
Data Link Layer: Services, Data Link Control, Framing, Flow and Error Control, Error Detection and Correction, CRC, Checksum, hamming code, Sliding Window Protocols, HDLC, Point-to-Point Protocol.

UNIT-IV
MAC sub layer: MAC Address, Multiple Access Protocol, ALOHA, CSMA Protocols, IEEE Standards, Standard Ethernet, Fast Ethernet, Gigabit Ethernet, IEEE 802.11.
Connecting Devices: Repeaters, Hubs, Bridges, Switches, Routers, Gateways.
Network Layer: Logical Addressing, IPv4, IPv6, Sub netting and Super netting, Internetworking.

UNIT-V
Datagram and Virtual-Circuit Networks, **Routing Protocols:** Flooding, Shortest path routing technique, Distance Vector routing, Count to Infinity problem, Link State routing, Hierarchical routing technique, Multicasting, Broadcasting.
Internet control protocols: ICMP, ARP, RARP, DHCP.
Congestion Control: Congestion Control in virtual –circuits and Datagram Subnets.
Traffic Shaping: Leaky-Bucket and Token-Bucket.

UNIT-VI
Transport Layer: Transport Services, Connection establishment, Connection release, TCP and UDP protocols.
Application Layer: Domain Name System, Electronic Mail and File Transfer Protocol, WWW and HTTP, Simple Network Management Protocol (SNMP).
Security and Privacy: Security attacks and services.

TEXT BOOKS:
1. Computer Networks — Andrew S Tanenbaum, 4th Edition. Pearson   Education/PHI.
2. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.

REFERENCES:
1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.
2. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson.
3. Data Communications, William Stallings, Seventh edition.

Syllabus for B.Tech. III Year I-Semester
Computer Science and Engineering (AI&ML)

INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Code: 8LC01

Prerequisite: Knowledge on Data Structures.

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Course Objectives:

1. To learn the distinction between optimal reasoning vs. human like reasoning.
2. To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
3. To learn different knowledge representation techniques.
4. To understand the applications of AI, namely game playing, theorem proving, and machine learning.

Course Outcomes:

1. Learn the distinction between optimal reasoning vs. human like reasoning and formulate an efficient problem space for a problem expressed in natural language. Also select a search algorithm for a problem and estimate its time and space complexities.
2. Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.
3. Learn different knowledge representation techniques.
4. Understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
5. Comprehend the applications of Probabilistic Reasoning and Bayesian Networks, analyze Supervised Learning vs. Learning Decision Trees.

UNIT-I:
Introduction to AI- Intelligent Agents, Problem-Solving Agents,
Searching for Solutions - Breadth-First Search, Depth-First Search, Hill-climbing Search, Simulated Annealing Search, Local Search in Continuous Spaces.

UNIT-II
Games- Optimal Decisions in Games, Alpha-Beta Pruning, Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Knowledge-Based Agents.
Logic-Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses.

UNIT-III
First-Order Logic-Syntax and Semantics of First-Order Logic, Using First Order Logic, Knowledge Engineering in First-Order Logic. Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification, Forward Chaining, Backward Chaining, Resolution.
Knowledge Representation: Ontological Engineering, Categories and Objects, Events.

UNIT-IV
Planning-Definition of Classical Planning, Algorithms for Planning with State Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches, Hierarchical Planning.

UNIT-V
Probabilistic Reasoning: Acting under Uncertainty, Basic Probability Notation Bayes' Rule and Its Use, Probabilistic Reasoning, Representing Knowledge in an Uncertain Domain.

UNIT-VI
Bayesian Networks- The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First-Order Probability.

TEXT BOOKS:
1. Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig, Pearson Education, Third Edition.

REFERENCES:
1. Artificial Intelligence, 3rd Edn.,E. Richand K. Knight(TMH)
2. Artificial Intelligence, 3rd Edn.,Patrick Henny Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems–Patterson, Pearson Education.

Syllabus for B.Tech. III Year I-Semester
Computer Science and Engineering (AI&ML)
MACHINE LEARNING

Code: 8EC17

L	T	P	C
3	0	0	3

Prerequisite: Introduction to Data Science

Course Objectives:
1. To introduce students to the basic concepts and techniques of Machine Learning.
2. To have a thorough understanding of the Supervised and Unsupervised learning techniques.
3. To study the various probability based learning techniques.
4. To understand graphical models of machine learning algorithms.

Course Outcomes:
At the end of this course, the student is able to
1. Understand the fundamental concepts of ML and Designing a Learning System.
2. Understand the basic concepts of linear models, tree and Probabilistic Models.
3. Understand various Dimensionality Reduction Techniques and Apply Various Evolutionary Algorithms with models.
4. Understand the Graphical models and Analytical Learning.

UNIT-I
INTRODUCTION: Learning– Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Linear Discriminants: Definitions of Perceptron, Linear separability, Linear Regression.
Design a Learning System– Perspectives and Issues in Machine Learning – Concept Learning Task – Concept Learning as Search – Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm. **(Textbook-1)**

UNIT-II
LINEAR MODELS:
Multi-layer Perceptron– Going Forwards – Going Backwards: Back Propagation Error – Multi-layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back-Propagation – Radial Basis Functions and Splines – Concepts – RBF Network – Interpolations and Basis Functions – Support Vector Machines. **(Textbook-2)**

UNIT-III
TREE AND PROBABILISTIC MODELS:
Learning with Trees– Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers – Basic Statistics – Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms. **(Textbook-2)**

UNIT-IV
DIMENSIONALITY REDUCTION AND EVOLUTIONARY MODELS:
Dimensionality Reduction– Linear Discriminant Analysis – Principal Component Analysis – Factor Analysis – Independent Component Analysis – Locally Linear Embedding – Isomap – Least Squares Optimization – Evolutionary Learning – Genetic algorithms – Genetic Offspring: - Genetic Operators – Using Genetic Algorithms – Reinforcement Learning – Overview – Getting Lost Example. **(Textbook-1)**

UNIT-V
GRAPHICAL MODELS:
Markov Chain Monte Carlo Methods– Sampling – Proposal Distribution – Markov Chain
Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden
Markov Models – Tracking Methods. **(Textbook-1)**

UNIT – VI
ANALYTICAL LEARNING
Learning with perfect domain theory– Explanation based Learning – Inductive analytical
approach to learning – KBANN algorithm. **(Textbook-2)**

TEXT BOOKS:
1. Stephen Marsland, ―Machine Learning – An Algorithmic Perspective, Second Edition,
Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
2. Tom M Mitchell, ―Machine Learning, First Edition, McGraw Hill Education, 2013.

REFERENCES:
1. Peter Flach, ―Machine Learning: The Art and Science of Algorithms that Make Sense of
Data, First Edition, Cambridge University Press, 2012.
2. Jason Bell, ―Machine learning – Hands on for Developers and Technical Professionals‖,
First Edition, Wiley, 2014.
3. Ethem Alpaydin, ―Introduction to Machine Learning 3e (Adaptive Computation and
Machine Learning Series), Third Edition, MIT Press, 2014.

Syllabus for B.Tech. III Year I-Semester
Computer Science and Engineering (AI & ML)
DATA WAREHOUSING AND DATA MINING

Code: 8EC04

L	T	P	C
2	1	0	3

Prerequisite: Knowledge on Database Management Systems.

Course Objectives:

1. To understand the principles of Data warehousing and Data Mining and understand types of data to improve the quality of data and efficiency using the mining process.
2. To be familiar with the Data warehouse architecture.
3. To understand applications of Association Rule Mining and algorithms to find them.
4. To perform classification and prediction of data.
5. To understand applications and algorithms for Clustering.
6. To introduce advanced topics in Data Mining.

Course Outcomes:
At the end of this course the student will be able to
1. Understand the fundamentals of Data Mining and Identify the techniques used in data preprocessing.
2. Understand the fundamentals of Data Warehousing and issues of mining with respect to architectures, technologies such as OLAP.
3. Learn insights of Data Mining Primitives and Infer the significance of Concept Description.
4. Apply the algorithms for mining association rules in large databases.
5. Discuss and apply the models of classification and use those models for the prediction of the new samples.
6. Apply various clustering techniques available for numerous applications. Identify the optimal clustering technique for a particular application

UNIT – I
Introduction: Fundamentals of data mining, KDD process, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task primitives, Integration of a data mining System with a Database or data warehouse systems, Major issues in Data Mining.
Data Preprocessing: Needs for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation, Data Mining Primitives, Data Mining Query Languages, Architectures of Data Mining Systems.

UNIT – II
Data Warehouse and OLAP Technology for Data Mining: Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, From Data Warehousing to Data Mining.

UNIT – III
Mining Frequent, Associations and Correlations: Basic concepts, Frequent Itemset mining methods, mining multilevel association rules from Transaction Databases, Mining Multidimensional association rules from Relational databases and Data Warehouses, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.

UNIT – IV

Classification and Prediction: Issues regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Classification by Back propagation, Support Vector Machines (SVMs),k-nearest neighbor classifier, Other Classification Methods. Prediction, Classifier Accuracy

UNIT – V

Cluster Analysis Introduction: Issues Regarding Classification and Prediction, Types of Data in Cluster Analysis, Major Clustering methods, Partitioning Methods, Density-Based methods, Grid-Based methods, Model-Based Clustering methods, Outlier Analysis.

UNIT – VI

Mining Complex Types of Data: Social Network Analysis, Spatial Data Mining, Multimedia Data Mining, Mining Time-Series data, Mining sequence Patterns in Transactional Databases, Text Mining, Mining the World Wide Web.

TEXT BOOKS:

1**.** Data mining: Concepts and Techniques, Jiawei Han and Micheline Kamber, 2nd Edition, Elsevier, 2006.
2. Data Mining Techniques – ARUN K PUJARI, University Press.

REFERENCES:

1. Data Mining Introductory and advanced topics –MARGARET H DUNHAM, PEARSON EDUCATION
2. Data Mining Techniques – ARUN K PUJARI, University Press.
3. Data Warehousing in the Real World – SAM ANAHORY & DENNIS MURRAY. Pearson Edn Asia.
4. Data Warehousing Fundamentals – PAULRAJ PONNAIAH WILEY STUDENT EDITION.
5. The Data Warehouse Lifecycle Toolkit – RALPH KIMBALL WILEY STUDENT EDITION
6. Introduction to Data Mining - First Edition, by Pang-Ning Tan, Michael Steinbach and Vipin Kumar, ISBN-13: 978-0321321367

Syllabus for B.Tech. III Year I-Semester
Computer Science and Engineering (AI & ML)
ENVIRONMENTAL SCIENCE AND ECOLOGY

Code: 8HC05

Course Objectives:

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1. To understand structure and function of ecosystem.
2. To learn classification and uses of natural resources.
3. To learn about Understanding the impacts of developmental activities and mitigation measures.
4. To know the source, causes and preventive methods of pollution.
5. To understand the importance of ecological balance for sustainable development.
6. To understand the environmental policies and regulations .

Course Outcomes
After completion of the course, the student will be able to:

1. Understand about ecosystem and energy flow among the organisms.
2. Know the resources available, use of them and overexploitation of the resources in the nature.
3. Learn the value, use and value of biodiversity.
4. Understand the causes and effect of pollution and implement measures in control of pollution.
5. Understand the sustainable development and implement green technology for sustainable development.
6. Learn and implement policy to protect the environment.

UNIT-I:
Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Bio magnification, ecosystem value, services and carrying capacity.

UNIT-II
Natural Resources: Classification of Resources: Living and Non-Living resources, water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, Land Energy resources: growing energy needs, renewable and non-renewable energy sources, and use of alternate energy source.

UNIT-III
Biodiversity and Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity, Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity, Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation.

UNIT-IV
Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, Air Pollution: Primary and secondary pollutants. Acid rain-Threshold limit values of chemicals present in environment, Global warming, Ozone layer

depletion, Water pollution: Sources and types of pollution. Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Solid waste: Municipal Solid Waste management, composition and characteristics of e-Waste and its management. Pollution control technologies: Sewage water Treatment, Kyoto protocol, and Montréal Protocol.

UNIT-V
Sustainable development and Green Technology: Concept of sustainable development, threats to sustainability population and its explosion, Crazy consumerism, over- exploitation of resources, strategies for achieving sustainable development environmental education, conservation of resources, urban sprawl sustainable cities and sustainable communities, human health , role of IT in Environment, Environmental Ethics, Environmental Economic – Concept of Green Building, Clean Development Mechanism (CDM).

UNIT-VI
Environmental Policy, Legislation & Environment Impact Assessment: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects, Strategies for risk assessment, Concepts of Environmental Management Plan (EMP).

TEXT BOOKS:
1. Perspectives in Environmental Studies: Kaushik A. and Kaushik, C.P. New Age International (P) Ltd. (2008)

REFERENCES:
1. Environmental Studies by ErachBharucha, 2005 University Press.
2. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
3. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
4. Environmental Science by Daniel B. Botkin& Edward A. Keller, Wiley INDIA edition.
5. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
6. Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.

Syllabus for B.Tech. III Year I-Semester
Computer Science and Engineering (AI & ML)
DATA MINING LAB & MACHINE LEARNING USING PYTHON LAB

Code: 8LC61

L	T	P	C
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Prerequisites: Knowledge on Database Management Systems.

Course Objectives:

1. The course is intended to obtain hands-on experience using data mining software.
2. Intended to provide practical exposure of the concepts in data mining algorithms.
3. To get an overview of the various machine learning techniques and can able to demonstrate them using python.

Course Outcomes:

1. Apply pre-processing statistical methods for any given raw data.
2. Gain practical experience of constructing a data warehouse.
3. Implement various algorithms for data mining in order to discover interesting patterns from large amounts of data.
4. Apply OLAP operations on data cube construction.
5. Apply common Machine Learning algorithms in practice and implementing their own.
6. Perform experiments in Machine Learning using real-world data.

LIST OF EXPERIMENTS (DATA MINING):

Experiments using Weka & Pentaho Tools

1. Data Processing Techniques:
   (i) Data cleaning (ii) Data transformation – Normalization (iii) Data integration
2. Partitioning - Horizontal, Vertical, Round Robin, Hash based
3. Data Warehouse schemas – star, snowflake, fact constellation
4. Data cube construction – OLAP operations
5. Data Extraction, Transformations & Loading operations
6. Implementation of Attribute oriented induction algorithm
7. Implementation of Apriori Algorithm
8. Implementation of FP – Growth Algorithm
9. Implementation of Decision Tree Induction
10. Calculating Information Gain measures
11. Classification of data using Bayesian approach
12. Classification of data using K – nearest neighbour approach
13. Implementation of K – means algorithm
14. Implementation of BIRCH algorithm
15. Implementation of PAM algorithm
16. Implementation of DBSCAN algorithm

LIST OF EXPERIMENTS (MACHINE LEARNING):

1. The probability that it is Friday and that a student is absent is 3 %. Since there are 5 school days in a week, the probability that it is Friday is 20 %. What is the probability that a student is absent given that today is Friday? Apply Baye's rule in python to get the result. (Ans: 15%)
2. Extract the data from database using python
3. Implement k-nearest neighbours classification using python
4. Given the following data, which specify classifications for nine combinations of VAR1 and VAR2 predict a classification for a case where VAR1=0.906 and VAR2=0.606, using the result of k- means clustering with 3 means (i.e., 3 centroids)

VAR1	VAR2	CLASS
1.713	1.586	0
0.180	1.786	1
0.353	1.240	1
0.940	1.566	0
1.486	0.759	1
1.266	1.106	0
1.540	0.419	1
0.459	1.799	1
0.773	0.186	1

5. Implement linear regression using python.
6. Implement Naïve Bayes theorem to classify the English text.
7. Implement an algorithm to demonstrate the significance of genetic algorithm.
8. Implement the finite words classification system using Back-propagation algorithm.

TEXT BOOKS:

1. Data Mining – Concepts and Techniques - JIAWEI HAN &MICHELINE KAMBER, Elsevier.
2. Data Warehousing, Data Mining & OLAP- Alex Berson and Stephen J. Smith- Tata McGraw- Hill Edition, Tenth reprint 2007.
3. Stephen Marsland, ―Machine Learning – An Algorithmic Perspective, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
4. Tom M Mitchell, ―Machine Learning, First Edition, McGraw Hill Education, 2013.

REFERENCES:

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Anuj Karpatne, Introduction to Data Mining, Pearson Education.
2. Peter Flach, ―Machine Learning: The Art and Science of Algorithms that Make Sense of Data, First Edition, Cambridge University Press, 2012.
3. Jason Bell, ―Machine learning – Hands on for Developers and Technical Professionals‖, First Edition, Wiley, 2014.

Syllabus for B. Tech. III Year I-Semester
Computer Science and Engineering (AI&ML)
COMPUTER NETWORKS LAB & ARTIFICIAL INTELLIGENCE LAB

Code: 8LC62

L	T	P	C
0	0	2	1

Course Objectives:
1. To understand the working principle of various communication protocols.
2. To understand the network simulation environment and visualize a network topologies.
3. To analyze the traffic flow and the contents of protocol frames
4. Become familiar with basic principles of AI toward problem solving, knowledge representation,and learning.

Course Outcomes:
1. Implement data link layer framing methods.
2. Develop flow control using sliding window protocol.
3. Implement and analyze routing and congestion issues in network design.
4. To be able to work with different networking tools.
5. Apply basic principles of AI in solutions that require problem solving, knowledge representation, and learning.

LIST OF EXPERIMENTS (COMPUTER NETWORKS):
1. Implement the data link layer framing methods such as character, character-stuffing and bitstuffing.
2. Develop a simple data link layer that performs the flow control using the sliding window protocol.
3. Simulation of networking tools Cisco Packet Tracer and Wireshark
4. Implement the network topologies using Cisco Packet Tracer tool
5. Implement the network devices like Hub, Router, etc.
6. Implement Home automation system using Cisco Packet Tracer tool.
7. Configuration of Web Server in cisco packet tracer tool?
8. Simulation of DNS, FTP, Web and Email server configuration using cisco packet tracer tool?

LIST OF EXPERIMENTS (ARTIFICIAL INTELLIGENCE):
1. Write a program in prolog to implement simple facts and Queries
2. Write a program in prolog to implement simple arithmetic
3. Write a program in prolog to solve Monkey banana problem
4. Write a program in prolog to solve Tower of Hanoi
5. Write a program in prolog to solve 8 Puzzle problems
6. Write a program in prolog to solve 4-Queens problem
7. Write a program in prolog to solve Traveling salesman problem
8. Write a program in prolog for Water jug problem

TEXT BOOKS:
1. Computer Networks, Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI.
2. Nikhil Buduma, Nicholas Locascio, "Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms", O'Reilly Media, 2017.
3. Ian Goodfellow, YoshuaBengio, Aaron Courville, "Deep Learning (Adaptive Computation and Machine Learning series", MIT Press, 2017.

REFERENCES:
1. Lingala Thirupathi, D.Rambabu, Thejoram Naresh Reddy Boya, Gattoju Saritha-Computer Networks and Simulation, Walnut Publication, 2022.
2. M. Tim Jones, ―Artificial Intelligence: A Systems Approach(Computer Science), Jones and Bartlett Publishers, Inc.; First Edition, 2008
3. Nils J. Nilsson, ―The Quest for Artificial Intelligence, Cambridge University Press, 2009.

Syllabus for B. Tech. III Year I-Semester
Computer Science and Engineering (AI&ML)
SUMMER INDUSTRY INTERNSHIP-I

Code: 8L491

L T P C
0 0 0 1

Prerequisite: All Courses till this Semester

Course Objectives:
To enhance the knowledge on selecting a project, learn related tools and enhance programming and communication skills for employability.

Course Outcomes:
At the end of this course the student will be able to
1. Use the concepts learned in the courses, so far, in conceptualizing, designing and executing the modules of the projects.
2. Exhibit the interest in learning the modern tools and technologies through the bridge courses arranged in the college, beyond the curriculum, and hence developing the software.
3. Inculcate an enthusiasm to use the creative ideas to build the innovative projects and prototypes which are meeting the current needs of the market and society as a whole.
4. Improve their communicative skills and team skills.

A summer industry internship project shall be carried out by a group of students consisting of 2 to 3 in number during summer third year first Semester at industries. This work shall be carried out under the guidance of the faculty assigned as internal guide as well as external guide at industry where students are carrying out summer industry internship projects. Project shall consist of design, fabrication, software development or building of prototype or application app. This can be of interdisciplinary nature also.

There will be 100 marks in total with 30 marks of internal evaluation and 70 marks of external
The **Internal Evaluation** shall consist of:
1. Day to day work (internal guide 10M external guide : 5M) :   15 Marks
2. Report   :   05 Marks
3. Demonstration / Presentation (Internal Presentation
   is evaluated by HOD, senior faculty and internal guide)   :   10 Marks
                                                                                               ----
                                                                                               30 Marks
End Examination   :   70 Marks.

Syllabus for B. Tech. III Year II-Semester
Computer Science and Engineering (AI &ML)
PRINCIPLES OF OPERATIONS RESEARCH
(Open Elective –II)

Code: 8BC53

L	T	P	C
2	0	0	2

Prerequisite : Linear Algebra and Calculus, Differential Calculus and Numerical Methods

Course Objectives:

The course aims at building capabilities in the students for analyzing different situations in the industrial/ business scenario involving limited resources and finding the optimal solution within constraints.

Course Outcomes:

1. Formulate and solve mathematical model (linear programming problem) for a physical situation like production, distribution of goods and economics.
2. Recognize and Solve the problem of transportation involving a large number of shipping routes with least transportation cost and generate optimal assignment strategy for different situations
3. Use Johnson's rule to create the optimal sequencing schedule for a sequencing problem and   make decisions about replacing an item using replacement policy
4. Analyze the performance measures of Queing system and Calculate the EOQ for minimizing the total inventory cost
5. Apply simulation techniques for solving various types of problems and general idea development about Markov chains

UNIT – I:

INTRODUCTION: Definition, Characteristics and Phases and Types of models, applications.

LINEAR PROGRAMMING PROBLEM- Formulation – Graphical solution, Simplex method-Types of variables, Unique and Multiple optimal solution, Redundancy & Degeneracy in LPP, Unbounded solution, Artificial variables techniques - Big-M method with feasible and infeasible solutions, Two–phase method, Primal to Dual formation with Duality Principle.

UNIT – II:

TRANSPORTATION PROBLEM – Formulation – methods of finding initial solution (NW corner, VAM, Least cost Method) Optimal solution (Stepping stone Method, MODI method) Special cases in TP: unbalanced, Degeneracy, Restriction and maximization case.

ASSIGNMENT PROBLEM – Formulation – Optimal solution (Hungarian Method) - Variants of Assignment Problem-Unbalanced, Restriction, Maximization, Airlines layover case, Traveling Salesman problem.

UNIT – III:

SEQUENCING – Introduction – Terminology, Assumptions, Johnson's procedure- Processing n jobs through two machines – Processing n jobs through three machines – Processing two jobs through 'm' machines (Gantt Chart).

REPLACEMENT: Introduction – Types of failure, Replacement of items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail completely, Group replacement.

UNIT – IV:

THEORY OF GAMES: Introduction and Terminologies, Criterion and optimal strategy – Solution of games with saddle points: Mixed Strategies-Rectangular games without saddle points, Dominance principle, Average Relational Dominance, m X 2 & 2 X n games - Graphical method and Sub Game Method, Matrix Method, Application of LPP in game theory.

UNIT – V:

WAITING LINES: Introduction, Terminology, Structure of a queue, calling population characteristics-size, behavior, pattern of arrivals, Kendall-Lee notation, Queuing Models: Single Channel: Poisson arrivals: exponential service times: with finite and infinite population, Multichannel: Poisson arrivals: exponential service times with infinite population

INVENTORY : Introduction, Inventory costs, Concept of EOQ, Single item Deterministic models with and without shortages, Single item inventory models with one price break and multiple price breaks, Stochastic models – Instantaneous demand and no set up cost.

UNIT – VI:

SIMULATION: Definition – Types of simulation – phases of simulation– applications of simulation – Inventory and Queuing problems – Advantages and Disadvantages
Markov chains: Introduction to Markov chains, Analysis Assumptions, Input output probabilities, Applications (Only basic understanding)

TEXT BOOKS:
1. Operations research / Hira & Gupta
2. Operation Research /J.K.Sharma/Macmillan Publishers.

REFERENCES:
1. Quantitative Techniques in Management: N D Vohra, TMH

Syllabus for III B.Tech. II-Semester
Computer Science and Engineering (AI & ML)
ADVANCED ENTREPRENEURSHIP
(Open Elective –II)

L T P C
2 0 0 2

Code : 8ZC23

Prerequisite: Basics of Entrepreneurship

Course Objectives :
The course is designed to impart the necessary managerial skills and tactics required for an emerging Entrepreneur for the Engineering students to enhance their prospects as an Entrepreneur.

Course Outcomes :
At the end of this course, the students will be able to
1. Gain knowledge on the stages of Startup and the turbulence environment it undergoes and the stages related to growth of the Startup.
2. Exposed to the various business models and critically evaluating the effectiveness of the business models and products
3. Understand the method of business traction, create roles and build their A- team
4. Understand the various channels of revenue building and exploration of new revenue avenues.
5. Understand the need of sales planning and people plan and also financial modeling
6. Exposed to the legal implications affecting the company's prospects and identifying right mentors and advisors to support startups

UNIT – I
Fundamentals of Entrepreneurship & Refining Business Model and Product:
Fundamentals and key concepts of entrepreneurship, refining the business model, products and services, pivoting, types of business models, business model evolution, generating new business models, analyzing the business model, adding new customer segment, product manager, significance and role of product manager.

UNIT – II
Business Planning & Exploring Revenue: Business plan, sales plan, hiring sale team, people plan, financial planning, financial forecasting, create a procurement plan, negotiating role play, understanding primary revenue sources, exploring customer lifecycle for growth customers, exploring and identify secondary sources of revenue,

UNIT- III
Funding the Growth & Building the A-Team: Overview of funding, funding options for an entrepreneur, explore the right funding options, create funding plan, pitch deck, introduction to building A-Team, pitching to attract the talent, setting your team, defining roles, hiring the A-Team members.

UNIT- IV
Brand and Channel Strategy & Leveraging Technologies: Introduction to branding, drawn the venture's golden circle, positioning and positioning statements, creating brand name, logo, social media handle, identify right channels, leaping ahead with technology,

digital marketing for startups, plan a social media campaign, digital collaboration, store documents online, other technology platforms, make tech plan, platform wish list.

UNIT –V
Measuring Progress and Legal Matters: Metrics for customer acquisition (CAC, CLV, and ARPU), metrics for customer retention and satisfaction, find CAC, CLV and ARPU, key financial metrics, communicate metrics, new revenue stream through key financial metrics, re-forecasting of financial plan, identify professional help for legal and compliance requirements, searching of trademark and brand name and company name.

UNIT –VI
Seeking Support and Final Project: Mentors help to create successful startups, identify mentors and advisors, importance of mentors and advisors, scout the board of directors, overview on final project, capstone project presentation, contents of capstone project.

TEXT BOOKS:
1. Entrepreneurship Rajeev Roy, oxford, 2012.
2. Entrepreneurship Development Khanka, S.Chand 2012.

REFERENCES:
1. Small Scale industries and Entrepreneurship Vasanth Desai "Himalya publishing 2012.
2. Robert Hisrich et al "enterpreneruship TMH 2012.
3. Entrepreneurship Development Khanka, ,S.Chand 2012.
4. Entrepreneurship Development B.Janikairam and M Rizwana.
5. E-resource: - www.learnwise.org .

Syllabus for III B.Tech. II-Semester
Computer Science and Engineering (AI & ML)
ENTREPRENEURSHIP PROJECT MANAGEMENT AND STRUCTURED FINANCE
(Open Elective –II)

Code : 8ZC19

Prerequisite: Basics of Entrepreneurship.

L	T	P	C
2	0	0	2

Course Objectives :
Make students understand the nature of Entrepreneurship, its importance and to create an awareness regarding the systematic planning and implementation of projects; highlight the components of structured finance and establish a framework of CMBS with respect to Servicing Agreements

Course Outcomes :
At the end of this course, the students will be able to:
1. Students will understand the nature of Entrepreneurship and its importance.
2. Will gain knowledge regarding project, its life cycle and organization.
3. Will gain knowledge relating to project formulation.
4. Comprehend the components of structured finance
5. Establish a framework of CMBS
6. Students will gain knowledge relating to the CRE Servicing

UNIT-I:
CONCEPTS OF ENTREPRENEURSHIP: Definition of Entrepreneurship, Evolution of Entrepreneurship, Classification of Entrepreneurs**,** Characteristics of Entrepreneur**,** Selection of Product and the means required for starting an enterprise, Financing and Financial incentives available, Success rate of entrepreneurs – a case study.

UNIT-II
BASICS OF PROJECT MANAGEMENT: Concept and characteristics of a project - types of projects - Objectives of project management - Project Organizational structure - Project life cycle - Challenges and problems of project management - Qualities & functions of a project manager.

UNIT-III
PROJECT FORMULATION AND IMPLEMENTATION: Generation of Project Ideas; Monitoring the environment; Preliminary Screening of Projects; Feasibility study; Project Selection. Detailed Project Report: Market, Technical, Financial and Economic aspects. Pre-requisites for Successful Project Implementation; Control of in-progress Projects (Gantt chart, PERT, CPM); Project Risk Management Process, Post-audit; Abandonment Analysis

UNIT-IV
INTRODUCTION TO STRUCTURED FINANCE: Term Loans, Bonds/Debentures, Types of debentures, Issue of debt instruments. Structured Finance: Evolution, Securitization process, characteristics, and structured finance products (ABS, CDO, MBS, CDS)

UNIT-V
COMMERCIAL MORTAGAGE LOAN BASICS: Definition and characteristics of CMBS, CMBS Vs other Mortgage Backed Securities, CMBS three level perspective: property level, loan level, bond level; Life cycle of commercial real estate loans – Loan cycle, Key players in loan cycle; Property types and characteristics, property performance.

B.Tech.-CSE(AI&ML)-A20

UNIT-VI
BASICS OF CRE SERVICING: Introduction to servicing, Role of the Servicer, Servicing approaches, Influence of technology, Ethics in commercial servicing, Servicing – sources of income, Overview of servicing agreements, Pooling & Servicing agreement, Sub servicing agreement.

TEXT BOOKS:
1. H. Nandan, Fundamentals of Entrepreneurship, Prentice Hall of India, First Edition, New Delhi, 2007.
2. Jeffrey K. Pinto "Project Management", 2nd edition, Pearson.

REFERENCES:
1. DhandapaniAlagiri "Structured Finance – Concepts & Perspectives", ICFAI University press.
2. Projects by Prasanna Chandra, McGraw-Hill Publishing Co. Ltd
3. Project Management: Systems approach to Planning Scheduling and Controlling, H. Kerzner.
4. The Complete Real Estate Documents by Mazyar M. Hedayat, John J. Oleary
5. The Fundamentals of Listing and Selling Commercial Real Estate - By Keim K. Loren (Author).

Syllabus for III B.Tech. II-Semester
Computer Science and Engineering (AI & ML)
BASICS OF POLITY AND ECOLOGY
(Open Elective –II)

Code: 8ZC26

L	T	P	C
2	0	0	2

Course Objectives :
To provide basic knowledge relating to the Indian Polity and Ecology, thus making the students appreciate the current aspects related to both polity and ecology.

Course Outcomes :
At the end of this course, the students will be able to
1. Outline knowledge relating to the Indian Constitution and the Preamble to the Constitution.
2. Relate to the fundamental rights and duties of the Indian citizens and the directive principles of state policy.
3. Identify about the federal structure and judiciary of India.
4. Understand knowledge relating to the conservation of the environment.
5. Analyze about bio-diversity and climatic changes occurring in the environment.
6. Discuss about the international treaties, conventions and organizations active in the field of environmental protection.

UNIT-I
Introduction to Salient Features of Constitution Significance of the Constitution, Distinction between Written and Unwritten Constitution, Composition of the Constituent Assembly and the role and objectives of the Drafting Committee, Main features and the nature of the Constitution of India. Preamble to the Constitution and its relevance; Basic principles of Preamble and their reflection in the constitutional provisions.

UNIT-II
Fundamental Rights, Duties and Directive Principles of State Policy Fundamental Rights and Duties of Citizens- Importance of Rights and Duties, Dignity of an individual, Safeguards against deprivation of life and personal liberty; Writs for the protection of Fundamental Rights; Meaning of Directive Principles of State Policy, Classification of the Directive Principles, Role of Directive Principles, Role of Directive Principles in the establishment of economic and social democracy.

UNIT- III
Government and Judiciary Legislative, financial and judicial powers of the President; Appointment of Prime Minister and constitution of Council of Ministers; Powers and functions of Prime Minister; Individual and collective responsibility; Powers and discretionary powers of the Governor; Appointment of the Chief Minister, Formation of the Council of Ministers; Powers and jurisdiction of the Supreme Court and High Courts of India.

Unit- IV
Ecology and Environment Environment-Origin, Evolution of Environment and its uses by Humans; Degradation of Natural Environment, Principles of Ecology; Composition and various types of Ecosystem; International Solar Alliance.

Unit -V

Bio-diversity and Climate Change Classification of Biodiversity, Biodiversity loss, Methods of biodiversity conservation, Conservation of Natural Resources such as Soil, Land, Water and Energy. Sustainable Development and Cleaner Technology. Green house effect and Global Warming, Strategies to cope with Green House Effect, Desertification, Depletion of ozone layer.

Unit-VI

International Treaties, Conventions & Organizations: Indian Board for Wildlife (IBW). United Nations Environmental Programme (UNEP), United Nations Framework Convention for Climate Change (UNFCCC). International Union for conservation of Nature and National Resources (IUCN), World Wide Fund for Nature (WWF).Montreal Protocol (1987), Kyoto Protocol (1997), Paris Agreement (2016).

TEXT BOOKS:
1. Indian Polity - M. Laxmikanth, 5th Edition, McGraw Hill Education, Chennai.
2. Environment And Ecology A Complete Guide for Civil Services Preliminary and Main Examinations – R. Rajgopalan, 2017, Oakbridge Publishing Pvt. Limited.

REFERENCES:
1. Introduction to Constitution of India – Dr. Durga Das Basu, 22nd Edition, 2015, LexisNexis.
2. Our Constitution – Subhash C Kashyap, 5th Edition, 2015, National Book Trust, India
3. Environment and Ecology – Anil Kumar De and Arnab Kumar De, 2009, New Age International (P) Limited.
4. ICSE Environment Education for Class X – Dr. M.P. Mishra , 2009, S.Chand and Company.

Syllabus for B. Tech. III Year II-Semester
Computer Science and Engineering (AI & ML)
CRYPTOGRAPHY AND NETWORK SECURITY
(Professional Elective –II)

Code: 8LC15

L T P C
3 0 0 3

Course Objectives:
1. The students should learn all cryptographic algorithms, attacks on information passing through the network.
2. After completion of this course, they are in a position to implement several authentication and encryption algorithm. They understand the security protocols in different layers.

Course Outcomes:

At the end of this course, the students will be able to
1. Understand the most common type of security attacks.
2. Understand the Encryption Principles, public key cryptography and algorithms.
3. Understand security protocols for protecting data on networks.
4. Be able to digitally sign emails and files.
5. Understand vulnerability assessments and the weakness of using passwords for authentication

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, Internet Standards and RFCs.

UNIT - II
Conventional Encryption Principles, Conventional encryption algorithms: DES, TDES, AES, cipher block modes of operation, location of encryption devices, key distribution, Approaches of Message Authentication, Secure Hash Functions: SHA1 and HMAC.
Public key cryptography principles, public key cryptography algorithms: RSA, DIFFIE HELL MAN, digital signatures, digital Certificates, Certificate Authority and key management
Kerberos, X.509 Directory Authentication Service.

UNIT - III
Email privacy: 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.

UNIT – V
Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET).
Intruders, Viruses and related threats.

UNIT - VI
Firewall Design principles, Trusted Systems. Intrusion Detection Systems.

TEXT BOOKS:
1. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.
2. Hack Proofing your network by Ryan Russell, Dan Kaminsky, Rain Forest Puppy, Joe Grand, David Ahmad, Hal Flynn Ido Dubrawsky, Steve W.Manzuik and Ryan Permeh, Wiley Dreamtech.

REFERENCES:
1. Fundamentals of Network Security by Eric Maiwald,Dreamtech Press.
2. Network Security - Private Communication in a Public World by Charlie Kaufman, Radia Perlman and Mike Speciner, Pearson/PHI.
3. Cryptography and network Security, Third edition, Stallings, PHI/Pearson.

Syllabus for B. Tech. III Year II-Semester
Computer Science and Engineering (AI & ML)
SOFTWARE PROJECT MANAGEMENT

(Professional Elective –II)

Code : 8FC13
L T P C
3 0 0 3

Prerequisites : Software Engineering Concepts.

Course Objectives:
Software Project Management course aims to give the students an understanding of the building blocks of software projects and induces the essence of project management. The spectrum of topics covered in this subject including software lifecycle, software economics, artifacts, processes, workflows, architecture, planning etc help strengthen the fundamentals of the student enabling them to have a deeper understanding of software project management.

Course Outcomes:
At the end of this course the student will be able to
1. Explain primitives of Project Planning and evolution of software economics.
2. Describe software economics; reduce Software product size, improvement in software processes, improving team effectiveness, improving automation, Achieving quality.
3. Explain Life cycle phases and Artifacts of the process.
4. Describe Model based software architectures and Work Flows.
5. Apply Checkpoints for a process such as Major mile stones, Minor Milestones and apply work breakdown structures for a iterative process within cost and schedule. Describe Project Organizations and Responsibilities.
6. Describe Automation and Project Control and Process instrumentation and explain Future Software Project Management such as Modern Project Profiles and Next generation project management.

UNIT-I
Concept of Management: Management Definition, Role and Responsibilities of Management, Management in Software Industry
Types of Software Organizations: Start-up companies, Independent Software Companies, Multi-National Software Companies.
Conventional Software Management: The waterfall model, conventional software Management performance.
Evolution of Software Economics: Software Economics, pragmatic software cost estimation.

UNIT-II
Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.
The old way and the new way: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

UNI-III
Life cycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases.

Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

UNIT-IV
Model based software architectures: A Management perspective and technical perspective.
Work Flows of the process: Software process workflows, Iteration workflows.

UNIT-V
Checkpoints of the process: Major mile stones, Minor Milestones, Periodic status assessments. **Iterative Process Planning:** Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning. **Project Organizations and Responsibilities:** Line-of-Business Organizations, Project Organizations, evolution of Organizations.

UNIT-VI
Process Automation: Automation Building blocks, The Project Environment.
Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations,
Future Software Project Management: Modern Project Profiles, Next generation Software economics, modern process transitions.
Case study: The command center processing and display system – Replacement (CCPDS-R)

TEXTBOOKS:
1. Software Project Management, Walker Royce: Pearson Education, 2005.

REFERENCES:
1. Management Concepts and Practices, Tim Hannagan, FT Prentice Hall, 5th Edition
2. Software Project Management, Bob Hughes and Mike Cotterell: Tata McGraw-Hill Edition.
3. Software Project Management, Joel Henry, Pearson Education.
4. Software Project Management in practice, Pankaj Jalote, Pearson Education.2005.

Syllabus for B. Tech. III Year II-Semester
Computer Science and Engineering (AI&ML)
INFORMATION RETRIEVAL SYSTEMS
(Professional Elective –II)

Code : 8JC03

L	T	P	C
3	0	0	3

Course Objectives

1. To learn the important concepts and algorithms in IRS
2. To understand the data / file structures that are necessary to design, and implement information retrieval (IR) systems.

Course Outcomes :

1. Ability to apply IR principles to locate relevant information large collections of data
2. Ability to design different document clustering algorithms
3. Implement retrieval systems for web search tasks.
4. Design an Information Retrieval System for web search tasks.

UNIT - I

Introduction to Information Retrieval Systems: Definition of Information Retrieval System, Objectives of Information Retrieval Systems, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses.

UNIT - II

Information Retrieval System Capabilities: Search Capabilities, Browse Capabilities, Miscellaneous.
Capabilities Cataloguing and Indexing: History and Objectives of Indexing, Indexing Process, Automatic Indexing, Information Extraction.

UNIT - III

Data Structure: Introduction to Data Structure, Stemming Algorithms, Inverted File Structure, N-Gram Data Structures, PAT Data Structure, Signature File Structure, Hypertext and XML Data Structures, Hidden Markov Models.

UNIT - IV

Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages.
Document and Term Clustering: Introduction to Clustering, Thesaurus Generation, Item Clustering, Hierarchy of Clusters.

UNIT - V

User Search Techniques: Search Statements and Binding, Similarity Measures and Ranking, Relevance Feedback, Selective Dissemination of Information Search, Weighted Searches of Boolean Systems, Searching the INTERNET and Hypertext.
Information Visualization: Introduction to Information Visualization, Cognition and Perception, Information Visualization Technologies.

UNIT - VI

Text Search Algorithms: Introduction to Text Search Techniques, Software Text Search Algorithms, Hardware Text Search Systems
Multimedia Information Retrieval: Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph Retrieval, Imagery Retrieval, Video Retrieval.

TEXT BOOKS :

1. Information Storage and Retrieval Systems–Theory and Implementation, Second Edition, Gerald J.Kowalski, MarkT.Maybury, Springer.

REFERENCES :

1. Frakes, W.B. ,Ricardo Baeza- Yates: Information Retrieval Data Structures and Algorithms ,PrenticeHall, 1992.
2. Information Storage& Retrieval By Robert Korfhage–John Wiley&Sons.
3. Modern Information Retrieval By Yates and Neto Pearson Education.

Syllabus for B. Tech. III Year II-Semester
Computer Science and Engineering (AI & ML)
INTRODUCTION TO INTERNET OF THINGS
(Professional Elective –II)

Code: 8IC45

L T P C
3 0 0 3

Prerequisite: Data Communications and Networks

Course Objective :
1. To understand the fundamentals of internet of things.
2. To understand Raspberry PI platform.

Course Outcomes:

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

1. Getting familiar with terminology, technology and applications of IOT
2. Understand and explain IoT system management using M2M (machine to machine) with necessary protocols
3. Design and develop Python Scripting Language programs preferred for many IoT applications
4. Use Raspberry PI as a hardware platform for designing the IoT sensor interfacing
5. Implement web based services for IoT
6. Understand and analyze the case studies illustrating IoT Design

UNIT-I:
Introduction to Internet of Things: Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IoT enabled Technologies like Wireless Sensor Networks, Cloud Computing, Big data analytics, and Communication protocols, Embedded Systems, IoT Levels and Templates.

UNIT-II
IoT and M2M Software defined networks, network function virtualization, difference between SDN and NFV for IoT; Basics of IoT System Management with NETCOZF-YANG (Block Diagrams).

UNIT-III
Developing IoT, IoT Design Methodology – The 10 steps design methodology; Logical design using Python: Introduction to Python - Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, date/time operations, Python packages of interest for IoT.

UNIT-IV
 IoT Physical Devices and End points Raspberry PI – Introduction to Raspberry PI and its Interfaces (serial, SPI, I2C) Programming – Python programming with Raspberry PI – Controlling Input / output (Interfacing with LED and LDR).

UNIT-V
IoT Physical Servers and Cloud Offerings Cloud concepts (IaaS, PaaS, Saas), Introduction to Cloud Storage models and communication APIs – WAMP, Xively; Python web application framework with Django, Designing a RESTful web API.

UNIT-VI

Case Studies Illustrating IoT Design Home Automation – Smart Lighting, Home intrusion detection, Cities – Smart parking, Environment – Weather monitoring system, Weather reporting bot, Air pollution monitoring, Forest fire detection, Agriculture – Smart irrigation, Productivity applications – IoT printer.

TEXT BOOKS:
1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547.
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759.

REFERENCES:
1. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015 3. Editors Ovidiu Vermesan
2. Peter Friess,'Internet of Things – From Research and Innovation to Market Deployment', River Publishers, 2014
3. N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2014.

Syllabus for B. Tech. III Year II Semester
Computer Science and Engineering (AI & ML)
AUTOMATA THEORY AND COMPILER DESIGN
Code : 8FC07

L	T	P	C
2	1	0	3

Course Objectives:

1. Learn principles of Finite state machine, finite automation models, and transition diagrams.
2. Understand regular languages and expressions for writing grammars.
3. Understand context free grammars useful in designing compilers.
4. Study the design and working of a complier.
5. Study the role of grammars in compiler design.
6. Learn the various parsing techniques for design of compilers.

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

1. Design the finite automata different Languages

2. Construct finite Automata for a given regular expression, and derive strings with suitable examples. Conceptualize context free grammars and normal forms.

3. Design the push down automata and Turing Machine for complex languages.

4. Understand LEX tool and relate parsing techniques,

5. Demonstrate and solve problems on SLR, CLR, LALR, operator precedence parser, LR (O), LR(1), LR(K) grammar and use YACC tool.

6. Understand Semantic Analysis concepts to design compiler: and describe Intermediate code generation such as 3-address code form.

UNIT-I
Strings, Alphabet, Language, Operations, finite automaton model, acceptance of strings, and languages, deterministic finite automaton and non-deterministic finite automaton, Equivalence between NFA to DFA conversion.

UNIT-II
Regular Languages, Regular sets, regular expressions, Constructing finite Automata for a given regular expression, Conversion of Finite Automata to Regular expressions. Closure properties of regular sets (proofs not required).
Context Free Grammars: Context free grammar, derivation trees, Right most and leftmost derivation of strings, Ambiguity in context free grammars, Minimization of Context Free Grammars, Chomsky normal form, Greiback normal form.

UNIT-III
Push down automata: definition, model, acceptance of CFL, Introduction to DCFL and DPDA. **Turing Machine:** Turing Machine, definition, model, design of TM, recursively enumerable languages. Chomsky hierarchy of languages

UNIT- IV
Overview of compiler – Environment, pass, phase, phases of compiler, LEX tool.

Top Down Parsing: Top down parsing technique, Recursive decent parsing with back tracking, Ambiguous grammar, Elimination of left recursion, Left factoring, Predictive parsing, LL (1).

UNIT-V
Bottom up parsing: shift reduce parser SLR, CLR, LALR, operator precedence parser, LR (O), LR(1), LR(K) grammar, YACC tool.

UNIT-VI
Semantic Analysis: Syntax directed translation, S- Attributed, L Attributed definition, Type checker, Intermediate code generation: 3-address code form, DAG. Code optimization: Optimization, loop optimization, peep-hole optimization, Symbol table format.

TEXTBOOKS:
1. Introduction to Automata Theory Languages and Computation. Hopcroft H.E. and Ullman J. D. Pearson Education.
2. Introduction to Theory of Computation, Sipser 2nd edition Thomson.
3. Compilers Principles, Techniques and Tools Aho, Ullman, Ravisethi, Pearson Education.

REFERENCES:
1. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
2. Introduction to languages and the Theory of Computation ,John C Martin, TMH.
3. Elements of Theory of Computation?, Lewis H.P. & Papadimition C.H. Pearson /PHI.
4. Theory of Computer Science Automata languages and computation -Mishra and Chandrashekaran, 2nd edition, PHI Course Requirements.
5. Modern Compiler Construction in C , Andrew W.Appel Cambridge University Press.
6. Compiler Construction, LOUDEN, Thomson.

Syllabus for B. Tech. III Year II Semester
Computer Science and Engineering (AI & ML)
CYBER SECURITY AND CYBER LAWS

Code: 8FC08

L	T	P	C
3	0	0	3

Course Objectives:
1. To learn fundamentals of cryptography and its application to network security.
2. To understand network security threats, security services, and countermeasures.
3. To learn computer security, Internet, E-commerce and E-governance with reference to Free
4. Market Economy
5. To learn International Efforts relating to Cyberspace laws and Cyber crimes
6. To learn Law relating to electronic records and intellectual property rights in India
7. To understand ethical laws of computer for different countries.
8. To learn Penalties, Compensation and Offences under the Cyberspace and Internet in India
9. To learn Miscellaneous provisions of IT Act and Conclusions

Course Outcomes:
At the end of this course the student will be able to
1. Familiarize the cryptographic procedures and Understand its primitives
2. Outline Security policy in Legislation and Comprehend E-Commerce frame work, models and its associated threats
3. Justify the role of electronic signatures in E-Commerce and summarize the various laws relating to it.
4. Categorize international cyber laws and cyber crimes.
5. Explore Penalties, Compensation and Adjunction of violations of provisions of IT Act 2000
6. Classify and Outline the offences under the Cyberspace law and the Internet in India

UNIT-I
Introduction to cyber Security, cryptography, Types of Attacks, Secrete Key Cryptography
Introduction: Cyber attacks, Defense Strategies and Techniques Mathematical background for Cryptography: Modulo arithmetic, The greatest common divisor, Useful Algebraic Structures, Chinese Remainder Theorem Basics of Cryptography: Secret versus Public key Cryptography, Types of attacks, Elementary substitution Ciphers, Elementary Transposition Ciphers, Other Cipher Properties Secrete Key Cryptography: Product Ciphers, DES Construction, Modes of Operation, MAC and other Applications, Attacks, Linear Crypt analysis.

UNIT-II
Introduction to Computer Security, Internet, E-commerce and E-governance with reference to Free Market Economy
Definition, Threats to security, Government requirements, Information Protection and Access Controls, Computer security efforts, Standards, Computer Security mandates and legislation, Privacy considerations, International security activity, Conceptual Framework of E-commerce: governance, the role of Electronic Signatures in E-commerce with Reference to Free Market Economy in India.

UNIT-III
Law relating to electronic records and intellectual property rights in India

Legal aspects of Electronic records / Digital signatures, Cyber laws, the roles and regulations of Certifying Authorities in India, Protection of Intellectual Property Rights in Cyberspace in India.

UNIT-IV
International Efforts relating to Cyberspace laws and Cyber crimes

International efforts related to Cyber laws, Council of Europe (COE) convention on Cyber Crimes.

UNIT-V
Penalties, Compensation

Penalties, Compensation and Adjunction of violations of provisions of IT Act 2000 and judicial review.

UNIT-VI
Offences under the Cyberspace, Internet in India and Miscellaneous provisions of IT Act and Conclusions

Some important offences under the Cyberspace law and the Internet in India, Other offences under the Information Technology Act in India, The role of Electronic Evidence and miscellaneous provisions of the IT Act.

TEXT BOOKS:
1. Network security and Cryptography by Bernard Menezes CENGAGE Learning Publications, 2010.
2. Cyber Laws and IT Protection, Harish Chander, PHI, 2012.

REFERENCES:
1. Debby Russell and Sr. G.T Gangemi, "Computer Security Basics (Paperback)", 2ndEdition, O' Reilly Media, 2006.
2. Wenbo Mao, "Modern Cryptography – Theory and Practice", Pearson Education, New Delhi, 2006.
3. Cyberspace and Cybersecurity, George Kostopoulos, Auerbach Publications, 2012.
4. Cyber Forensics: A Field Manual for Collecting, Examining, and Preserving Evidence of Computer Crimes, Second Edition, Albert Marcella, Jr., Doug Menendez, Auerbach Publications, 2007.

Syllabus for B. Tech. III Year II Semester
Computer Science and Engineering (AI & ML)
WEB TECHNOLOGIES

Code: 8EC07

L	T	P	C
2	1	0	3

Prerequisite:
1. Data Communications and Computer Networks Concepts.
2. Object Oriented Programming through Java.

Course Objectives:
1. To understand the basics of Web Designing using HTML and CSS
2. Perform the client-side scripting with JavaScript.
3. Understand the different data stores XML, and JSON with full-stack web application development using Angular and study with Server-side programming using Java Servlets and PHP.

Course Outcomes:
At the end of this course the student will be able to
1. Demonstrate the use of HTML tags. Apply Styles using CSS and Bootstrap.
2. Develop scripts using XML and validate using parsers.
3. Appraise the Expressions, Filters, Directives, Controller, and Modules of Angular.
4. Design responsive web applications.
5. Comprehend the uses of Web servers and design the server-side scripts using Servlets.
6. Design and develop server-side scripts and components using PHP.

UNIT-I
Client-Side Web Development. (Text Book 1)
HTML 4 - List, Tables, Images, Forms, Div. (with all attributes and sub-elements)
Cascading Style sheets 3 - Selectors (Basic, Combinatory, Attribute, Pseudo-class, Pseudo Element) using properties (font, background),
Bootstrap basics (Text Book 2)
JavaScript - Introduction, variables, objects (Boolean, Number, String, Date, Math, Regular expression, Array), Function, Event handlers (mouse, keyboard, window), Using CSS with JavaScript. Introduction to **Typescript**.(Text Book 2)

UNIT-II
Data Store
XML: DTD, XML Schemas, Using XML Processors: DOM Parser and SAX Parser. (Text Book 1)
JSON: Introduction, JSON vs XML, Data Types, Parsing JSON, stringify(), Objects, Array, JSON HTML, JSONP (Refer to Textbook: 1 and 5)

UNIT-III
Application Development Using Angular: (Part –I) (Text Book 2)
Basics: MVC-The Angular way, Features of Angular, Model-View-Controller, My First Angular app.
Expressions: Angular Expressions, Angular vs JavaScript.
Filters: Built-In Filters, Using Angular Filters, Creating Custom Filters.
Directives: Introduction to Directives, Directive Lifecycle, Binding controls to data, Matching directives, Using Angular built-in directives, creating a custom directive.

Controllers: Role of a Controller, Controllers & Modules, Attaching Properties and functions to scope, Nested Controllers, Using Filters in Controllers, Controllers in External Files.

Modules: Introduction to Angular Modules, Bootstrapping Angular.

UNIT-IV
Application Development Using Angular: (Part- II) **(Text Book 2)**
Forms: Working with Angular Forms, Model Binding, Forms Events, Updating Models with a Twist, Form Controller, Validating Angular Forms, $error object.

Scope: Scope Lifecycle, Scope Inheritance, Scope & Controllers, Root scope, Scope Broadcasting, Two-way data binding, Scope Inheritance, Scope & Directives, $apply and $watch, Scope Events.

Dependency Injection & Services: Dependency Injection, Creating Services, Factory, Service & Provider, Using Dependency Injection, Using Angular built-in services.

Single Page Application (SPA): SPA and its Pros and Cons, Passing Parameters, Changing location, installing the Route module, Configure routes, Resolving promises, Creating Single Page Apps.

UNIT-V
Web Hosting (Text Book 3)
Introduction to Servlets, Lifecycle of a Servlet, Servlet API: javax.servlet package, javax.servlet.http package, Reading Servlet Context Parameters, Reading Initialization parameters, Request Dispatcher Handling HTTP Requests & Responses, Session Tracking.

UNIT-VI
Server Scripting Language: PHP (Text Book 1)
Declaring variables, data types, array, string, operators, Expression, control statement, function, Reading data from form controls like text boxes, radio buttons, lists, etc.

Handling file upload, connecting to the database with CRUD operation (Mysql as reference), Handling sessions and cookies. File handling in PHP.

TEXTBOOKS:
1. Web Programming: Building Internet Applications, 3rd Edition, Chris Bates, Wiley Publications.
2. Angular - The Complete Guide [2021 Edition], Maximilian Schwarzmuller, Packt Publishing.
3. Head First Servlets and JSP, 2nd Edition by Kathy Sierra, Bryan Basham, Bert Bates, O'Reilly Media, Inc.

REFERENCES:
1. Programming the World Wide Web, Robert W. Sebesta.
2. Building Web Applications with TypeScript, Angular and React, Sahil Malik, Ivo Gabe de Wolff, Gabriel Isenberg, Packt Publishing.

Syllabus for B. Tech. III Year II Semester
Computer Science and Engineering (AI & ML)
BIG DATA ANALYTICS

Code: 8EC18

L T P C
2 1 0 3

Prerequisites: Machine Learning

Course Objectives:

1. To explore the fundamental concepts of big data analytics.
2. To understand storage and parallel processing of Big Data using Hadoop
3. To introduce programming tools like HIVE, SQOOP, HBASE in Hadoop ecosystem.
4. To understand the applications using Apache Spark RDD Concepts.
5. To know high level API like Data Frames and Spark SQL
6. To teach the fundamental techniques and principles in achieving big data analytics with stream processing.

Course Outcomes:
At the end of this course, the student will be able to
1. Comprehend the fundamentals of big data analytics and understand how Hadoop solves the big data problem in real life.
2. Interpret the challenges with big data and elaborate the knowledge about the technological developments in big data environment.
3. Demonstrate the difference between NOSQL and SQL databases.
4. Discuss the Hadoop distributed file system (HDFS) framework and anatomy of Hadoop map-reduce.
5. Design the algorithms to process big data using Apache Spark Low Level API.
6. Apply Hadoop Data Analysis to social Media Analytics and Opinion Mining on Tweets.

UNIT– I
Introduction to Big Data: Big Data Analytics, Characteristics of Big Data – The Four Vs, importance of Big Data, Different Use cases, Data-Structured, Semi-Structured, Un-Structured
Introduction to Hadoop and its use in solving big data problems. Comparison Hadoop with RDBMS, Brief history of Hadoop, Apache Hadoop EcoSystem, Components of Hadoop, The Hadoop Distributed File System (HDFS):, Architecture and design of HDFS in detail, Working with HDFS (Commands)

UNIT-II
Anatomy of Hadoop map-reduce (Input Splits, map phase, shuffle, sort, combiner, reduce phase) (theory)
Hive: Introduction to Hive, data types and file formats, HiveQL data definition(Creating Databases and Tables),HiveQL for Data loading, HiveQL data manipulation, Logical joins, Window functions, Optimization, Table partitioning, Bucketing, Indexing, Join Strategies.

UNIT-III
SQOOP : Introduction to SQOOP, SQOOP imports : From Database to HDFS/Hive, SQOOP exports: From HDFS/Hive to Database, Incremental imports
NoSQL &HBase: Overview, HBasearchitecture, CRUD operations

UNIT-IV
SPARK Basics: History of Spark, Spark Architecture, Spark Shell,Working with RDDs in Spark:RDD Basics, Creating RDDs in Spark. RDD Operations. Passing Functions to Spark, Transformations and Actions in Spark, Spark RDD Persistence
Working with Key/Value Pairs : Pair RDDs, Transformations on Pair RDDs, Actions Available on Pair RDDs

UNIT-V
Structured API :DataFrames,SQL : Overview of Structured Spark Types, Schemas, Columns and Expressions, DataFrame Transformations, Working with different types of data,
 Aggregations- Aggregation Functions, Grouping, User-Defined Aggregation Functions, ,Joins-Inner Joins, Outer Joins, Processing CSV Files, JSON Files, Text Files and Parquet Files, Spark SQL

UNIT-VI
Spark streaming:Stream Processing Fundamentals, Structured Streaming Basics - Core Concepts, Structured Streaming in Action, Transformations on Streams, Input and Output(Kafka)
Case study: Twitter Stream processing application

Text Books:
1. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley,2012
2. SPARK: The Definitive Guide, Bill Chambers &MateiZaharia, O'Reilley, 2018 Edition

REFERENCES:
1. "Hadoop Operations", O'Reilley, Eric Sammer, 2012.
2. "ProgrammingHive",O'Reilley,E.Capriolo,D.Wampler,andJ.Rutherglen, 2012.
3. "HBase: The Definitive Guide", O'Reilley, Lars George, 2011.
4. Big Data, Big Analytics: Emerging, Michael Minnelli, Michelle Chambers, and AmbigaDhiraj.

Syllabus for B. Tech. III Year II Semester
Computer Science and Engineering (AI & ML)

BIG DATA ANALYTICS LAB

Code: 8MC63

	L	T	P	C
	0	0	2	1

Course Objectives:
1. To provide the students with the knowledge of Big data Analyticsprinciples and techniques.
2. To give an exposure of the frontiers of Big data Analytics

Course Outcomes:
1. Use Excel as an Analytical tool and visualization tool.
2. Ability to program using HADOOP and Map reduce.
3. Ability to perform data analytics using ML in R.
4. Use Cassandra to perform social media analytics.

List of Experiments:

1. Implement a simple map-reduce job that builds an inverted index on the set of inputdocuments (Hadoop)
2. Process big data in HBase
3. Store and retrieve data in Pig
4. Perform Social media analysis using cassandra
5. Buyer event analytics using Cassandra on suitable product sales data.
6. Using Power Pivot (Excel) Perform the following on any dataset
   a) Big Data Analytics   b)Big Data Charting
7. Use R-Project to carry out statistical analysis of big data
8. Use R-Project for data visualization of social media data

TEXT BOOKS:
1. Big Data Analytics, Seema Acharya, Subhashini Chellappan, Wiley 2015.
2. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business, Michael Minelli, Michehe Chambers, 1st Edition, Ambiga Dhiraj, Wiely CIO Series, 2013.
3. Hadoop: The Definitive Guide, Tom White, 3rd Edition, O"Reilly Media, 2012.
4. Big Data Analytics: Disruptive Technologies for Changing the Game, Arvind Sathi, 1st Edition, IBM Corporation, 2012.

REFERENCES:
1. Big Data and Business Analytics, Jay Liebowitz, Auerbach Publications, CRC press (2013).
2. Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop, Tom Plunkett, Mark Hornick, McGraw-Hill/Osborne Media (2013), Oracle press.

Syllabus for B. Tech. III Year II Semester
Computer Science and Engineering (AI & ML)
WEB TECHNOLOGIES LAB AND COMPILER DESIGN LAB

Code : 8LC63

L	T	P	C
0	0	2	1

Prerequisite: Object Oriented Programming through Java Lab

Course Objectives:
1. To implement programs using HTML tags, Java scripts along with Event Handling.
2. To implement scripts using XML, DOM parser, and SAX parser for project development.
3. To implement the MVC architecture applications.
4. To experiment on the basic techniques of compiler construction and tools that can be used to perform syntax-directed translation of a high-level programming language into an executable code.

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

1. Demonstrate the use of HTML tags and be able to design web pages. Develop dynamic programs involving Java scripts, popup windows in JavaScript along Event Handling.
2. Develop scripts using XML and XSLT and read XML documents using parsers, DOM parser, and SAX parser. Develop JSON files and access them via HTML pages.
3. Implement Angular with Expressions, Filters, Directives, Controller, and Modules.
4. Develop a Single Page Application with implementation of Scope and Form.
5. Implement Java servlets using Apache Tomcat Server for User authentications
6. Develop an application in PHP with Database connectivity.
7. Implementation of DFA for a given Languages/ Regular Expression.

Hardware and Software required:

1. A working computer system with either Windows or Linux.
2. A web browser either Microsoft Edge or Firefox or Chrome.
3. Visual Studio IDE or Eclipse IDE.
4. XML editor like Altova Xml-spy [www.Altova.com/XMLSpy – free ,Stylus studio.
5. Tomcat web server and Apache web server.
6. XAMPP for PHP and Database programs JVM(Java virtual machine) must be installed on your system.

LIST OF EXPERIMENTS (WEB TECHNOLOGIES):

Week-1:

1. Create a web page with advanced layouts and positioning with CSS and HTML.
2. Design a website with different methods of embedding CSS in a web page.
3. Create a static web page which displays your personal details. (Hint: CSS3 and HTML5)
4. Create a web page through which the user can enter his / her details to become an authenticated user of that page.

Week-2:

1. Create a web page that shows different methods of embedding JavaScript with validation.
2. Create a web page with rollover menus. Rollover menus should be created using JavaScript.
3. Create a simple calculator, which can perform the basic arithmetic operations.

Week-3:

1. Write an XML file which will display the Book information which includes the following:

    1) Title of the book   2) Author Name   3) ISBN number

    4) Publisher name   5) Edition   6) Price
2. Write a Document Type Definition (DTD) or XML Schema Definition (XSD) to validate the above XML file.

Week-4:

1. Prepare a JSON file with Student information and display the content in HTML Table format.

Week-5:

1. Prepare a program that displays the name that we feed in the ng-init directive.
2. AngularJS expression can contain arithmetic operators which will produce the result based on the type of operands
3. Program for AngularJS expression can contain variables declared via ng-init directive.
4. Return the names that contain the letter "i".
5. Type a letter in the input field, and the list will shrink/grow depending on the match.
6. By using ng-click directive on the table headers, we can run a function that changes the sorting order of the array.
7. Creating a custom myFormat filter will format every other character to uppercase.

Week-6:

1. Program to implement any 5 directives from ng-app, ng-init, ng-model, ng-controller, ng-bind, ng-repeat, ng-show, ng-readonly, ng-disabled, ng-if, ng-click.
2. Demonstrates by attaching properties to the $scope object inside a controller and then displaying property value in HTML.
3. Program to handle click events of a button.
4. Program to implement complex and nested controllers
5. Create a module using controllers

Week-7:

1. Prepare a angular Student information form
2. Prepare a program to implement Scope & Directives, $apply and $watch

Week-8:

1. Write a program for Single Page Application (SPA) using angular.

Week-9:

1. Install APACHE TOMCAT web server and while installation, assign port number 8181. Make sure that this port is available i.e., no other process is using this port.

2. Write a servlet program to print welcome messages on the browser.
3. Develop a web application to pass the parameters from the HTML page and display them using servlet.

Week-10:

1. Develop a web application using servlet to perform Session Tracking with hidden form fields, cookies and url-rewriting and http sessions. (Files to developed- Html,Java, Web.xml)
2. Write a servlet using the RequestDispatcherclass and Develop a web application using servlet to perform the user Authentication:

A. Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Write a servlet for doing the following:

1. Create a Cookie and add these four user id's and passwords to this Cookie.

2. Read the user id and passwords entered in the Login form (week1) and authenticate with the values (user id and passwords) available in the cookies.

If he is a valid user(i.e., user-name and password match) you should welcome him by name(user-name) else you should display " You are not an authenticated user ".

Use init-parameters to do this. Store the user-names and passwords in the webinf.xml and access them in the servlet by using the getInitParameters() method.

B. Authenticate the user when he submits the login form using the username and password from the database.

Week-11:

1. Write a PHP to test the database connection
2. Write a PHP to create a Table.

Week-12:

1. Write a PHP to insert values form HTML to database (registration Page)
2. Write a PHP to insert values to a Database.
3. Write a PHP to select values from a database table.
4. Write a PHP to update existing records of a database table.
5. Write a PHP to validate user login

LIST OF EXPERIMENTS (COMPILER DESIGN):

1) Implement DFA accepting the language containing even binary numbers.
2) Implement DFA that accept all the strings of a's and b's 3rd symbol from is RHS always a
3) Implement DFA accepting the language of strings not ending with 00 over the input (0,1)
4) Implement the DFA that accepts all the string of a's and b's where number of a 's is divisible by 3 and number of b's is divisible by2.
5) write lex program to implement lexical analyzer functionality.
6) Write a lex program to count the number of words and number of lines in a given file or program.
7) Write a 'C' program to implement lexical analyzer using c program.

8) write recursive descent parser for the grammar E->E+T E->T T->T*F T->F
   F->(E)/id.

9) write recursive descent parser for the grammar S->(L)   S->a L->L,S L->S
10) Write a C program to calculate first function for the grammar
    E->E+T E->T T->T*F T->F   F->(E)/id

11) Write a YACC program to implement top down parser for the given grammar.
12) Write a YACC program to evaluate algebraic expression.

TEXTBOOKS:
1. Web Programming: Building Internet Applications, 3rd Edition, Chris Bates, Wiley Publications.
2. Angular - The Complete Guide [2021 Edition], Maximilian Schwarzmuller, Packt Publishing.
3. Introduction to Automata Theory Languages and Computation. Hopcroft H.E. and Ullman J. D. Pearson Education.
4. Introduction to Theory of Computation, Sipser 2nd edition Thomson.

REFERENCES:
1. Programming the World Wide Web, Robert W. Sebesta.
2. Building Web Applications with TypeScript, Angular and React, Sahil Malik, Ivo Gabe de Wolff, Gabriel Isenberg, Packt Publishing.
3. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
4. Introduction to languages and the Theory of Computation ,John C Martin, TMH.

Syllabus for B. Tech. III Year II Semester
Computer Science and Engineering (AI & ML)
COMPREHENSIVE TEST AND VIVA VOCE – V

Code: 8L680

L T P C
0 0 0 1

Prerequisite: All core Courses till this Semester

Course Objectives:
Prepare students in basics and advanced relevant courses to revise and face technical interviews for enhancing employability.

Course Outcomes:
At the end of this course the student will be:

1. Assessed the knowledge of the students in the Core and Elective subjects that they have studied till the completion of that academic year.

Comprehensive Viva Voce will be conducted in third year second Semester for 100 marks. Out of 100 marks 30 marks are evaluated internally and 70 marks for external evaluation.
Internal:
Comprehensive Viva Voce is conducted twice in a Semester and evaluated for 30 marks each and average will be considered for internal.
Internal Examination   :   30 Marks
End Examination   :   70 Marks.

External Evaluation of the project (viva-voce) shall be conducted by a committee appointed by the Chief Superintendent. The end examination will be carried out by a committee consisting of an external examiner, head of the department, and subject experts.

Syllabus for B. Tech. III Year II Semester
Computer Science and Engineering (AI & ML)
GROUP PROJECT

Code: 8L691

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Course Objectives:
To acquire basic knowledge on selecting a project, learn related tools and enhance programming and communication skills for employability.

Course Outcomes:
 At the end of this course the student will be able to
1. Use the concepts learned in the courses, so far, in conceptualizing, designing and executing the modules of the projects.
2. Exhibit the interest in learning the modern tools and technologies through the bridge courses arranged in the college, beyond the curriculum, and hence developing the software.
3. Inculcate an enthusiasm to use the creative ideas to build the innovative projects which are meeting the current needs of the market and society as a whole.
4. Improve their communicative skills and team skills largely improve.
5. Work as an individual and in a team.

A group project shall be carried out by a group of students consisting of 2 to 3 in number in third year first Semester. This work shall be carried out under the guidance of the faculty assigned as internal guide and shall involve design, fabrication, software development or any other significant activity. This can be of interdisciplinary nature also.

There will be 100 marks in total with 30 marks of internal evaluation and 70 marks of external

The **Internal Evaluation** shall consist of:

Day to day work	:	15 Marks
Report	:	05 Marks
Demonstration / Presentation	:	10 Marks
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		30 Marks
End Examination	:	70 Marks.

External Evaluation of the project (viva-voce) shall be conducted by a committee appointed by the Chief Superintendent. The end examination will be carried out by a committee consisting of an external examiner, head of the department, a senior faculty member and the supervisor.

Syllabus for B. Tech. IV Year I Semester
Computer Science and Engineering (AI & ML)
BLOCKCHAIN TECHNOLOGIES
(Professional Elective –III)

Code: 8EC13

L	T	P	C
3	0	0	3

Prerequisite: Information Security

Course Objectives:
To understand how block chain systems (mainly Bitcoin and Ethereum) work, to securely interact with them, Design, build, and deploy smart contracts and distributed applications, Integrate ideas from block chain technology into their own projects.

Course Outcomes:
At the end of this course the student will be able to
1. Understand the principles of HDFS and digital signature.
2. Explore the block chain Technology, Simplified Payment Verification protocol and its life cycle.
3. Analyze the Nakamoto consensus and differentiate proof-of-work and proof-of-stake consensus algorithms.
4. Understand the working of crypto currency, Bitcoin and Ethereum.
5. Explore Applications on legal issues of block chain.
6. Explore new trends in block chain technologies.

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.

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 Bitcoin, 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.

UNIT-VI
(Trends and Topics) - Zero Knowledge proofs and protocols in Blockchain - Succinct non interactive argument for Knowledge (SNARK) - pairing on Elliptic curves - Zcash.

TEXT BOOKS:
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).

REFERENCES:
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 TizianaCimoli, A survey of attacks on Ethereum smart contracts

Syllabus for B. Tech. IV Year I Semester
Computer Science and Engineering (AI & ML)
UNIFIED MODELING LANGUAGE
(Professional Elective –III)

Code: 8LC16

L	T	P	C
3	0	0	3

Course Objectives:
1. To become familiar with all phases of object oriented analysis and design, master the main features of the UML.
2. Ability to analyze and solve challenging problems in various domains.
3. Learn the Object Design Principles and understand how to apply them towards implementation.

Course Outcomes:
1. Understand various stages and phases of software projects.
2. Select the basic elements of modeling such as Things, Relationships and Diagrams depending on the views of UML Architecture and SDLC.
3. Design class and object diagrams that represent static aspects of a software system.
4. Design component and deployment diagrams for software systems.
5. Design activity and state chart diagrams for software systems.

UNIT - I
Introduction to UML: Importance of Modeling, Principles of Modeling, Conceptual model of the UML, Architecture, Software Development Life Cycle.

Basic Structural Modeling: Classes, Relationships, Common Mechanisms and Diagrams.

UNIT - II
Basic Structural Modeling: Class Diagrams, Common Modeling Techniques for Class Diagrams. Forward and Reverse Engineering.

Advanced Structural Modeling: Advanced classes, Advanced Relationships, Interfaces, Types and Roles, Packages.

UNIT - III
Object Diagrams: Terms, concepts, Common Modeling techniques for Object Diagrams.

Basic Behavioral Modeling: Use cases, Use case Diagrams.

UNIT - IV
Basic Behavioral Modeling: Interactions, Interaction diagrams, Activity Diagrams.

UNIT – V

Advanced Behavioral Modeling: Events and Signals, State Machines, Processes and Threads, Time and Space, State Chart Diagrams.

UNIT - VI
Architectural Modeling: Components, Deployment, Component Diagrams and Deployment Diagrams.

CASE STUDY: Unified Library Application-Structural and Behavioral Modeling.

TEXT BOOKS:

1. Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modeling Language User Guide, Pearson Education.
2. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, WILEY Dreamtech India Pvt. Ltd.
3. Ivar Jacobson, Grady Booch, James Rumbaugh: The Unified Software Development Process, Pearson Edition.

REFERENCES:

1. Meilir Page-Jones: Fundamentals of Object-Oriented Design in UML, Pearson Education.
2. Pascal Roques: Modeling Software Systems Using UML2, WILEY Dreamtech India Pvt. Ltd.
3. Atul Kahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.
4. Mark Priestley: Practical Object-Oriented Design with UML, TATA McGraw Hill.

Syllabus for B. Tech. IV Year I Semester
Computer Science and Engineering (AI & ML)
AUGMENTED AND VIRTUAL REALITY
(Professional Elective –III)

Code: 8FC20

L T P C
3 0 0 3

Pre-Requisites: Data Structures

Course Objectives:
This course provides students with an opportunity to explore the research issues in Augmented Reality and Virtual Reality (AR &VR). It also makes the students know the basic concepts and framework of virtual reality.

Course Outcomes: After completion of course, students will be able to
1. Understand the fundamentals of Virtual Reality.
2. Analyze multiple Models of Input and Output Interface in Virtual Reality like Gloves, Video-based Input, 3D Menus & 3DScanner etc.
3. Illustrate the fundamentals or advanced topics of Computer Graphics.
4. Analyze the Interactive Techniques on VR in respect of Body Track, Hand Gesture, 3D Manus, and Object Grasp.
5. Understand the development tools of VR.
6. Explore the Conceptual idea on Augmented Reality and relate the illustrations.

UNIT-I
Introduction of Virtual Reality: Fundamental Concept and Components of Virtual Reality. Primary Features and Present Development on Virtual Reality.

UNIT-II
Multiple Models of Input and Output Interface in Virtual Reality: Input -- Tracker, Sensor, Digital Glove, Movement Capture, Video-based Input, 3D Menus & 3DScanner etc. Output -- Visual /Auditory Haptic Devices.

UNIT-III
Visual Computation in Virtual Reality: Fundamentals of Computer Graphics. Software and Hardware Technology on Stereoscopic Display. Advanced Techniques in CG: Management of Large Scale Environments & Real Time Rendering.

UNIT -IV
Interactive Techniques in Virtual Reality: Body Track, Hand Gesture, 3D Manus, And Object Grasp.

UNIT-V
Development Tools and Frameworks in Virtual Reality: Frameworks of Software Development Tools in VR. X3D Standard; Vega, MultiGen, Virtools etc. Application of VR in Digital Entertainment: VR Technology in Film & TV Production. VR Technology in Physical Exercises and Games. Demonstration of Digital Entertainment by VR.

UNIT-VI
Augmented and Mixed Reality, Taxonomy, technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality, wireless displays in educational augmented reality applications, mobile projection interfaces, marker-less

tracking for augmented reality, enhancing interactivity in AR environments, evaluating AR systems.

TEXTBOOKS:
1) Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley-IEEE Press, 2003/2006.
2) Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.

REFERENCES:
1) Alan Craig, William Sherman and Jeffrey Will, Developing Virtual Reality Applications, Foundations of Effective Design, Morgan Kaufmann, 2009**.**

Syllabus for B. Tech. IV Year I Semester
Computer Science and Engineering (AI & ML)
NATURAL LANGUAGE PROCESSING
(Professional Elective –III)

Code : 8LC18

L	T	P	C
3	0	0	3

Prerequisites: Data Structures, Finite Automata and Probability Theory

Course Objectives:
1. Introduce to some of the problems and solutions of NLP and their relation to linguistics andstatistics.
2. Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems.

Course Outcomes:
On successful completion of this course, students will be able to:
1. Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
2. Understand and carry out proper experimental methodology for training and evaluatingempirical NLP systems
3. Able to manipulate probabilities, construct statistical models over strings and trees, andestimate parameters using supervised and unsupervised training methods.
4. Able to design, implement, and analyze NLP algorithms
5. Able to design different language modeling Techniques.

UNIT-I
Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models.
Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches.

UNI-II
Syntax Analysis: Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing,Multilingual Issues

UNIT-III
Semantic Parsing: Introduction, Semantic Interpretation, System Paradigms, Word Sense Systems, Software.

UNIT-IV
Predicate-Argument Structure, Meaning Representation Systems, Software.

UNIT-V
Discourse Processing: Cohension, Reference Resolution, Discourse Cohension and Structure.

UNI-VI
Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific ModelingProblems, Multilingual and Crosslingual Language Modeling

TEXT BOOKS:
1. Multilingual natural Language Processing Applications: From Theory to Practice –Daniel M.Bikel and Imed Zitouni, Pearson Publication.
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary.

REFERENCES:
1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, PearsonPublications.
2. Charniak, E.: Statistical Language Learning. The MIT Press.
3. Jelinek, F.: Statistical Methods for Speech Recognition. The MIT Press.
4. Lutz and Ascher - "Learning Python", O'Reilly

Syllabus for B. Tech. IV Year I Semester
Computer Science and Engineering (AI & ML)
SCRIPTING LANGUAGES
(Professional Elective –IV)

Code: 8JC05

L T P C
3 0 0 3

Prerequisites:
Computer Programming and Data Structures, Object Oriented Programming Concepts.

Course Objectives:
1. This course introduces the script programming paradigm.
2. Introduces scripting languages such as Perl, Ruby and TCL.

Course Outcomes:
1. Identify the differences between typical scripting languages and typical system and application programming languages.
2. Gain knowledge of the strengths and weakness of Perl, TCL and Ruby; and select an appropriate language for solving a given problem.
3. Acquire programming skills in scripting languages.

UNIT - I
Introduction: Ruby, Rails, The structure and Excution of Ruby Programs, Package management with RUBYGEMS, Ruby and web: Writing CGI scripts, cookies, Choice of Webservers, SOAP and webservices.
RubyTk – Simple Tk Application, widgets, Binding events, Canvas, scrolling

UNIT - II
Extending Ruby: Ruby Objects in C, the Jukebox extension, Memory allocation, Ruby Type System, Embedding Ruby to Other Languages, Embedding a Ruby Interpreter.

UNIT - III
Introduction to PERL and Scripting
Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages.
PERL- Namesand Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern andregular expressions, subroutines.

UNIT - IV
Advanced perl: Finer points of looping, pack and unpack, filesystem, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

UNIT - V
TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures, strings, patterns, files, Advance TCL- eval, source, exec and uplevel commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts Internet Programming, Security Issues, C Interface.

UNIT - VI

Tk: Tk-Visual Tool Kits, Fundamental Concepts of Tk, Tk by example, Events and Binding, Perl-Tk.

TEXT BOOKS:
1. The World of Scripting Languages, David Barron,Wiley Publications.
2. Ruby Progamming language by David Flanagan and Yukihiro Matsumoto O'Reilly.
3. "Programming Ruby" The Pramatic Progammers guide by Dabve Thomas Second Edition.

REFERENCES:
1. Open Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP, J. Lee and B. Ware (Addison Wesley) Pearson Education.
2. Perl by Example, E. Quigley, Pearson Education.
3. Programming Perl, Larry Wall, T. Christiansen and J. Orwant, O'Reilly, SPD.
4. Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
5. Perl Power, J. P. Flynt, Cengage Learning.

Syllabus for B. Tech. IV Year I Semester
Computer Science and Engineering (AI & ML)
AGILE SOFTWARE DEVELOPMENT
(Professional Elective –IV)

Code : 8FC15

L T P C
3 0 0 3

Prerequisite: Software Engineering

Course Objectives:
To understand how an iterative, incremental development process leads to faster delivery of more useful software.

Course Outcomes:
At the end of this course, the student will be able to
1. To understand the essence of agile development methods
2. To apply the principles and practices of extreme programming in real world problems.
3. To incorporate proper coding standards and guidelines in an agile process.
4. To optimize an agile process by exploring the possible risks and threats in the software process
5. To improve the process by eliminating waste
6. To design an agile process for a business application and deal with appropriate tradeoff.

UNIT-I
Why Agile? Understanding Success, Beyond Deadlines, The Importance of Organizational Success, Enter Agility, How to Be Agile? Agile Methods, Don't Make Your Own Method, The Road to Mastery, Find a Mentor

UNIT-II
Understanding XP: The XP Lifecycle, The XP Team, XP Concepts, Adopting XP: Is XP Right for Us? Assess Your Agility

UNIT-III
Practicing XP: Thinking: Pair Programming, Energized Work, Informative Workspace, Root-Cause Analysis, Retrospectives, collaborating: Trust, Sit Together, Real Customer Involvement, Ubiquitous Language, Stand-Up Meetings, Coding Standards, Iteration Demo, Reporting, releasing: "Done", No Bugs, Version Control, Ten-Minute Build, Continuous Integration, Collective Code Ownership, Documentation.

UNIT-IV
Planning: Vision, Release Planning, The Planning Game, Risk Management, Iteration Planning, Slack, Stories, Estimating. Developing: Incremental requirements, Customer Tests, Test-Driven Development, Refactoring, Simple Design, Incremental Design and Architecture, Spike Solutions, Performance Optimization, Exploratory Testing

UNIT-V
Mastering Agility Values and Principles: Commonalities, About Values, Principles, and Practices, Further Reading, Improve the Process: Understand Your Project, Tune and Adapt, Break the Rules, Rely on People: Build Effective Relationships, Let the Right People Do the Right Things, Build the Process for the People, Eliminate Waste: Work in Small, Reversible Steps, Fail Fast, Maximize Work Not Done, Pursue Throughput

UNIT-VI

Deliver Value: Exploit Your Agility, Only Releasable Code Has Value, Deliver Business Results, Deliver Frequently, Seek Technical Excellence: Software Doesn't Exist, Design Is for Understanding, Design Tradeoffs, Quality with a Name, Great Design, Universal Design Principles, Principles in Practice, Pursue Mastery

TEXT BOOKS:

1. James Shore and Shane Warden, "The Art of Agile Development", O'REILLY, 2007.

REFERENCES:

1. Robert C. Martin, "Agile Software Development, Principles, Patterns, and Practices", PHI, 2002.
2. Angel Medinilla, "Agile Management: Leadership in an Agile Environment", Springer, 2012.
3. Bhuvan Unhelkar, "The Art of Agile Practice: A Composite Approach for Projects and Organizations", CRC Press.
4. Jim Highsmith, "Agile Project Management", Pearson education, 2004.
5. Elisabeth Hendrickson, "Agile Testing" Quality Tree Software Inc. 2008.

Syllabus for B. Tech. IV Year II Semester
Computer Science and Engineering (AI & ML)
Mobile Application Développent
(Professional Elective – IV)

Code: 8LC20

L T P C
3 0 0 3

Course Objectives:

1. To facilitate students to understand android SDK
2. To help students to gain a basic understanding of Android application development
3. To inculcate working knowledge of Android Studio development tool

Course Outcomes:

1. Skills lean in the Multimedia Technology.
2. Students will be exposed to a variety of software applications (includes the Internet, Adobe Photoshop, Illustrator, InDesign, Premiere, Flash and Dreamweaver).
3. Students will be assigned projects in which they will work closely with staff.

UNIT-I
Fundamental concepts in Text and Image: Multimedia and hypermedia, world wide web, overview of multimedia software tools. Graphics and image data representation graphics/image data types, file formats, Color in image and video: color science, color models in images, color models in video.

UNIT-II
Fundamental concepts in video and digital audio: Types of video signals, analog video, digital video, digitization of sound, MIDI, quantization and transmission of audio.

UNIT-III
Multimedia data compression: Lossless compression algorithm: Run-Length Coding, Variable Length Coding, Dictionary Based Coding, Arithmetic Coding, Lossless Image Compression, Lossy compression algorithm: Quantization, Transform Coding, Wavelet-Based Coding, Embedded Zerotree of Wavelet Coefficients Set Partitioning in Hierarchical Trees (SPIHT).

UNIT-IV
Action Script I: ActionScript Features, Object-Oriented ActionScript, Datatypes and Type Checking, Classes, Authoring an ActionScript Class

UNIT-V
Action Script II: Inheritance, Authoring an ActionScript 2.0 Subclass, Interfaces, Packages, Exceptions

UNIT VI
Application Development: An OOP Application Frame work, Using Components with ActionScript Movie Clip Subclasses.

TEXT BOOKS:

1. Fundamentals of Multimedia by Ze-Nian Li and Mark S. Drew PHI/Pearson Education.
2. Essentials ActionScript 2.0, Colin Moock, SPD O, REILLY.

REFERENCES:

1. Digital Multimedia, Nigel chapman and jenny chapman, Wiley-Dreamtech
2. Macromedia Flash MX Professional 2004 Unleashed, Pearson.
3. Multimedia and communications Technology, Steve Heath, Elsevier (Focal Press).
4. Multimedia Applications, Steinmetz, Nahrstedt, Springer.
5. Multimedia Basics by Weixel Thomson.
6. Multimedia Technology and Applications, David Hilman , Galgotia.

Syllabus for B. Tech. IV Year I Semester
Computer Science and Engineering (AI & ML)
DEVOPS
(Professional Elective –IV)

Code: 8LC17

L	T	P	C
3	0	0	3

Course Objectives:
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 to reach a continuous delivery capability.
3. Implement automated system update and DevOps lifecycle.

Course Outcomes:
On successful completion of this course, 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.
6. Collaborate and adopt Devops in real-time projects.

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, Microservices, 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

UNIT – VI

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.

TEXT BOOKS:

1. Joakim Verona. Practical Devops, Second Edition. Ingram short title; 2nd edition (2018). ISBN-10: 1788392574.
2. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications. ISBN: 9788126579952.

REFERENCES:

1. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley; ISBN-10.

Syllabus for B. Tech. IV Year I Semester
Computer Science and Engineering (AI & ML)
BUSINESS INTELLIGENCE
(Professional Elective –IV)

Code: 8EC19

L	T	P	C
3	0	0	3

Course Objectives:
1. Introduce the Business intelligence concepts, techniques and models.
2. Understand the modeling process behind business analytics.
3. To analyze different data analysis tools and techniques.

Course Outcomes:

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

1. Understand the importance of business intelligence and its applications in today's world.
2. Illustrate the different form of analytics such as business analytics, predictive analytics.
3. Compare in detail the various aspects of business intelligence.
4. Understand the technological components of operational intelligence.
5. Analyze and understand the broad concepts in prescriptive analytics with Decision Tables.
6. Apply business intelligence process for web mining and web analytics.

UNIT-I
Introduction to Business Intelligence, Business Intelligence, Mobile Business Intelligence, Real-time Business Intelligence **(Text Book-1)**

UNIT-II
Analytics: A Comprehensive Study, Business Analytics, Analytics, Software Analytics, Embedded Analytics, Learning Analytics, Predictive Analytics, Prescriptive Analytics, Social Media Analytics, Behavioral Analytics **(Text Book-1)**

UNIT-III
Essential Aspects of Business Intelligence, Context Analysis, Business Performance Management, Business Process Discovery, Information System, Organizational Intelligence, Data Visualization, Data Profiling, Data Cleansing, Process Mining, Competitive Intelligence **(Text Book-1)**

UNIT-IV
Operational Intelligence: Technological Components, Operational Intelligence, Business Activity Monitoring, Complex Event Processing, Business Process Management, Metadata, Root Cause Analysis **(Text Book-1)**

UNIT-V
Prescriptive Analytics:
Certainty, Uncertainty, and Risk- Decision Modeling with Spreadsheets - Mathematical Programming Optimization - Decision Analysis with Decision Tables and Decision Trees - Problem-Solving Search Methods - Problem-Solving Search Methods **(Text Book-2)**

UNIT-VI

Web Analytics and Web Mining: Web Mining Overview - Web Content and Web Structure Mining - Search Engines - Search Engine Optimization - Web Analytics Technologies, metrics - Web Analytics Maturity Model and Web Analytics Tools **(Text Book-2)**

TEXT BOOKS:

1. Drew Bentley, Business Intelligence and Analytics, Published by Library Press.
2. Efraim Turban, Ramesh Sharda, DursunDelen, "Business Intelligence and Analytics", 10th Edition, Pearson, 2015.

REFERENCES:

1. S. Christian Albright, Wayne L. Winston, Business Analytics: Data Analysis & Decision Making, 6th Edition, CENGAGE INDIA, 2017.
2. Dinabandhu Bag, Business Analytics, Routledge, 1st edition, 2016 .
3. Rick Sherman, Business Intelligence Guidebook: From Data Integration to Analytics, Morgan Kaufmann, 1st edition 2014.
4. Introduction to business Intelligence and data warehousing, IBM, PHI.

Syllabus for B. Tech. IV Year I Semester
Computer Science and Engineering (AI & ML)
IMAGE PROCESSING

Code : 8FC18

L	T	P	C
2	1	0	3

Prerequisites: Computer Graphics

Course Objectives:
Make decisions from image data, online inspection and face recognition.

Course Outcomes:
At the end of this course the student will be able to
1. Analyze general terminology of image processing.
2. Examine various types of images, intensity transformations and spatial filtering.
3. Develop Fourier transform for image processing in frequency domain.
4. Evaluate the methodologies for image segmentation, restoration etc.
5. Implement image process and analysis algorithms.
6. Apply image processing algorithms in practical applications.

UNIT – I
Introduction: Examples of fields that use digital image processing, fundamental steps in digital image processing, components of image processing system. Digital Image Fundamentals: A simple image formation model, image sampling and quantization, basic relationships between pixels.

UNIT – II
Image Enhancement in the spatial domain: Basic gray-level transformation, histogram processing, enhancement using arithmetic and logic operators, basic spatial filtering, smoothing and sharpening spatial filters, combining the spatial enhancement methods

UNIT – III
Image Restoration: A model of the image degradation/restoration process, noise models, restoration in the presence of noise–only spatial filtering, Weiner filtering, constrained least squares filtering, geometric transforms; Introduction to the Fourier transform and the frequency domain, estimating the degradation function

UNIT– IV
Color Image Processing: Color fundamentals, color models, pseudo color image processing, basics of full–color image processing, color transforms, smoothing and sharpening, color segmentation.

UNIT – V
Image Compression and Morphology: Fundamentals, image compression models, error-free compression, lossy predictive coding, image compression standards, Morphological Image Processing: Preliminaries, dilation, erosion, open and closing, hit or miss transformation

UNIT – VI

Image Segmentation and Recognition: Detection of discontinuous, edge linking and boundary detection, thresholding, region–based segmentation, Patterns and patterns classes, recognition based on decision–theoretic methods, matching, optimum statistical classifiers

TEXT BOOKS:

1. Digital Image Processing, Rafeal C.Gonzalez, Richard E.Woods, Third Edition, Pearson Education/PHI.

REFERENCES:

1. Image Processing, Analysis, and Machine Vision, Milan Sonka, Vaclav Hlavac and Roger Boyle, Second Edition, Thomson Learning.
2. Introduction to Digital Image Processing with Matlab, Alasdair McAndrew, Thomson Course Technology
3. Computer Vision and Image Processing, Adrian Low, Second Edition, B.S.Publications
4. Digital Image Processing, William K. Prat, Wily Third Edition
5. Digital Image Processing and Analysis, B. Chanda, D. Datta Majumder, Prentice Hall of India, 2003.

Syllabus for B. Tech. IV Year I Semester
Computer Science and Engineering (AI & ML)
ADVANCED ARTIFICIAL INTELLIGENCE AND DEEP LEARNING

Code: 8LC03

L	T	P	C
2	1	0	3

Prerequisite: Machine Learning

Course Objectives:
1. To understand the different types of AI agents
2. Know various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction, genetic algorithms)
3. To understand the fundamentals of knowledge representation (logic-based, frame-based, semantic nets), inference and theorem proving
4. Demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information
5. Ability to apply knowledge representation, reasoning, and machine learning techniques to real-world problems
6. Ability to apply concepts of convolutional networks in day to day applications.

Course Outcomes:
After completion of this course, student will be able to
1. Identify different types of agents and their relationships with the environment.
2. Demonstrate the application of agents handling applications dealing with conflict resolution.
3. Represent knowledge in logical level and also be able to convert it to a form suitable for implementation.
4. Derive inferences applying rules of First Order Logic.
5. Formulate an approach for applications involving complete and incomplete Planning.
6. Choose the appropriate learning strategy needed for solving a given problem.

UNIT-I
Introduction: AI problems, Intelligent agents: Agents and Environments, Rationality, Nature of environments, Structure of agents, Problem solving agents, Problem formulation – Planning Application – Classical Planning problem.

UNIT-II
Searching and Game Theory: Searching for solutions, searching with partial information (Heuristic search), Greedy best first search, A* search Constraint Satisfaction problem -Game Playing: Adversarial search: Games, Minimax algorithm, Optimal decisions in multiplayer games, Alpha-Beta pruning, Evaluation functions. **Case studies:** Tic-tac-toe game.

UNIT-III
Knowledge Representation and Reasoning: Logical Agents, Knowledge Based Agents, Wumpus world, Propositional logic, Resolution patterns in propositional Logic, First order logic, Inference in first order logic, propositional vs. First order inference, Unification and Lifting, forward chaining, Backward chaining, Resolution.

UNIT-IV
Uncertain Knowledge and Reasoning: Bayes Rule, Concepts of Time and Uncertainty, Utility Functions, Value of Information, Value iteration, Policy iteration, Partially Observable MDP.

UNIT–V
Basics of Deep Learning:
Deep learning architectures: Convolutional Neural Networks : Neurons in Human Vision-The Shortcomings of Feature Selection - Full Description of the Convolutional Layer - Max Pooling-Full Architectural Description of Convolution Networks - Closing the Loop on MNIST with Convolutional Networks- -Building a Convolutional Network for CIFAR-10 - Visualizing Learning in Convolutional Networks- Leveraging Convolutional Filters to Replicate Artistic Styles-Learning Convolutional Filters for Other Problem Domains-Training algorithms.

UNIT VI
Deep Reinforcement Learning:
Deep Reinforcement Learning Masters Atari Games - Reinforcement Learning-Markov Decision Processes (MDP)-Explore Versus Exploit - Pole-Cart with Policy Gradients-Q-Learning and Deep Q-Networks-Improving and Moving Beyond DQN.

TEXT BOOKS:
1   S. Russell and P. Norvig, Artificial Intelligence: A Modern Approach, Prentice Hall, Third Edition, 2009.
2. Artificial Intelligence, 3rd Edition, Patrick Henry Winston, Pearson Education, 1992.
3. Nikhil Buduma, Nicholas Locascio, "Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms", O'Reilly Media, 2017.
4. Ian Goodfellow, YoshuaBengio, Aaron Courville, "Deep Learning (Adaptive Computation and Machine Learning series", MIT Press, 2017.

REFERENCES:
1. M. Tim Jones, ―Artificial Intelligence: A Systems Approach(Computer Science), Jones and   Bartlett Publishers, Inc.; First Edition, 2008
2. Nils J. Nilsson, ―The Quest for Artificial Intelligence, Cambridge University Press, 2009.
3. William F. Clocksin and Christopher S. Mellish, Programming in Prolog: Using the ISO Standard, Fifth Edition, Springer, 2003.
4. Gerhard Weiss, ―Multi Agent Systems, Second Edition, MIT Press, 2013.
5. David L. Poole and Alan K. Mackworth, ―Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, 2010.
6. Bratko, ―Prolog: Programming for Artificial Intelligence, Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.

Syllabus for B. Tech. IV Year I Semester
Computer Science and Engineering (AI & ML)
INTRODUCTION TO LINUX PROGRAMMING

Code: 8IC07

L	T	P	C
2	0	0	2

Prerequisite : Operating Systems

Course Objectives:

1. Induce working principles of Linux operating system, usage of File handling utilities, Security by file permissions, process utilities, Disk utilities, networking utilities.
2. Impart the shell responsibilities and meta-characters of it, control structures, shell interrupt processing, functions, debugging shell scripts.
3. Impart basics of file concepts kernel support for file, file structure and low-level I/O functions, system calls (file API's). Induce knowledge regarding Directory management and its API.
4. Demonstrate basics of process creation, execution and synchronization mechanisms. Give knowledge regarding a signal, need for having them, usage of various signals.
5. Narrate the need for Inter Process Communication. Explore the possible mechanisms to implement System V APIs. To demonstrate the usage of message queues.
6. Incorporate implementation for semaphore API and shared memory API. To explain the need for using a basic Client-Server model.

Course Outcomes:

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

1. List and demonstrate the basic Linux utilities.
2. Recite and solve problems using Shell Scripting.
3. Understand and elaborate File System structure and kernel support for files in Linux.
4. Summarize the fundamentals of process control primitives and signal handling.
5. Classify the techniques of Inter process communication and apply them to real world problems.
6. Demonstrate the significance of Semaphores for Kernel support and simulate program using the same.

UNIT-I
Linux Utilities-File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands, Filters, Text processing utilities and Backup utilities.

(Applications: Determining what types of files are present in a system, debugging issues with file accessibility, finding a process troubling for a task and discarding from its existing, Write and extract necessary information from huge test files.)

UNIT – II
Working with the Bourne again shell(bash): Introduction, shell responsibilities, pipes and input Redirection, output redirection, running a shell script, the shell as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, the

environment, quoting, test command, control structures, arithmetic in shell, shell script examples, interrupt processing, functions, debugging shell scripts.

(Applications: Writing shell scripts for automating most of the regular jobs, taking backup on regular basis and restoring the same)

UNIT-III

Files: File Concept, File System Structure, I nodes, File Attributes, File types, Library functions, the standard I/O and formatted I/O in C, stream errors, kernel support for files, System calls, file descriptors, low level file access – File structure related system calls (File APIs), file and record locking, file and directory management – Directory file APIs, Symbolic links & hard links.

(Applications: write some system programs to interact with file system, developing small system software's to work with files and devices, developing program's on directory management system)

UNIT-IV

Process – Process concept, Kernel support for process, process attributes, process control-process creation, waiting for a process, process termination, zombie process, orphan process, Process APIs. Signals– Introduction to signals, Signal generation and handling, Kernel support for signals, Signal function, unreliable signals, reliable signals, kill, raise , alarm, pause, abort, sleep functions.

(Applications: Applications to find number of typical processes are under different context and controlling them in synchronous manner. Develop user defined modules for handling a signal and controlling several issues with signals.)

UNIT-V

Inter-process Communication: Introduction to IPC, Pipes, FIFOs, Introduction to three types of IPC-message queues, semaphores and shared memory. Message Queues Kernel support for messages, UNIX system V APIs for messages, client/server example.

(Applications: Developing applications complying with IPC mechanisms, developing an application that exchanges a set of messages among different processes. Write a client server application to go with any concurrent approach)

UNIT- VI:

Semaphores-Kernel support for semaphores, UNIX system V APIs for semaphores. Shared Memory-Kernel support for shared memory, UNIX system V APIs for shared memory, semaphore and shared memory example.

(Applications: Develop critical section handling mechanisms to deal with any real problems. Building applications to share a piece of memory resource among processes concurrently)

TEXT BOOKS:
1. Unix System Programming using C++, T.Chan, PHI.
2. Unix Concepts and Applications, 4th Edition, Sumitabha Das, TMH, 2006.
3. Beginning Linux Programming, 4th Edition, N.Matthew, R.Stones, Wrox, Wiley India Edition, rp-2008 .

REFERENCES:
1. Linux System Programming, Robert Love, O'Reilly, SPD.

Syllabus for B. Tech. III Year II Semester
Computer Science and Engineering (AI & ML)
INTELLECTUAL PROPERTY RIGHTS

Code: 8GC49

L	T	P	C
1	0	0	1

Course Objective:

This course is intended to impart awareness on intellectual property rights and various regulatory issues related to IPR

Course Outcomes:
At the end of this course the student will be able to
1. Demonstrate a breadth of knowledge in Intellectual property
2. Overview of Patents, Searching, filling and drafting of Patents
3. Overview of copyright & GI .
4. Overview of Trade Mark & Trade Secret,
5. Overview of Integrated Circuit and Industrial Design.
6. Knowledge about different national and international: Conventions and Treaties Governing the IPRs.

UNIT–I:
Introduction to IPR: Discovery, Invention, Creativity, Innovation, History & Significance of IPR, Overview of IPR -Patent, Copyright, Trade Mark, Trade Secret , GI, Industrial Design & Integrated Circuit, Non-patentable criteria.

UNIT–II:
Patents: Patents- Patentability Criteria, Types of Patents-Process, Product & Utility Models, Software Patenting and protection, Patent infringement- Case studies- Apple Vs Samsung, Enfish LLC Vs Microsoft, Overview of Patent search-Types of Searching, Public & Private Searching Databases, Basics of Patent Filing & Drafting, Indian Patents Law.

UNIT–III:
Copyrights and Geographical Indications: Types of Copyrights, Procedure for filing, copyright infringement, Copyright Law, Geographical Indications –Tirupati Laddu , Darjeeling Tea, Basmati rice.

UNIT–IV:
Trademark and Trade secrets: Trade Marks –Commercial importance, protection, registration, Case Studies- Sabena and Subena, Castrol Vs Pentagon, Trade Secrets- Case Studies-Kentucky Fried Chicken (KFC), Coca-Cola.

UNIT–V:
Protection of Industrial Designs & Integrated Circuits: Industrial Designs – Scope, protection, filing, infringement; Integrated Circuits & Layout design, Semiconductors, Unfair competition, Designs Act.

UNIT–VI:
International Conventions & Treaties: Overview of WTO, GATT, TRIPS, WIPO, Berne Convention, Rome convention, Paris Convention, Patent Cooperation Treaty (PCT), Madrid Protocol, Budapest Treaty, Hague agreement

TEXT BOOKS:

1. Deborah E. Bouchoux, Intellectual Property for Paralegals – The law of Trademarks, Copyrights, Patents & Trade secrets, 3rd Edition, Cengage learning, 2012.
2. N.S. Gopalakrishnan& T.G. Agitha, Principles of Intellectual Property, Eastern Book Company, Lucknow, 2009.

REFERENCES:

1. M. M. S. Karki , Intellectual Property Rights: Basic Concepts, Atlantic Publishers, 2009.
2. Neeraj Pandey &KhushdeepDharni, Intellectual Property Rights, Phi Learning Pvt. Ltd.
3. AjitParulekar and Sarita D' Souza, Indian Patents Law – Legal & Business Implications; Macmillan India ltd, 2006.
4. B. L. Wadehra. Law Relating to Patents, Trade Marks, Copyright, Designs & Geographical Indications; Universal law Publishing Pvt. Ltd., India 2000.
5. P. Narayanan; Law of Copyright and Industrial Designs; Eastern law House, Delhi, 2010.

Syllabus for B. Tech. IV Year I Semester
Computer Science and Engineering (AI & ML)
CLOUD COMPUTING

Code : 8EC20

L T P C
3 0 0 3

Course Objectives :
Understand the basic characteristics of cloud computing and technologies that support to implement cloud computing. Analyze the basic cloud computing models that are used to implement cloud technology and available cloud resources in the market. Analyzing the security issues in cloud computing environment and understanding different case studies in cloud computing and IOT platform.

Course Outcomes :
At the end of this course, the students will be able to
1. Summarize the characteristics of cloud and differentiate the cloud service and deployment models.
2. Demonstrate the different kinds of cloud services.
3. Analyze different architectures for cloud applications, Create and run Amazon ec2 instance through python programs
4. Assess the performance of cloud services and summarize the innovative applications of IOT on cloud.
5. Design architecture of an Apps such as map reduce, image processing app etc on cloud.
6. Understand various security aspects in cloud.

UNIT-I
Introduction to Cloud Computing: Introduction, characteristics, Cloud Models and examples, Applications of Cloud Services. Cloud Concepts and Technologies.

UNIT-II
Cloud Services and Platforms: Compute Services, Storage Services, Database Services, Application Services, Content Delivery Services, Analytics Services, Deployment and Management Services, Identity and Access Management Services, Open Source Private Cloud Software.

UNIT-III
Cloud Application Design: Design Considerations for Cloud Application, Reference Architectures for Cloud Applications. Cloud Application Design Methodologies, Data Storage Approaches. Python for Cloud: Python for Amazon Web Services, Map Reduce.

UNIT –IV
Cloud and the Internet of Things: Cloud Computing Standards, Performance of Distributed Systems and the Cloud- Enabling Technologies for the Internet of Things- Innovative Applications of the Internet of Things- Online Social and Professional Networking.

UNIT-V
Cloud Application Development in Python: Design Approaches, Image Processing App, Document Storage App, Map Reduce App, Social Media Analytics App.

UNIT-VI

Cloud Security: Introduction, Cloud Security Architecture (CSA), Authentication, Authorization, Identity Access Management (IAM), Data Security, Key Management, Auditing.

Cloud for Industry, Healthcare and Education.

TEXT BOOKS:

1. Cloud Computing –A Hands on Approach, Arshdeep,Vijay Medisetti, University Press.
2. Distributed and Cloud Computing,1st Edition,From Parallel Processing to the Internet of Things, Authors: Kai Hwang Jack Dongarra Geoffrey Fox**(Unit-IV)**.
3. Cloud Computing: Raj Kumar Buyya, James Broberg, Andrzej GOscinski,Wiley.

REFERENCES:

1. Cloud Computing: Dr.Kumar Saurab Wiley India 2011.
2. Code in the cloud computing: K Chandrasekharan CRC Press.
3. Cloud Compuitng: John W. Rittinghouse, James Ransome, CRC Press.
4. Virtualization Security: Dave Shackleford2013,SYBEX a Willy Brand.
5. Cloud Computing and Software Service: Ahson, iiyas.2011.
6. Cloud Computing Bible: Sosinsky 2012 Wiley India.

Syllabus for B. Tech. IV Year I Semester
Computer Science and Engineering (AI & ML)
CLOUD COMPUTING LAB AND DEEP LEARNING LAB

Code: 8LC64

L	T	P	C
0	0	4	2

Course Objectives:
1. To Build The Foundation Of Deep Learning.
2. To Understand How To Build The Neural Network.
3. To enable students to develop successful machine learning concepts.

Course Outcomes:
1. Upon the Successful Completion of the Course, the Students would be able to:
2. Learn The Fundamental Principles Of Deep Learning.
3. Identify The Deep Learning Algorithms For Various Types of Learning Tasks in various domains.
4. Implement Deep Learning Algorithms And Solve Real-world problems.

LIST OF EXPERIMENTS (CLOUD COMPUTING LAB):
1. Install Virtual box/Vmware Workstation with different flavors of Linux or Windows OS on top of windows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs.
3. Install Google App Engine. Create a hello world app and other simple web applications using python/java.
4. Find a procedure to transfer the files from one virtual machine to another virtual machine.
5. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)

LIST OF EXPERIMENTS (DEEP LEARNING LAB):
1. Setting up the Spyder IDE Environment and Executing a Python Program.
2. Installing Keras, Tensorflow and Pytorch libraries and making use of them.
3. Applying the Convolution Neural Network on computer vision problems.
4. Image classification on MNIST dataset (CNN model with Fully connected layer).
5. Applying the Deep Learning Models in the field of Natural Language Processing.
6. Train a sentiment analysis model on IMDB dataset, use RNN layers with LSTM/GRU notes.
7. Applying the Autoencoder algorithms for encoding the real-world data.
8. Applying Generative Adversial Networks for image generation and unsupervised tasks.

TEXT BOOKS:
1. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press.
2. The Elements of Statistical Learning by T. Hastie, R. Tibshirani, and J. Friedman, Springer.
3. Probabilistic Graphical Models. Koller, and N. Friedman, MIT Press.

REFERENCES:
1. Bishop, C, M., Pattern Recognition and Machine Learning, Springer.
2. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd.
3. Golub, G.H., and Van Loan C.F., Matrix Computations, JHU Press.

Syllabus for B. Tech. IV Year I Semester
Computer Science and Engineering (AI & ML)
LINUX PROGRAMMING LAB & PE-IV (DEVOPS) LAB

Code: 8LC65

L	T	P	C
0	0	2	1

Course Objectives:
1. To make use of File handling utilities, Security by file permissions, process utilities, Disk utilities, networking utilities.
2. To understand meta-characters of BASH, acquire the knowledge regarding control structures, shell interrupt processing, functions, debugging shell scripts.
3. To analyze syntaxes for process creation, execution and synchronization mechanisms, usage of message queues APIs.
4. Describe the agile relationship between development and IT operations.
5. Understand the skill sets and high-functioning teams involved in
6. DevOps and related methods to reach a continuous delivery capability 4. Implement automated system update and DevOps lifecycle

Course Outcomes:
1. To understand how to work with Linux commands for handling files, processes, text utilities, backup and network utilities.
2. To explore basics of building shell scripts gain knowledge to compose various Shell Scripts.
3. To learn and demonstrate the I/O functions, low-level system calls System Calls available for file and directory handling.
4. To understand how to implement pipes, FIFO, how to use for communication purpose in IPC, understand the significance of Semaphores for Kernel support and simulate program using the same
5. Identify components of Devops environment
6. Apply different project management, integration, testing and code deployment tool
7. Investigate different DevOps Software development models

LIST OF EXPERIMENTS (LINUX PROGRAMMING):
1. Basic Linux Commands File handling utilities, Security by file permissions, Process utilities, Disk utilities, sed, awk, grep.
2. Write a shell script that accepts a file name, starting and ending line numbers as arguments and displays all the lines between the given line numbers.
3. Write a shell script that deletes all lines containing a specified word in one or more files supplied as arguments to it.
4. Write a shell script that displays a list of all the files in the current directory to which the user has read, write and execute permissions.
5. C programming examples using Linux Operating systems.
   a) wc   b) cat   c) cp
6. Write a shell script that receives any number of file names as arguments checks if every argument supplied is a file or a directory and reports accordingly. Whenever the argument is a file, the number of lines on it is also reported.
7. Write the following Shell scripts:
   a) To accept a list of file names as its arguments, counts and reports the occurrence of each word that is present in the first argument file on other argument files.
   b) To list all of the directory files in a directory.
   c) To find factorial of a given integer.
8. Implement in C the following UNIX commands using System calls a) rename b) link
9. Write a C program to emulate the UNIX ls – l command.

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10. Write a C program on zombie process
11. Write a C program that illustrates the following.
    a) Creating a message queue.
    b) Writing to a message queue.
    c) Reading from a message queue.
12. Write a C program to implement record locking.

LIST OF EXPERIMENTS (DEVOPS):
1. Write code for a simple user registration form for an event.
2. Explore Git and GitHub commands.
3. Practice Source code management on GitHub. Experiment with the source code written in exercise 1.
4. Jenkins installation and setup, explore the environment.
5. Demonstrate continuous integration and development using Jenkins.
6. Explore Docker commands for content management.
7. Develop a simple containerized application using Docker.
8. Integrate Kubernetes and Docker
9. Automate the process of running containerized application developed in exercise. 7 using Kubernetes.
10. Install and Explore Selenium for automated testing.
11. Write a simple program in JavaScript and perform testing using Selenium.
12. Develop test cases for the above containerized application using selenium.

TEXT BOOKS:
1. Joakim Verona. Practical Devops, Second Edition. Ingram short title; 2nd edition (2018). ISBN- 10: 1788392574
2. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications. ISBN: 9788126579952.
3. Beginning Linux Programming, 4th Edition, N.Matthew, R.Stones, Wrox, Wiley India Edition, rp-2008.

REFERENCES:
1. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley
2. Edureka DevOps Full Course - https://youtu.be/S_0q75eD8Yc
3. Linux System Programming, Robert Love, O'Reilly, SPD.

Syllabus for B. Tech. IV Year I Semester
Computer Science and Engineering (AI & ML)
LINUX PROGRAMMING LAB & PE-IV (SCRIPTING LANGUAGES) LAB

Code: 8LC65

L	T	P	C
0	0	2	1

Prerequisites: Any high-level programming language (C, C++).

Course Objectives:

1. To make use of File handling utilities, Security by file permissions, process utilities, Disk utilities, networking utilities.
2. To understand meta-characters of BASH, acquire the knowledge regarding control structures, shell interrupt processing, functions, debugging shell scripts.
3. To analyze syntaxes for process creation, execution and synchronization mechanisms, usage of message queues APIs.
4. To understand the concepts of scripting languages for developing web-based projects.
5. To understand the applications of Ruby, TCL, Perl scripting languages.

Course Outcomes:

1. To understand how to work with Linux commands for handling files, processes, text utilities, backup and network utilities.
2. To explore basics of building shell scripts gain knowledge to compose various Shell Scripts.
3. To learn and demonstrate the I/O functions, low-level system calls System Calls available for file and directory handling.
4. To understand how to implement pipes, FIFO, how to use for communication purpose in IPC, understand the significance of Semaphores for Kernel support and simulate program using the same.
5. Able to understand the differences between scripting languages and programming languages.
6. Able to gain some fluency programming in Ruby, Perl, TCL.

LIST OF EXPERIMENTS (LINUX PROGRAMMING):
1. Basic Linux Commands File handling utilities, Security by file permissions, Process utilities, Disk utilities, sed, awk, grep.
2. Write a shell script that accepts a file name, starting and ending line numbers as arguments and displays all the lines between the given line numbers.
3. Write a shell script that deletes all lines containing a specified word in one or more files supplied as arguments to it.
4. Write a shell script that displays a list of all the files in the current directory to which the user has read, write and execute permissions.
5. C programming examples using Linux Operating systems.
   a) wc   b) cat   c) cp
6. Write a shell script that receives any number of file names as arguments checks if every argument supplied is a file or a directory and reports accordingly. Whenever the argument is a file, the number of lines on it is also reported.
7. Write the following Shell scripts:
   a) To accept a list of file names as its arguments, counts and reports the occurrence of each word that is present in the first argument file on other argument files.
   b) To list all of the directory files in a directory.
   c) To find factorial of a given integer.

8. Implement in C the following UNIX commands using System calls a) rename b) link
9. Write a C program to emulate the UNIX ls – l command.
10. Write a C program on zombie process
11. Write a C program that illustrates the following.
    a) Creating a message queue.
    b) Writing to a message queue.
    c) Reading from a message queue.
12. Write a C program to implement record locking.

LIST OF EXPERIMENTS (SCRIPTING LANGUAGES):

1. Write a Ruby script to create a new string which is n copies of a given string where n is a nonnegative integer.
2. Write a Ruby script which accept the radius of a circle from the user and compute the parameter and area.
3. Write a Ruby script which accept the user's first and last name and print them in reverse order with a space between them.
4. Write a Ruby script to accept a filename from the user print the extension of that
5. Write a Ruby script to find the greatest of three numbers.
6. Write a Ruby script to print odd numbers from 10 to 1.
7. Write a Ruby scirpt to check two integers and return true if one of them is 20 otherwise return their sum.
8. Write a Ruby script to check two temperatures and return true if one is less than 0 and the other is greater than 100.
9. Write a Ruby script to print the elements of a given array.
10.Write a Ruby program to retrieve the total marks where subject name and marks of a student stored in a hash.
11. Write a TCL script to find the factorial of a number.
12. Write a TCL script that multiplies the numbers from 1 to 10.
13. Write a TCL script for Sorting a list using a comparison function.
14. Write a TCL script to (i) create a list (ii) append elements to the list (iii) traverse the list (iv) concatenate the list.
15. Write a TCL script to comparing the file modified times.
16. Write a TCL script to Copy a file and translate to native format.
17. a) Write a Perl script to find the largest number among three numbers.
    b) Write a Perl script to print the multiplication tables from 1-10 using subroutines.
 18. Write a Perl program to implement the following list of manipulating functions.
    a) Shift
    b) Unshift
    c) Push.
19. a) Write a Perl script to substitute a word, with another word in a string.
b) Write a Perl script to validate IP address and email address.
20. Write a Perl script to print the file in reverse order using command line arguments.

TEXT BOOKS:
1. The World of Scripting Languages, David Barron, Wiley Publications.
2. Ruby Programming language by David Flanagan and Yukihiro Matsumoto O'Reilly.
3. "Programming Ruby" The Pragmatic Programmer's guide by Dabve Thomas Second edition.
4. Beginning Linux Programming, 4th Edition, N.Matthew, R.Stones, Wrox, Wiley India Edition, rp-2008.

REFERENCES:

1. Open Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP, J.Lee and B. Ware (Addison Wesley) Pearson Education.
2. Perl by Example, E. Quigley, Pearson Education.
3. Linux System Programming, Robert Love, O'Reilly, SPD.

Syllabus for B. Tech. IV Year I Semester
Computer Science and Engineering (AI & ML)
LINUX PROGRAMMING LAB & PE-IV (MOBILE APPLICATION DEVELOPMENT) LAB

Code: 8LC65

L	**T**	**P**	**C**
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Course Objectives:

1. To make use of File handling utilities, Security by file permissions, process utilities, Disk utilities, networking utilities.
2. To understand meta-characters of BASH, acquire the knowledge regarding control structures, shell interrupt processing, functions, debugging shell scripts.
3. To analyze syntaxes for process creation, execution and synchronization mechanisms, usage of message queues APIs.
4. To learn how to develop Applications in android environment.
5. To learn how to develop user interface applications.
6. To learn how to develop URL related applications.

Course Outcomes:

1. To understand how to work with Linux commands for handling files, processes, text utilities, backup and network utilities.
2. To explore basics of building shell scripts gain knowledge to compose various Shell Scripts.
3. To learn and demonstrate the I/O functions, low-level system calls System Calls available for file and directory handling.
4. To understand how to implement pipes, FIFO, how to use for communication purpose in IPC, understand the significance of Semaphores for Kernel support and simulate program using the same.
5. Student understands the working of Android OS Practically.
6. Student will be able to develop user interfaces.
7. Student will be able to develop, deploy and maintain the Android Applications.

LIST OF EXPERIMENTS (LINUX PROGRAMMING):

1. Basic Linux Commands File handling utilities, Security by file permissions, Process utilities, Disk utilities, sed, awk, grep.
2. Write a shell script that accepts a file name, starting and ending line numbers as arguments and displays all the lines between the given line numbers.
3. Write a shell script that deletes all lines containing a specified word in one or more files supplied as arguments to it.
4. Write a shell script that displays a list of all the files in the current directory to which the user has read, write and execute permissions.
5. C programming examples using Linux Operating systems.
   a) wc   b) cat   c) cp
6. Write a shell script that receives any number of file names as arguments checks if every argument supplied is a file or a directory and reports accordingly. Whenever the argument is a file, the number of lines on it is also reported.
7. Write the following Shell scripts:
   a) To accept a list of file names as its arguments, counts and reports the occurrence of each word that is present in the first argument file on other argument files.
   b) To list all of the directory files in a directory.
   c) To find factorial of a given integer.

---

8. Implement in C the following UNIX commands using System calls a) rename b) link
9. Write a C program to emulate the UNIX ls – l command.
10. Write a C program on zombie process
11. Write a C program that illustrates the following.
    a) Creating a message queue.
    b) Writing to a message queue.
    c) Reading from a message queue.
12. Write a C program to implement record locking.

LIST OF EXPERIMENTS (MOBILE APPLICATION DEVELOPMENT):

1. a) Create an Android application that shows Hello + name of the user and run it on an emulator. (b) Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.

2. Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button. Use (a) Linear Layout (b) Relative Layout and (c) Grid Layout or Table Layout.

3. Develop an application that shows names as a list and on selecting a name it should show the details of the candidate on the next screen with a "Back" button. If the screen is rotated to landscape mode (width greater than height), then the screen should show list on left fragment and details on right fragment instead of second screen with back button. Use Fragment transactions and Rotation event listener.

4. Develop an application that uses a menu with 3 options for dialing a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked using intents.

5. Develop an application that inserts some notifications into Notification area and whenever a notification is inserted, it should show a toast with details of the notification.

6. Create an application that uses a text file to store user names and passwords (tab separated fields and one record per line). When the user submits a login name and password through a screen, the details should be verified with the text file data and if they match, show a dialog saying that login is successful. Otherwise, show the dialog with Login Failed message.

7. Create a user registration application that stores the user details in a database table.

8. Create a database and a user table where the details of login names and passwords are stored. Insert some names and passwords initially. Now the login details entered by the user should be verified with the database and an appropriate dialog should be shown to the user.

9. Create an admin application for the user table, which shows all records as a list and the admin can select any record for edit or modify. The results should be reflected in the table.

10. Develop an application that shows all contacts of the phone along with details like name, phone number, mobile number etc.

11. Create an application that saves user information like name, age, gender etc. in shared preference and retrieves them when the program restarts.

12. Create an alarm that rings every Sunday at 8:00 AM. Modify it to use a time picker to set alarm time.

13. Create an application that shows the given URL (from a text field) in a browser.

TEXT BOOKS:
1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012.
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013.
3. Beginning Linux Programming, 4th Edition, N.Matthew, R.Stones, Wrox, Wiley India Edition, rp-2008.

REFERENCES:
1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013.
2. Linux System Programming, Robert Love, O'Reilly, SPD.

Syllabus for B. Tech. IV Year I Semester
Computer Science and Engineering (AI & ML)
LINUX PROGRAMMING LAB & PE-IV (AGILE SOFTWARE DEVELOPMENT) LAB

Code: 8LC65

L	T	P	C
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Course Objectives:

1. To make use of File handling utilities, Security by file permissions, process utilities, Disk utilities, networking utilities.
2. To understand meta-characters of BASH, acquire the knowledge regarding control structures, shell interrupt processing, functions, debugging shell scripts.
3. To analyze syntaxes for process creation, execution and synchronization mechanisms, usage of message queues APIs.
4. Describe the agile relationship between development and IT operations.
5. Understand the skill sets and high-functioning teams involved in DevOps and related methods to reach a continuous delivery capability.
6. Implement automated system update and DevOps lifecycle, understand the fundamentals of software development cycles, Agile, Devops as culture and cloud platforms.
7. Learn various frameworks and tools like Ansible, Git, Jenkins framework, docker and datadog.

Course Outcomes:

1. To understand how to work with Linux commands for handling files, processes, text utilities, backup and network utilities.
2. To explore basics of building shell scripts gain knowledge to compose various Shell Scripts.
3. To learn and demonstrate the I/O functions, low-level system calls System Calls available for file and directory handling.
4. To understand how to implement pipes, FIFO, how to use for communication purpose in IPC, understand the significance of Semaphores for Kernel support and simulate program using the same.
5. Understand software development cycle, devops, and develop EC2 instances on cloud platform AWS.
6. Configure and manage projects with Ansible and version control tool Git.
7. Build and integrate Builds, automating the process by using Jenkins Framework.
8. Create and deploy docker images by using docker as deployment tool and monitor application using datadog CO$: maintain Devops applications effectively.

LIST OF EXPERIMENTS (LINUX PROGRAMMING):
1. Basic Linux Commands File handling utilities, Security by file permissions, Process utilities, Disk utilities, sed, awk, grep.
2. Write a shell script that accepts a file name, starting and ending line numbers as arguments and displays all the lines between the given line numbers.
3. Write a shell script that deletes all lines containing a specified word in one or more files supplied as arguments to it.
4. Write a shell script that displays a list of all the files in the current directory to which the user has read, write and execute permissions.
5. C programming examples using Linux Operating systems.
   a) wc   b) cat   c) cp

6. Write a shell script that receives any number of file names as arguments checks if every argument supplied is a file or a directory and reports accordingly. Whenever the argument is a file, the number of lines on it is also reported.

7. Write the following Shell scripts:
    a) To accept a list of file names as its arguments, counts and reports the occurrence of each word that is present in the first argument file on other argument files.
    b) To list all of the directory files in a directory.
    c) To find factorial of a given integer.

8. Implement in C the following UNIX commands using System calls a) rename b) link

9. Write a C program to emulate the UNIX ls – l command.

10. Write a C program on zombie process

11. Write a C program that illustrates the following.
    a) Creating a message queue.
    b) Writing to a message queue.
    c) Reading from a message queue.

12. Write a C program to implement record locking.

LIST OF EXPERIMENTS (AGILE SOFTWARE DEVELOPMENT):

1. Subscription to AWS, Management console, EC2 essentials & Build EC2 instances, Different IPs assign to EC2 instance, Elastic IP address. (Amazon Web Services)

3. Creation of Ubuntu EC2 instance, connect (open putty session), practice Linux commands and terminate, SSH-authentication setup between different servers, Security groups, Keypairs (Public key, Private keys). (Amazon Web Services)

4. Installing Git, Sign up process for Git, Subversion controls/Git working with local repositories, remote repositories, Software configuration management (SCM) using Git, Managing project from Git. (Git/GitHub)

5. Installation of Git server, Git commands, Cloning fetch/pull, Merging in Git, Branchingstrategies of Git. (**Git/GitHub**)

6. Continuous integration continuous deployment tools, Jenkins installation, User profile and management in Jenkins, Builds setup and pipeline of jobs in Jenkins. (**Jenkins FrameWork**)

7. Jenkins master & slave node configuration, Jenkins workspace management, Securing Jenkins- authentication, Authorization, Confidentiality, Creating users. (**Jenkins FrameWork**)

8. Jenkins plugins- Installing Jenkins plugins, SCM plugin, Build and test, Artifacts, Integration with Git, Create a docker Image. (Jenkins FrameWork)

9. Docker terminologies, Installation of Docker, Docker image creation and Docker hands-on, Docker container creation/start/stop/destroy. (Docker)

10. Installing Ansible on Linux (Aws-Ec2 server) and SSH-authentication setup, Understanding modules, Ansible playbooks, Playbooks creation and execution. (Ansible)

11. Writing and executing different types of playbooks, Playbook with direct static tasks, Playbook with dynamic variable pass, Playbook with roles. (**Ansible**)

TEXT BOOKS:
1. Andrew Stellman and Jennifer Greene, Learning Agile, 1st ed. Mumbai: Shroff-O'Reilly, 2018.
2. Beginning Linux Programming, 4th Edition, N.Matthew, R.Stones, Wrox, Wiley India Edition, rp-2008.

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REFERENCES:
1. Andrew Stellman and Jennifer Greene, Learning Agile, 1st ed. Mumbai: Shroff-O'Reilly, 2018.
2. Pierluigi Riti , Pro Devops with Google Cloud Platform with Docker ,Jenkins and Kubernetes, 1st ed.,New York: Apress, 2018.
3. James shore and Shane warden, The art of Agile development, 1st ed., Mumbai: Shroff-O'Reilly,2018.
4. Linux System Programming, Robert Love, O'Reilly, SPD.

Syllabus for B. Tech. IV Year I Semester
Computer Science and Engineering (AI & ML)
SUMMER INDUSTRY INTERNSHIP – II

Code: 8L792

L	T	P	C
0	0	0	1

Prerequisite: All Courses till this Semester

Students shall carry out the project in industry during summer vacation for 3 - 6 weeks and the evaluation is carried out in fourth year first Semester.

Course Objectives:
To enhance the knowledge on selecting a project, learn related tools and enhance programming and communication skills for employability.

Course Outcomes:
At the end of this course the student will be able to
1. Use the concepts learned in the courses, so far, in conceptualizing, designing and executing the modules of the projects.
2. Exhibit the interest in learning the modern tools and technologies through the bridge courses arranged in the college, beyond the curriculum, and hence developing the software.
3. Inculcate an enthusiasm to use the creative ideas to build the innovative projects and prototypes which are meeting the current needs of the market and society as a whole.
4. Improve their communicative skills and team skills.

A summer industry internship project shall be carried out by a group of students consisting of 2 to 3 in number during summer third year first Semester at industries. This work shall be carried out under the guidance of the faculty assigned as internal guide as well as external guide at industry where students are carrying out summer industry internship projects. Project shall consist of design, fabrication, software development or building of prototype or application app. This can be of interdisciplinary nature also.

There will be 100 marks in total with 30 marks of internal evaluation and 70 marks of external

The **Internal Evaluation** shall consist of:
Day to Day Work (Internal Guide 10M and External Guide: 5M)   :   15 Marks
Report   :   05 Marks
Demonstration / Presentation (Internal Presentation
is evaluated by HOD, senior faculty and internal guide)   :   10 Marks
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30 Marks
End Examination   :   70 Marks.
External Evaluation of the project (viva-voce) shall be conducted by a committee appointed by the Chief Superintendent. The end examination will be carried out by a committee consisting of an external examiner, head of the department, a senior faculty member and the internal guide.

Syllabus for B. Tech. IV Year II Semester
Computer Science and Engineering (AI & ML)
FUNDAMENTALS OF RENEWABLE ENERGY SOURCES
Open Elective-III

	L	T	P	C
Code: 8AC45	2	0	0	2

Course Objectives :
Becomes familiar with solar energy, its radiation, Collection, storage and application and also gets introduced to other forms of Renewable Energy sources viz., the Wind energy, Biomass energy, geothermal energy and ocean energy.

Course Outcomes :
At the end of this course, the students will be able to
1. Understand the role and potential of new and renewable energy sources realize the potential of solar energy, its impact on environment; define and understand the terms describing the different angles that one may incur in setting up a solar panel and be able to use the instruments for measuring solar radiation.
2. Demonstrates the knowledge of different techniques of solar collection and storage.
3. Classify different types of horizontal and vertical axis wind mills and understands the performance characteristics of the same. The student also demonstrates the knowledge of different Bio-gas digesters and factors influencing its yield.
4. Understand the potential of geothermal energy in India and will be able to characterize different types of geothermal wells.
5. Differentiate the different methods of kinetic energy extraction from Ocean waves and tides and thermal energy extraction from Oceans.
6. Demonstrates the knowledge of Direct Energy Conversion in different phenomena viz., Joule Thomson effect, Seebeck effect, Peltier effect etc. and the principle of operation of Fuel Cells.

UNIT–I
PRINCIPLES OF SOLAR RADIATION: Role and potential of new and renewable source, The solar energy option, Environmental impact of solar power, Physics of the sun, the solar constant, Extraterrestrial and terrestrial solar radiation, Solar radiation on titled surface, Instruments for measuring solar radiation and sun shine, Solar radiation data.

UNIT-II
SOLAR ENERGY COLLECTION STORAGE AND APPLICATIONS: Flat plate and concentrating collectors, Classification of concentrating collectors, orientation and thermal analysis, advanced collectors. Different methods, Sensible, Latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

UNIT–III
WIND ENERGY: Sources and potentials, Horizontal and vertical axis windmills, Performance characteristics, Betz criteria

BIO-MASS: Principles of Bio-Conversion, Anaerobic/aerobic digestion, Types of Bio-gas digesters, Gas yield, Combustion characteristics of bio-gas, Utilization for cooking, I.C.Engine operation and economic aspects.

UNIT–IV
GEOTHERMAL ENERGY: Resources, types of wells, methods of harnessing the energy, Potential in India.

UNIT-V
OCEAN ENERGY: OTEC, Principles utilization, Setting of OTEC plants, Thermodynamic cycles. Tidal and wave energy, Potential and conversion techniques, Mini-hydel power plants and their economics.

UNIT-VI
DIRECT ENERGY CONVERSION: Need for DEC, Carnot cycle, Limitations, principles of DEC. Thermoelectric generators, seebeck, Peltier and joul Thomson effects, Figure of merit, materials, Applications, MHD generators, Principles, Dissociation and ionization, Hall effect, Magnetic flux, MHD accelerator, MHD Engine, Power generation systems, Electron gas dynamic conversion, economic aspects. Fuel cells – principles - Faraday's law's - Thermodynamic aspects - selection of fuels and operating conditions.

TEXT BOOKS:
1. Non-Conventional Energy Sources - G.D. Rai
2. Renewable Energy Technologies - Ramesh & Kumar /Narosa.

REFERENCES:
1. Renewable energy resources - Tiwari and Ghosal/ Narosa.
2. Non-Conventional Energy - Ashok V Desai /Wiley Eastern.
3. Non-Conventional Energy Systems - K Mittal /Wheeler

Syllabus for B. Tech. IV Year II Semester
Computer Science and Engineering (AI & ML)
PRODUCT AND SERVICES
(Open Elective –III)

Code: 8ZC24

L	T	P	C
2	0	0	2

Course Objectives:
This course helps to provide the basic concepts of Product and Services. This course will enable the students to study areas of basic insights in product management and Services Design.

Course Outcomes:
At the end of this course the student will be able to
1. Understand the basic concepts of product.
2. Determine the process of new product development and stages in the process.
3. Understand the concept of product testing, product planning and the preparatory groundwork for launching a new product
4. Differentiate various types of services, its differences with the goods and the application of marketing principles for services.
5. Understand the attributes of a good service design and the tools for producing and distributing the services.
6. Identify the importance of quality of services and also introduce some measurement scales to evaluate the service quality.

UNIT- I
PRODUCT AS A COMMERCIAL FACTOR
Product concept: premarketing, product definition, product dimensions. Product classification- by its nature, by final use by reasons for purchase, by consumer groups.

UNIT- II
PRODUCT INNOVATION
New products-What is a new product, Concept, Reasons, Succeed and failure factors, Launch process, Opportunities identification, Idea generation Systems, Evaluation, Check list, Financial analysis, Product concept.

UNIT- III
PRODUCT MANAGEMENT
Concept test, Product testing, Pre-launch, Market test, Final evaluation "Stage / Gate Process" A sequence system for a product launch. Product planning and development- Product planning, Price planning, Bake even point analysis, Communications Planning, Advertising Planning, Distribution planning

UNIT – IV
INTRODUCTION TO SERVICE:
Meaning and Definition of Service, Characteristics of Services, Classification of Service, Five levels of Service, Service verses Physical Goods, 7 P's for Marketing of Services, Marketing Mix for Tourism, Hospitality, Education, and Health Industry.

UNIT – V
SERVICE PROCESS DESIGN:

Challenges & Critical Success Factors, Distribution Methods for Service, Process of Service Delivery, Tools for Service Design, Customer involvement in the Production Process, Tools for Innovation, Role of Intermediaries, Attributes of a Good Design.

UNIT – VI
QUALITY OF SERVICE:
Definition of Service Quality, Elements of Service Quality, Service Quality Measuring Tools; SERVQUAL Scale, Service Quality Gap Analysis, Objective Service Metrics, Cost of Quality in Service. Challenges and Problems of Service Quality in India.

TEXT BOOKS:
1. Dr. S.L. Gupta, Product Management, Wisdom Publications.
2. C.Merle Crawford ,New Product Management.

REFERENCES:
1. Valarie A.Zeithaml & Mary Jo-Bitner: Services Marketing—Integrating Customer Focus Across the Firm, 3/e, Tata McGraw Hill, 2007.
2. Thomas J.Delong & Asish Nanda: Managing Professional Servies—Text and Cases, McGraw-Hill International, 2006.
3. Christopher Lovelock: Services Marketing People, Technology, Strategy, Fourth Edition, Pearson Education, 2006

Syllabus for B. Tech. IV Year II Semester
Computer Science and Engineering (AI & ML)
ENTREPRENEURSHIP AND BUSINESS DESIGN
(Open Elective –III)

Code : 8ZC10

L	T	P	C
2	0	0	2

Course Objective:
The objective of the course is to make students understand the essentials of building their startups and to familiarize with business design process develop business models, and market their product.

Course Outcomes:
At the end of this course, the students will be able to
1. Understand the essentials of entrepreneurship and the key role played by the entrepreneurs.
2. Differentiate the different phases of UI /UX.
3. Outline the attentiveness on designing a business strategy.
4. Explore on designing and delivery of services.
5. Understand reverse engineering methods in product development.
6. Indicate information on IPR, and patent application.

UNIT – I
Introduction to Entrepreneurship: Meaning of Entrepreneurship. Reasons feeding the Entrepreneurial fire. Understanding Entrepreneurship as a Process. Multiple roles of Entrepreneur: Intrapreneur, Inventor, Coordinator, Manager and Controller. Psychological and behavioral aspects of First-Generation Entrepreneur.

UNIT – II
Introduction to UI/UX: Human centered design and benefits, the distinction between UX and UI, UX process – user research, prototyping strategies, UI principles, UI analysis, UI design, UI components and Responsive design.

UNIT – III
Designing a Business Strategy: Define a problem and frame a strategic question, map the lives of users, journey mapping and ideation, color theory, killing the ideas through Stage Gate Models, pitching of full-fledged, idea, choosing the Start-Up Team.

UNIT – IV
Designing Services and Services Delivery: Services as solutions, Service delivery pathways, rapid branding and marketing strategies, key metrics for Design thinking. Types of New services, Mix of core services and secondary and enhancing services, service flower and service design matrix.

UNIT – V
Business Model: Meaning of business model, Difference between business model and business planning, the business model canvas, Risks and Assumptions, Validation of business models, building solution demo and MVP, revenue streams and pricing strategies.

UNIT – VI

Entrepreneurial Funding and Risk Management: Bootstrapping, Angel Investors, Venture capitalists, Private equity funding, customer acquisition, return on equity and Break even analysis, Risk propensity Vs. Risk avoidance, Locus of control of entrepreneur, Risk estimation techniques, risk avoidance strategies.

TEXT BOOKS:
1. Adrian McEwen, Hakim Cassimally – "Designing the Internet of Things", Wiley Publications, 2012
2. Hedman, J., &Kalling, T. (2003). The business model concept: theoretical underpinnings and empirical illustrations. European journal of information systems, 12(1), 49-59.
3. Cabrera, J. (2017). Modular Design Frameworks: A Projects-based Guide for UI/UX Designers.

REFERENCES:
1. J. Chris Leach & Ronald W. Melicher "Entrepreneurial Finance, Fourth Edition", South Western, Cengage Learning, 2012.
2. Robert D. Hisrich & Veland Ramadani – " Effective Entrepreneurial Management, Strategy, Planning, Risk Management, and Organization" , Springer, 2017.
3. Mæhlum, A. R. (2017). Extending the TILES Toolkit-from Ideation to Prototyping (Master's thesis, NTNU).
4. Norman, D. (2013). The design of everyday things: Revised and expanded edition. Basic books.

Syllabus for B. Tech. IV Year II Semester
Computer Science and Engineering (AI & ML)
FINANCIAL INSTITUTIONS, MARKETS AND SERVICES
(Open Elective –III)

Code : 8ZC15

L	T	P	C
2	0	0	2

Prerequisite: Banking Operations, Insurance and Risk Management

Course Objectives:
The objective of the course is to provide to students an understanding of Financial Markets, the major Institutions involved and the Services offered within this framework.

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

1. Understand the financial structure and the financial sector reforms after 1991.
2. Identify the role of RBI and the Regulating and credit policies adopted by the RBI.
3. Analyze the role of Non-Banking financial institutions and the role of financial institutions in India.
4. Understand the role of regulatory bodies like SEBI and also to know the capital and money market instruments.
5. Understand about the asset fund based financial services
6. Expose to investment banking and merchant banking.

UNIT-I
INTRODUCTION: The structure of financial system, Equilibrium in financial markets, Indicators of Financial Development, Financial system and Economic Development, Financial Sector Reforms after 1991.

UNIT-II
BANKING INSTITUTIONS: Structure and Comparative performance, Functions and Role of RBI, Competition, Interest rates, Spread; Bank Capital Adequacy norms; Banking Innovations – BPLR to Base rate, Core Banking System, Financial Inclusion, Current rates: Policy rates, Reserve Ratios, Exchange rates, Lending/ Deposit rates.

UNIT-III
NON BANKING FINANCIAL INSTITUTIONS: Structure and functioning of Unit Trust of India and Mutual Funds, Growth of Indian Mutual funds and their Regulation, Role of AMFI. Performance of Non-Statutory Financial Organizations: IFCI, IRBI, NABARD, SIDBI and SFCs.

UNIT-IV
FINANCIAL AND SECURITIES MARKETS: -, Role and functions of SEBI, Structure and functions of Call Money Market, Government Securities Market – T-bills Market, Commercial Bills Market, Commercial paper and Certificate of Deposits; Securities Market – Organization and Structure, Listing, Trading and Settlement, SEBI and Regulation of Primary and Secondary Markets.

UNIT-V
ASSET/FUND BASED FINANCIAL SERVICES: Lease Finance, Consumer Credit and Hire purchase Finance, Factoring - Definition, Functions, Advantages, Evaluation, Forfeiting, Bills Discounting, Housing Finance, and Venture Capital Financing. Fee-based Advisory services: Stock Broking, Credit Rating.

UNIT-VI
INVESTMENT BANKING AND MERCHANT BANKING: Investment Banking: Introduction, Functions and Activities, Underwriting, Banker to an Issue, Debenture Trustees and Portfolio managers, Challenges faced by Investment Bankers. Merchant Banking: Definition, Merchant Banks Vs Commercial Banks, Services of Merchant Banks.

TEXT BOOKS:
1. L.M. Bhole: Financial Institutions and Markets, TMH, 2009.
2. E. Gordon, K. Natarajan: Financial Markets and Services, Himalaya Publishing House, 2013.

REFERENCES:
1. Vasant Desai: Financial Markets and Financial Services, Himalaya,2009
2. Pathak: Indian Financial Systems, Pearson, 2009
3. M.Y. Khan: Financial Services, TMH, 2009.
4. S. Gurusamy: Financial Services and System, Cengage,2009
5. Justin Paul and Padmalatha Suresh: Management of Banking and Financial Services, Pearson, 2009.

Syllabus for B. Tech. IV Year II Semester
Computer Science and Engineering (AI & ML)
ETHICAL HACKING
(Professional Elective –V)

Code: **8JC02**

L	T	P	C
3	0	0	3

Prerequisite: Knowledge in information security, Web application

Course Objectives:
1. Introduce the methodologies and framework of ethical hacking for enhancing the security.
2. The course includes-Impacts of Hacking; Types of Hackers; Information Security Models; Information Security Program; Business Perspective; Planning a Controlled Attack.

Course Outcomes:
At the end of this course, the student will be able to
1. Gain the knowledge of the use and availability of tools to support an ethical hack.
2. Interpret the results of a controlled attack.
3. Explain the role of inherent and imposed limitations and metrics for planning of a test.
4. Comprehend the dangers associated with penetration testing.

UNIT- I
Introduction: Hacking Impacts, The Hacker Framework: Planning the test, Sound Operations, Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Final Analysis, Deliverable, Integration
Information Security Models: Computer Security, Network Security, Service Security, Application Security, Security Architecture

UNIT - II
Information Security Program: The Process of Information Security, Component Parts of Information Security Program, Risk Analysis and Ethical Hacking
The Business Perspective: Business Objectives, Security Policy, Previous Test Results, Business Challenges

UNIT - III
Planning for a Controlled Attack: Inherent Limitations, Imposed Limitations, timing is Everything, Attack Type, Source Point, Required Knowledge, Multi-Phased Attacks, Teaming and Attack Structure, Engagement Planner, The Right Security Consultant, The Tester, Logistics, Intermediates, Law Enforcement

UNIT - IV
Preparing for a Hack: Technical Preparation, Managing the Engagement
Reconnaissance: Social Engineering, Physical Security, Internet Reconnaissance

UNIT - V
Enumeration: Enumeration Techniques, Soft Objective, Looking Around or Attack, Elements of Enumeration, Preparing for the Next Phase
Exploitation: Intutive Testing, Evasion, Threads and Groups, Operating Systems, Password Crackers, RootKits, applications, Wardialing, Network, Services and Areas of Concern

UNIT - VI
Deliverable: The Deliverable, The Document, Overal Structure, Aligning Findings,

Presentation Integration: Integrating the Results, Integration Summary, Mitigation, Defense Planning, Incident Management, Security Policy, Conclusion.

TEXT BOOK:

1. James S. Tiller, "The Ethical Hack: A Framework for Business Value Penetration Testing", Auerbach Publications, CRC Press.

REFERENCES:

1. EC-Council, "Ethical Hacking and Countermeasures Attack Phases", Cengage Learning.

2. Michael Simpson, Kent Backman, James Corley, "Hands-On Ethical Hacking and Network Defense", Cengage Learning.

Syllabus for B. Tech. IV Year II Semester
Computer Science and Engineering (AI & ML)
QUANTUM COMPUTING
(Professional Elective – V)

Code: 8LC21

L	T	P	C
3	0	0	3

Course Objectives:
1. To introduce the fundamentals of quantum computing
 2. The problem-solving approach using finite dimensional mathematics

Course Outcomes:
1. Understand basics of quantum computing
2. Understand physical implementation of Qubit
3. Understand Quantum algorithms and their implementation
4. Understand the Impact of Quantum Computing on Cryptography

UNIT – I
Introduction to Essential Linear Algebra: Some Basic Algebra, Matrix Math, Vectors and Vector Spaces, Set Theory. Complex Numbers: Definition of Complex Numbers, Algebra of Complex Numbers, Complex Numbers Graphically, Vector Representations of Complex Numbers, Pauli Matrice, Transcendental Numbers.

UNIT – II
Basic Physics for Quantum Computing: The Journey to Quantum, Quantum Physics Essentials,
Basic Atomic Structure, Hilbert Spaces, Uncertainty, Quantum States, Entanglement.

UNIT-III
Basic Quantum Theory: Further with Quantum Mechanics, Quantum Decoherence, Quantum Electrodynamics, Quantum Chromodynamics, Feynman Diagram Quantum Entanglement and QKD, Quantum Entanglement, Interpretation, QKE.

UNIT – IV
Quantum Architecture: Further with Qubits, Quantum Gates, More with Gates, Quantum Circuits, The D-Wave Quantum Architecture. Quantum Hardware: Qubits, How Many Qubits Are Needed? Addressing Decoherence, Topological Quantum Computing, Quantum Essentials.

UNIT – V
Quantum Algorithms: What Is an Algorithm? Deutsch's Algorithm, Deutsch-Jozsa Algorithm, Bernstein-Vazirani Algorithm, Simon's Algorithm, Shor's Algorithm, Grover's Algorithm.

UNIT – VI
Current Asymmetric Algorithms: RSA, Diffie-Hellman, Elliptic Curve. The Impact of Quantum Computing on Cryptography: Asymmetric Cryptography, Specific Algorithms, Specific Applications.

TEXT BOOKS:
1. Nielsen M. A., Quantum Computation and Quantum Information, Cambridge University Press.
2. Dr. Chuck Easttom, Quantum Computing Fundamentals, Pearson.

REFERENCES:
1. Quantum Computing for Computer Scientists by Noson S. Yanofsky and Mirco A. Mannucci.
2. Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol.

Syllabus for B. Tech. IV Year II Semester
Computer Science and Engineering (AI & ML)
PARALLEL AND DISTRIBUTED COMPUTING
(Professional Elective – V)

Code: 8LC22

	L	T	P	C
	3	0	0	3

Course Objectives:
1. To learn core ideas behind parallel and distributed computing.
2. To explore the methodologies adopted for parallel and distributed environments.
3. To understand the networking aspects of parallel and distributed computing.
4. To provide an overview of the computational aspects of parallel and distributed computing.
5. To learn parallel and distributed computing models.

Course Outcomes:
1. Explore the methodologies adopted for parallel and distributed environments.
2. Analyze the networking aspects of Distributed and Parallel Computing.
3. Explore the different performance issues and tasks in parallel and distributed computing.
4. Tools usage for parallel and distributed computing.
5. Understanding high performance computing techniques.

UNIT – I
Parallel and Distributed Computing— Introduction- Benefits and Needs- Parallel and Distributed Systems- Programming Environment- Theoretical Foundations -

UNIT – II
Parallel Algorithms— Introduction- Parallel Models and Algorithms- Sorting - Matrix Multiplication- Convex Hull- Pointer Based Data Structures.

UNIT – III
Synchronization- Process Parallel Languages- Architecture of Parallel and Distributed Systems- Consistency and Replication- Security- Parallel Operating Systems.

UNIT – IV
Management of Resources in Parallel Systems- Tools for Parallel Computing- Parallel Database Systems and Multimedia Object Servers.

UNIT – V
Networking Aspects of Distributed and Parallel Computing- Process- Parallel and Distributed ScientificComputing.

UNIT – VI
High-Performance Computing in Molecular Sciences- Communication Multimedia Applications for Parallel and Distributed Systems- Distributed File Systems.

TEXT BOOKS:
1. Jacek Błażewicz, et al., "Handbook on parallel and distributed processing", Springer Science & Business Media, 2013.
2. Andrew S. Tanenbaum, and Maarten Van Steen, "Distributed Systems: Principles andParadigms". Prentice-Hall, 2007.

REFERENCES:
1. George F.Coulouris, Jean Dollimore, and Tim Kindberg, "Distributed systems: concepts and design", Pearson Education, 2005.
2. Gregor Kosec and Roman Trobec, "Parallel Scientific Computing: Theory, Algorithms, and Applications of Mesh Based and Meshless Methods", Springer, 2015.

Syllabus for B. Tech. IV Year II Semester
Computer Science and Engineering (AI & ML)
MAJOR PROJECT

Code : 8L896

L	T	P	C
0	0	10	5

Prerequisite: All Courses till this Semester

Course Objectives:
To enhance the knowledge on selecting a project, learn related tools and enhance programming and communication skills for employability.

Course Outcomes:
At the end of this course, the students will be able to
1. Estimate the human and physical resources required, and make plan for the development of Project.
2. Break down the Project into tasks and determine handover procedures.
3. Identify links and dependencies, and schedule to achieve deliverables.
4. Allocate roles with clear lines of responsibility and accountability with team spirit.
5. Design and develop the software or prototype using modern software tools wherever applicable to meet societal needs.
6. Present the Project done and submit the report.

A project shall be carried out by a group of students consisting of 2 to 3 in number in fourth year second Semester. This work shall be carried out under the guidance of the faculty assigned as internal guide and shall involve design, fabrication, software development or any other significant activity. This can be of interdisciplinary nature also.

Out of total 100 marks for project work (in the final year second Semester), 30 marks shall be for Internal Evaluation and 70 marks for the External Evaluation at the end of the Semester.

External Evaluation of the project (viva-voce) shall be conducted by a committee appointed by the Chief Superintendent. The committee consists of an external examiner, HOD, a Senior Faculty Member and Internal Guide.

Division of Marks for Internal Evaluation – 30 Marks
Division of Marks for External Evaluation – 70 Marks