ACADEMIC REGULATIONS (R22)

COURSE STRUCTURE AND DETAILED SYLLABUS

(CHOICE BASED CREDIT SYSTEM (CBCS))

B.Tech. with Honours Program

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B.Tech. with Minor Program in AI&ML/CS/DS/IOT/I&E

(B.Tech. Regular: Applicable for the batches admitted from 2022 - 2023)

Department of Computer Science and Engineering

CMR INSTITUTE OF TECHNOLOGY

(UGC - Autonomous)

Approved by AICTE, Permanently Affiliated to JNTUH, Accredited by NBA and NAAC with A Grade

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FOREWORD

CMR Institute of Technology, established in the year 2005, Approved by AICTE, New Delhi, Permanently Affiliated to JNTUH, Accredited by NBA under Tier-I, Achieved UGC Autonomous Status and has been bestowed with NAAC 'A' Grade for its remarkable academic accomplishments accompanied by its unflinching spirit and dedication to impart quality technical education to the deserving aspirants. The institution has commenced functioning independently within the set norms prescribed by UGC and AICTE. The performance of the institution manifests the confidence that the prestigious monitoring body, the UGC has on it, in terms of upholding its spirit and sustenance of the expected standards of functioning on its own consequently facilitating the award of degrees for its students. Thus, an autonomous institution is provided with the necessary freedom to have its own **curriculum, examination system and monitoring mechanism**, independent of the affiliating University but under its observance.

CMR Institute of Technology takes pride for having won the confidence of such distinguished academic bodies meant for monitoring the quality in technology education. Besides, the institution is delighted to sustain the same spirit of discharging the responsibilities that it has been conveying since 2005 to attain the current academic excellence in improvement of the standards and ethics. Institutional Governance enriched by eminent personalities on many of its boards/councils such as the Governing Body, Academic Council, Boards of Studies, IQAC to frame the guidelines for curriculum design and development in the interest of the key-stakeholders.

The autonomous academic regulations, course structure and syllabi have been framed in accordance with the vision and mission of the institution on the valuable suggestions from various stakeholders from the diverse fields of academics, industry, R&D and society with a bird-eye-view to impart quality professional technical education to contribute the society with innovation and creativity.

All the staff members, parents and students are requested to study all the rules and regulations carefully and approach the Principal to seek any clarifications, if needed, without presumptions, to avoid unwanted subsequent embarrassments. The cooperation of all the stakeholders is sought for the successful implementation of the autonomous system in the larger interests of the institution and for brightening the career prospects of engineering and management graduates.

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CMR INSTITUTE OF TECHNOLOGY

Vision: To create world class technocrats for societal needs.

Mission: Achieve global quality technical education by assessing learning environment through

- Innovative Research & Development
- Eco-system for better Industry institute interaction
- Capacity building among stakeholders

Quality Policy: Strive for global professional excellence in pursuit of key-stakeholders.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (CSE)

Vision: Develop competent software professionals, researchers and entrepreneurs to serve global society.

Mission: The department of **Computer Science and Engineering** is committed to

- create technocrats with proficiency in design and code for software development
- adapt contemporary technologies by lifelong learning and face challenges in IT and ITES sectors
- quench the thirst of knowledge in higher education, employment, R&D and entrepreneurship

I. Programme Educational Objectives (PEOs): Engineering Graduates will

1. Pursue successful professional career in IT and IT-enabled sectors.
2. Pursue lifelong learning skills to solve complex problems through multidisciplinary-research.
3. Exhibit professionalism, ethics and inter-personal skills to develop leadership qualities.

II. Programme Outcomes (POs): Engineering Graduates will be able to

1. Apply mathematics, science, engineering fundamentals to solve complex engineering problems.
2. Identify, formulate and analyze complex engineering problems to reach substantiated conclusions.
3. Design and develop a component/system/process to solve complex societal engineering problems.
4. Design and conduct experiments to analyze, interpret and synthesize data for valid conclusions.
5. Create, select and apply modern tools, skills, resources to solve complex engineering problems.
6. Apply contextual engineering knowledge to solve societal issues.
7. Adapt modern engineering practices with environmental safety and sustainable development.
8. Apply professional code of ethics, responsibilities and norms in engineering practices.
9. Compete as an individual and/or as a leader in collaborative cross cultural teams.
10. Communicate effectively through technical reports, designs, documentations and presentations.
11. Endorse cognitive management skills to prepare project report using modern tools and finance.
12. Engage in independent and life-long learning in the broad context of technological changes.

III. Programme Specific Outcomes (PSOs): Engineering Graduates will be able to

1. Design and develop Computer-Based-Systems using Algorithms, Networks, Security, Gaming, Full Stack, DevOps, IoT, Cloud, Data Science and AI&ML.
2. Apply cutting-edge technologies to solve real world problems.

Academic Regulations (R22)
B.Tech. with Honours Program
(For Batches Admitted from the Academic Year 2022 - 23)

1. Objectives

The key objectives of offering B.Tech. with Honours program to the students are:

- To expand the domain knowledge of the students laterally and vertically.
- To increase the core competency and employability with expanded knowledge.
- To pursue their higher studies with wide range of specializations.

2. Academic Regulations for B.Tech. Honours Degree

a. The weekly instruction hours, internal & external evaluation and award of grades are on par with regular 4-Years B.Tech. program.

b. For B.Tech. with honours program, a student needs to earn additional 20 credits (over and above the required 160 credits for B.Tech degree). The broad guidelines for the courses of Honours program, their respective credits weightage and semester-wise break-up of thecourse are enclosed as Annexure. All these 20 credits need to be completed in III and IV years only.

c. After registering for the honours programme, if a student is unable to pass all courses in first attempt and earn the required 20 credits, the student shall not be awarded honours degree. However, if the student earns all the required 160 credits of B.Tech., the student will be awarded only B.Tech. degree in the concerned branch.

d. There is no transfer of credits from honours program courses to B.Tech. course & vice versa.

e. These 20 credits are to be earned from the additional courses offered by the host department in the college or from closely related departments in the college as well as from the MOOCS.

f. For the course selected under MOOCS platform following guidelines may be followed:

- For MOOCS courses a formal approval from the Head of the Department is essential regarding course, syllabus, credits, duration and mode of evaluation etc.
- Credits for MOOCS course must be ≥ the credits specified in the honours course structure.
- Only Pass-grade or above shall be considered for issue of honours course memo.

g. The choice to opt/take an honours program is purely on the choice of the students and any expenses incurred are met by students only.

h. The student shall be given a choice of withdrawing all the courses registered and/or the credits earned for Honours program at any time; and in that case the student will be awarded only B. Tech. degree in the concerned branch on earning the required credits of 160.

i. The student of B.Tech. degree course can choose either honours program or minor program.

j. The B.Tech. with Honours program shall be offered from the AY 2022-23 onwards. The students who are pursuing their V semester in the current academic year can register for the honours program if they fulfill the eligibility criteria.

k. A student can graduate with honours, if the student fulfills the requirements of regular B.Tech. program as well as honours program.

l. The institute maintains the record of students registered and pursuing their honours programs branch-wise and the same needs to be sent to JNTUH.

m. The department shall prepare the time-tables for each Honours program offered without any overlap/clash with other courses of study in the respective semesters.

3. Eligibility conditions of the students for the Honours degree

a. The department concerned shall offer at least one M.Tech. Program.

b. A student can opt for B.Tech. degree with honours, if the student passed all subjects in first attempt in all the semesters till the results announced and maintaining ≥ 7.5 CGPA.

c. Prior approval of the mentor and Head of the Department is mandatory before commencement of V semester for enrolment into honours program.

d. If more than 30% of the students in a branch fulfill the eligibility criteria (as stated above), the number of students given eligibility should be limited to 30%. The criteria to be followed for choosing 30% candidates in a branch may be the CGPA (7.5 and above) secured by the students till III semester.

e. If a student fails in any registered course of either B.Tech. or honours in any semester of four years program, the student will not be eligible for obtaining honors degree. The student shall be eligible for only B.Tech. degree.

f. Successful completion of 20 credits earmarked for honours program with at least 7.5 CGPA along with successful completion of 160 credits earmarked for regular B.Tech. Program with at least 7.5 CGPA and passing all the subjects in first attempt are eligible for the award of B.Tech. (Honours) degree.

g. For CGPA calculation of B.Tech. course, the 20 credits of honours program will not be considered.

4. Registration for the course in Honours program

a. At the beginning of each semester, just before the commencement of classes, students shall register for the courses which they wish to take in that semester.

b. The students should choose a course from the list against each semester (from honours course structure) other than the courses they have studied/registered for regular B.Tech. programme. No course should be identical to that of the regular B.Tech. course. The students should take the advice of faculty mentors while registering for a course at the beginning of semester.

c. The maximum number of courses for the honours is limited to two in a semester along with regular semester courses.

d. The student has to pay a registration fee of **Rs. 1000/-** per one credit and a fee for late registration may be imposed as per the norms.

Academic Regulations (R22)
B.Tech. with Minor Program
(For Batches Admitted from the Academic Year 2022 - 23)

1. Introduction

The philosophy behind Engineering as an academic discipline has been to orient the knowledge seekers in a manner that shatters the theoretical boundaries and pushes them into the realms of a practical world view.

The **B.Tech. with Minor** program focuses on the fundamental principles of multiple engineering disciplines, critical & analytical thinking and to develop a distinctive approach to interdisciplinary problems. CMRIT has introduced **B.Tech. in a particular branch with minor in a specified program** (Ex. B.Tech. in ECE with Minor in AI&ML) from the AY 2022-23.

2. Objectives

The key objectives of offering B.Tech. with Minor program to the students are:

- To expand the domain knowledge in one of the other branches of engineering.
- To increase the employability opportunities in diverse fields.
- To provide an opportunity to pursue higher studies in the inter-disciplinary areas.
- To offer the knowledge in thrust areas and emerging technologies of engineering.

3. Minor courses and the offering departments

S. No.	Minor Program	Eligible Branch of Students	Offering Department*	Award of Degree
1	Artificial Intelligence & Machine Learning	B.Tech. in CSE/CSE (DS) / CSE (CS)/ ECE	CSE	B.Tech. in branch name with Minor in Artificial Intelligence & Machine Learning
2	Cyber Security	B.Tech. in CSE/CSE (DS) / CSE (AI&ML)/ ECE	CSE	B.Tech. in branch name with Minor in Cyber Security
3	Data Science	B.Tech. in CSE/CSE (CS) / CSE (AI&ML)/ ECE	CSE	B.Tech. in branch name with Minor in Data Science
4	IOT	B.Tech. in CSE/CSE (CS) / CSE(DS)/CSE (AI&ML)/ ECE	ECE	B.Tech. in branch name with Minor in IOT
5	Innovation and Entrepreneurship	All branches.	MBA	B. Tech. in branch name with Minor in Innovation and Entrepreneurship

Note: * As per AICTE guide lines.

4. Academic Regulations for B. Tech. Degree with Minor programs

a. The weekly instruction hours, internal & external evaluation and award of grades are on par with regular 4-Years B.Tech. program.

b. For B.Tech. with Minor, a student needs to earn additional 18 credits (over and above the required 160 credits for B.Tech degree). The list of courses of each Minor program, their respective credits weightage and semester-wise break-up of the courses are enclosed as Annexure. All these 18 credits need to be completed in III and IV years only.

c. After registering for the Minor programme, if a student is unable to earn all the required 18 credits in a specified duration (twice the duration of the course), the student shall not be awarded Minor degree. However, if the student earns all the required 160 credits of B.Tech., the student will be awarded only B. Tech degree in the concerned branch.

d. There is no transfer of credits from minor program courses to B.Tech. course & vice versa.

e. All 18 credits are to be earned from additional courses offered by host department/MOOCS.

f. For the course selected under MOOCS platform following guidelines may be followed:

- For MOOCS courses a formal approval from the Head of the Department is essential regarding course, syllabus, credits, duration and mode of evaluation etc.
- Credits for MOOCS course must be ≥ the credits specified in the minor course structure.
- Only Pass-grade or above shall be considered for issue of minor course memo.

g. The choice to opt/take a minor program is purely on the choice of the students and any expenses incurred are met by students only.

h. The student shall be given a choice of withdrawing all the courses registered and/or the credits earned for minor program at any time; and in that case the student will be awarded only B.Tech. degree in the concerned branch on earning the required credits of 160.

i. The student of B.Tech. degree course can choose either honours program or minor program.

j. The B.Tech. with a minor program shall be offered from the AY 2022-23 onwards. The students who are pursuing their V semester in the current academic year can register for the Minor program if they fulfill the eligibility criteria.

k. A student can graduate with minor, if the student fulfills the requirements of regular B.Tech. program as well as minor program.

l. The institute maintains the record of students registered and pursuing their minor programs, minor program-wise and parent branch-wise and the same needs to be sent to JNTUH.

m. The department shall prepare the time-tables for each minor course offered without any overlap/clash with other courses of study in the respective semesters.

5. Eligibility conditions for the student to register for Minor course

a. A student can opt for B.Tech. degree with minor program if she/he has no active backlogs till III semester at the time of entering into V semester.

b. Prior approval of mentor and Head of the Department for the enrolment into minor program, before commencement of V Semester, is mandatory.

c. If more than 50% of the students in a branch fulfill the eligibility criteria (as stated above), the number of students given eligibility should be limited to 50%.

6. Registration for the courses in Minor Program

a. At the beginning of each semester, just before the commencement of classes, students shall register for the courses which they wish to take in the semester.

b. The students should choose a course from the list against each semester (from minor course structure) other than the courses they have studied/registered for regular B.Tech. programme. No course should be identical to that of the regular B.Tech. course. The students should take the advice of faculty mentors while registering for a course at the beginning of semester.

c. The maximum No. of courses for the minor is limited to two (three in case of inclusion of lab) in a semester along with regular semester courses.

d. The student has to pay a registration fee of **Rs. 1000/-** per one credit and a fee for late registration may be imposed as per the norms.

ANNEXURE – A

Course Structure for B.Tech. Honours Degree Programs

(Applicable from the batch admitted during 2022-23 and onwards)

S. No.	Semester	Course to be chosen from/studied	Mode of Learning	No. of Credits
1	V	PE-I	Blended/Conventional	3
2	VI	PE-II	Conventional	3
3		Research Methodologies	Conventional	3
4	VII	PE-III	Conventional	3
5		PE-IV	Conventional	3
6	VIII	PE-V or PE-VI or any subject suggested by the Department.	MOOCS	3
7		Technical Paper writing	Under the mentorship of a supervisor	2
Total Credits				**20**

Note:

a. Professional Elective (PE) course should be selected (which is not studied) from each Professional Electives list provided in regular B. Tech. course.

b. Courses can be chosen as in above table.

c. The institute shall offer a course on Research Methodologies by combining the students of all branches (if the number of students is more, multiple parallel sessions may be conducted). The time slots in the time-tables of respective branches should be aligned. The external evaluation of Research Methodologies course shall be done by the Institute.

d. If the blended course option is chosen, for the subject in V semester, the learning should be partially in online mode and partially in offline mode. The external evaluation shall be done by the Institute; however, for the internal evaluation component, online assessment should also be taken into account while finalizing the internal marks by the course teacher.

TECHNICAL PAPER WRITING

Course	B.Tech.-VIII-Sem.	L	T	P	C
Subject Code	22CSPR81H	-	-	4	2

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PO9	PO10	PO11	PO12	PSO1
CO1	identify complex engineering problem	3	3	3	3	3	3	3
CO2	review technical research papers	3	3	3	3	3	3	3
CO3	analyze the collected data	3	3	3	3	3	3	3
CO4	apply modern tools in support of objectives	3	3	3	3	3	3	3
CO5	write and publish a technical research paper	3	3	3	3	3	3	3

Guidelines

S. No.	Title
1	The student shall take up a problem/topic of engineering branches (inter-disciplinary nature) and apply the knowledge which they acquired while pursuing their engineering branch. It is expected to analyze, design and develop an application for the identified problem and write a technical paper/document.
2	Alternatively, the student (i) shall identify a research topic, analyze the problem, carryout the experiments, write a technical paper and publish-in/communicate for a scopus indexed journal/any journal with decent reputation or (ii) demonstrate a talent/an idea/development of an innovative product.
3	The evaluation shall be done by the same committee which is constituted for project evaluation, along with the final semester project work.
4	The students should start exploration for the technical paper writing immediately after the VI semester exams. Only the evaluation part shall be carried in VIII semester.

RESEARCH METHODOLOGIES

Course	B.Tech.-VI-Sem.	L	T	P	C
Course Code	22HS61H	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PO9	PO10	PO12	PSO1
CO1	distinguish research methods	3	3	3	3	3	3
CO2	identify contemporary research problems	3	3	3	3	3	3
CO3	analyze the collected data	3	3	3	3	3	3
CO4	apply test-statistic and support hypotheses	3	3	3	3	3	3
CO5	write and publish a technical research report	3	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	9
Objective of Research; Definition and Motivation; Types of Research; Research Approaches; Steps in Research Process; Criteria of Good Research.		
II	**Research Formulation and Literature Review**	11
Problem Definition and Formulation; Literature Review; Characteristics of Good Research Problem; Literature Review Process; Plagiarism, Ethics in Research.		
III	**Data Collection and Analysis**	4+6=10
Part A: Data Collection: Primary and Secondary Data; Primary and Secondary Data Sources; Data Collection Methods; Data Processing; Classification of Data.		
Part B: Data Analysis: Statistical Analysis; Multivariate Analysis; Correlation Analysis; Regression Analysis; PrincipleComponent Analysis; Samplings.		
IV	**Research Design, Hypothesis Formulation and Testing**	9
Research Design: Need for Research Design; Features of a Good Design; Types of Research Designs; Induction and Deduction. **Hypothesis Formulation and Testing:** Hypothesis; Important Terms; Types of Research Hypothesis; Hypothesis Testing; Z-Test; t-Test; f-Test; Making a Decision; Types of Errors; ROC Graphics.		
V	**Presentation of the Research Work**	9
Business Report; Technical Report; Research Report; General Tips for Writing Report; Presentation of Data; Oral Presentation; Bibliography and References; Intellectual Property Rights; Open-Access Initiatives; Plagiarism.		
Textbooks		
1. Research Methodology. Methods & Technique: Kothari. C.R. 2. Stuart Melville and Wayne Goddard, "Research Methodology: An Introduction for Science & Engineering Students".		
References		
1. Research methodology - S.S. Vinod Chandra, S. Anand Hareendran. 2. Intellectual Property Rights by Deborah E. Bouchoux, Cengage Learning. 3. Managing Intellectual Property - The Strategic Imperative, Vinod V.Sople, 2nd Edition, PHI.		

ANNEXURE – B

B.Tech. Minor in AI & ML - R22 Course Structure

(Applicable from the batch admitted during 2022-23 and onwards)

(*Which is not studied in regular B.Tech. course*)

S. No.	Course Code	Subject	POs	PSOs	Hours Per Week			Credits
					L	T	P	
V – Semester								
1	22CSA51M	Foundations of Artificial Intelligence	1,2,3,6,12	1	3	-	-	3
2	22CSA52M	Artificial Intelligence Lab	4,5,9	2	-	-	3	1.5
Total (A)					**3**	**-**	**3**	**4.5**
VI - Semester								
3	22CSA61M	Artificial Intelligence Applications	2,3,5,8,12	1	4	-	-	4
Total (B)					**4**	**-**	**-**	**4**
VII - Semester								
Either online through MOOCS or off-line Class								
4	22CSA71M	Machine Learning	1,2,3,6,12	1	3	-	-	3
5	22CSA72M	Machine Learning Lab	4,5,9	2	-	-	3	1.5
or								
4	22CSA73M	Deep Learning	1,2,3,6,12	1	3	-	-	3
5	22CSA74M	Deep Learning Lab	4,5,9	2	-	-	3	1.5
Total (C)					**3**	**-**	**3**	**4.5**
VIII - Semester								
6	**Any one of the following**				3	-	-	3
	22CSA81M	Robotics Process Automation	2,3,5,6,12	1				
	22CSA82M	Natural Language Processing	2,3,5,8,12	1				
	22CSA83M	Computer Vision & Robotics	2,3,5,6,12	1				
	22CSA84M	Soft Computing	2,3,5,7,12	1				
7	22CSA85M	Mini Project	1 to 12	1,2			4	2
Total (D)					**3**	**-**	**4**	**5**
TOTAL CREDITS (A + B + C + D)								**18**

FOUNDATIONS OF ARTIFICIAL INTELLIGENCE

Course	B.Tech.-V-Sem.	L	T	P	C
Subject Code	22CSA51M	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO6	PO12	PO13
CO1	explain the concepts of artificial intelligence	3	3	3	3	2	3
CO2	illustrate various search algorithms	3	3	3	3	2	3
CO3	adapt various probabilistic reasoning approaches	3	3	2	3	3	3
CO4	elaborate Markov decision process	3	3	2	3	2	3
CO5	perceive various reinforcement learning approaches	3	3	2	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	8
Concept of AI, history, current status, scope, agents, environments, Problem Formulations, Review of tree and graph structures, State space representation, Search graph and Search tree.		
II	**Search Algorithms**	10
Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, Best first search, A* algorithm, Game Search.		
III	**Probabilistic Reasoning**	6+4=10
Part-A: Probability, conditional probability, Bayes Rule, Bayesian Networks- representation, construction and inference.		
Part-B: Temporal Model, Hidden Markov Model.		
IV	**Markov Decision Process**	10
MDP formulation, utility theory, utility functions, value iteration, policy iteration and partially observable MDPs.		
V	**Reinforcement Learning**	10
Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning.		
Textbooks:		
1. Elaine Rich & Kevin Knight, 'Artificial Intelligence', 3rd Edition, TMH, 2008. 2. Russel and Norvig, 'Artificial Intelligence', Pearson Education, PHI, 2003.		
References:		
1. Trivedi, M.C., "A Classical Approach to Artifical Intelligence", Khanna Publishing House, Delhi. 2. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, 2011. 3. David Poole and Alan Mackworth, "Artificial Intelligence: Foundations for Computational Agents", Cambridge University Press 2010.		

ARTIFICIAL INTELLIGENCE LAB

Course	B.Tech.-V-Sem.	L	T	P	C
Subject Code	22CSA52M	-	-	3	1.5

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PO9	PSO2
CO1	illustrate various search techniques	3	3	3	3
CO2	solve real-time problems using graph theory	3	3	3	3
CO3	develop various games using AI techniques	3	3	3	3
CO4	adapt Bayesian probability model	3	3	3	3
CO5	design programs based on Markov decision process	3	3	3	3

List of Experiments

Week	Title/Experiment
1	Write a program to implement BFS Traversal.
2	Write a program to implement DFS Traversal.
3	Write a program to implement A* Search.
4	Write a program to implement Travelling Salesman Problem.
5	Write a program to implement Graph Coloring Problem.
6	Write a program to implement Missionaries and Cannibals Problem.
7	Write a program to implement Water Jug Problem.
8	Write a program to implement Hangman game.
9	Write a program to implement Tic-Tac-Toe game.
10	Write a program to implement 8 Queens Problem
11	Write a program to implement Bayesian Network.
12	Write a program to implement Hidden Markov Model.

References

1. Artificial Intelligence Lab Manual, Department of CSE, CMRIT, Hyd.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Intelligent vehicles using Artificial Intelligence.
2. Smart ICU Predictive detection of deterioration of seriously ill patients using Artificial Intelligence.
3. Artificial Intelligence Innovation.
4. Prevention against Cyber security Threats using Artificial Intelligence.
5. Efficient, Scalable Processing of Patient Data using Artificial Intelligence.
6. Smart Bike Share Programs using Artificial Intelligence.
7. Automatic Document Classification using Bayesian theorem.
8. Automated Geophysical Feature Detection using Artificial Intelligence.
9. Artificial Intelligence for Records Management.
10. Artificial Intelligence in e-Commerce.

ARTIFICIAL INTELLIGENCE APPLICATIONS

Course	B.Tech.-VI-Sem.	L	T	P	C
Subject Code	22CSA61M	4	-	-	4

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO8	PO12	PSO1
CO1		3	3	3	3	3	3
CO2		3	3	3	3	2	3
CO3		3	3	2	3	3	3
CO4		3	3	2	3	2	3
CO5		3	3	2	3	3	3

Syllabus

Unit	Title/Topics	Hours
I		8
Linguistic aspects of natural language processing, A.I. And Quantum Computing, Applications ofArtificial Intelligence (AI) in business.		
II		10
Emotion Recognition using human face and body language, AI based system to predict the diseases early, Smart Investment analysis, AI in Sales and Customer Support.		
III		6+4=10
Part-A: Robotic Processes Automation for supply chain management.		
Part-B: Robotic Processes Automation for supply chain management. (Continuation)		
IV		10
AI-Optimized Hardware, Digital Twin i.e. AI Modelling, Information Technology &Security using AI.		
V		10
Recent Topics in AI/ML: AI/ML in Smart solutions, AI/ML in Social Problems handling, Block chainand AI.		
Textbooks		
1. Sameer Dhanrajani, AI and Analytics, Accelerating Business Decisions, John Wiley &Sons. 2. Artificial Intelligence in Practice: How 50 Successful Companies Used AI and Machine Learning to Solve Problems, Bernard Marr, Matt Ward, Wiley.		
References		
1. Life 3.0: Being Human in the Age of Artificial Intelligence by Max Tegmark, 2018. 2. Homo Deus: A Brief History of Tomorrow by Yuval Noah Harari, 2017.		

MACHINE LEARNING

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	22CSA71M	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO6	PO12	PSO1
CO1		3	3	3	3	3	3
CO2		3	3	3	3	2	3
CO3		3	3	2	3	3	3
CO4		3	3	2	3	2	3
CO5		3	3	2	3	3	3

Syllabus

Unit	Title/Topics	Hours
I		8
Introduction - Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning, Concept learning and the general to specific ordering – introduction, a concept learning task, concept learning as search, find-S: finding a maximally specific hypothesis, version spaces and the candidate elimination algorithm, remarks on version spaces and candidate elimination,inductive bias. Decision Tree Learning – Introduction, decision tree representation, appropriate problems for decision tree learning, the basic decision tree learning algorithm, hypothesis space search in decision tree learning, inductive bias in decision tree learning, issues in decision tree learning.		
II		10
Artificial Neural Networks-1 - Introduction, neural network representation, appropriate problems for neural network learning, perceptions, multilayer networks and the back-propagation algorithm. Artificial Neural Networks-2 - Remarks on the Back-Propagation algorithm, An illustrative example:face recognition, advanced topics in artificial neural networks. Evaluation Hypotheses – Motivation, estimation hypothesis accuracy, basics of sampling theory, a general approach for deriving confidence intervals, difference in error of two hypotheses, comparing learning algorithms.		
III		6+4=10
Part-A: Bayesian learning – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum Likelihood and least squared error hypotheses, maximum likelihood hypotheses for predicting probabilities, minimum description length principle, Bayes optimal classifier, Gibs algorithm, Naïve Bayes classifier, an example: learning to classify text, Bayesian belief networks, the EM algorithm.		
Part-B: Computational learning theory – Introduction, probably learning an approximately correct hypothesis, sample complexity for finite hypothesis space, sample complexity for infinite hypothesis spaces, the mistake bound model of learning. Instance-Based Learning- Introduction, k-nearest neighbor algorithm, locally weighted regression, radial basis functions, case-based reasoning, remarks on lazy and eager learning.		
IV		10
Genetic Algorithms – Motivation, Genetic algorithms, an illustrative example, hypothesis space search, genetic programming, models of evolution and learning, parallelizing genetic algorithms. Learning Sets of Rules – Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution. Reinforcement Learning – Introduction, the learning task, Q–learning, non-deterministic, rewards and actions, temporal difference learning, generalizing from examples, relationship to dynamic programming.		
V		10
Analytical Learning-1- Introduction, learning with perfect domain theories: PROLOG-EBG,		

remarks onexplanation-based learning, explanation-based learning of search control knowledge. Analytical Learning-2-Using prior knowledge to alter the search objective, using prior knowledge toaugment search operators. Combining Inductive and Analytical Learning – Motivation, inductive-analytical approaches to learning, using prior knowledge to initialize the hypothesis.
Textbooks
1. Machine Learning – Tom M. Mitchell, - MGH.
References
1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis.

MACHINE LEARNING LAB

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	22CSA72M	-	-	3	1.5

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PO9	PSO2
CO1		3	3	3	3
CO2		3	3	3	3
CO3		3	3	3	3
CO4		3	3	3	3
CO5		3	3	3	3

List of Experiments

Week	Title/Experiment
1	Basic programs in Python to get familiarize various programming structures.
2	Implementation of logical rules in Python.
3	Using any data apply the concept of a) Liner regression b) Gradient decent c) Logistic regression
4	Perform and plot overfitting in a data set.
5	Implementation of KNN classification algorithm.
6	Implementation of k-means clustering algorithm.
7	Explore statistical methods for machine learning.

References

1. Machine Learning Lab Manual, Dept. of CSE, CMRIT, Hyd.

Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab internal examination.

1. Diagnose crop disease with Machine Learning.
2. Recurrence of prostate cancer using Machine learning for survival analysis.
3. Develop a system to find out duplicate data.
4. Develop a system to analyze buying behavior of a customer.
5. Develop a system to study sentiment of users on twitter.
6. Diagnose crop disease with Machine Learning.
7. Develop a system to analyze buying behavior of a customer.
8. Develop a system to study sentiment of users on twitter.
9. Develop a predictive model to study the employee satisfaction in an organization.
10. Develop a predictive model to study the rainfall of your society.

DEEP LEARNING

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	22CSA73M	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO6	PO12	PSO1
CO1		3	3	3	3	3	3
CO2		3	3	3	3	2	3
CO3		3	3	2	3	3	3
CO4		3	3	2	3	2	3
CO5		3	3	2	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	8
Feed forward Neural networks, Gradient descent and the back propagation algorithm, Unit saturation, the vanishing gradient problem, and ways to mitigate it. RelU Heuristics for avoiding bad local minima, Heuristics for faster training, Nestors accelerated gradient descent, Regularization, Dropout.		
II	**Convolutional Neural Networks**	10
Architectures, convolution/pooling layers, Recurrent Neural Networks: LSTM, GRU, Encoder Decoder architectures. Deep Unsupervised Learning: Auto encoders, Variational Auto-encoders, Adversarial Generative Networks, Auto-encoder and DBM Attention and memory models, Dynamic Memory Models.		
III	**Applications of Deep Learning to Computer Vision**	6+4=10
Part-A: Image segmentation, object detection, automatic image captioning, Image generation with Generative adversarial networks.		
Part-B: video to text withLSTM models, Attention Models for computer vision tasks.		
IV	**Applications of Deep Learning to NLP**	10
Introduction to NLP and Vector Space Model of Semantics, Word Vector Representations: Continuous Skip-Gram Model, Continuous Bag-of-Words model (CBOW), Glove, Evaluations and Applications in word similarity		
V	**Analogy reasoning**	10
Named Entity Recognition, Opinion Mining using Recurrent Neural Networks: Parsing and Sentiment Analysis using Recursive Neural Networks: Sentence Classification using Convolutional Neural Networks, Dialogue Generation with LSTMs		
Textbooks		
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, 2006. 2. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009. 3. Golub, G.,H., and Van Loan,C.,F., Matrix Computations, JHU Press, 2013. 4. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.		

DEEP LEARNING LAB

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	22CSA74M	-	-	2	1

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PO9	PSO2
CO1		3	3	3	3
CO2		3	3	3	3
CO3		3	3	3	3
CO4		3	3	3	3
CO5		3	3	3	3

List of Experiments

Week	Title/Experiment
1	Basic programs in Python to get familiarize various programming structures.
2	Implementation of logical rules in Python.
3	Using any data apply the concept of a) Liner regression b) Gradient decent c) Logistic regression
4	Perform and plot overfitting in a data set.
5	Implementation of KNN classification algorithm.
6	Implementation of k-means clustering algorithm.
7	Explore statistical methods for machine learning.

References

1. Deep Learning Lab Manual, Dept. of CSE, CMRIT, Hyd.

Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab internal examination.

1. Build an API for implementing Multilayer perceptron for XOR problem.
2. Build a slack Boat for file uploading.
3. Build an API to implement Back Propagation in Neural Networks.
4. Build a simple proxy server.
5. Build an Ecommerce website.
6. Build a convolutional neural network by implementing convolutional function.
7. Build a CRUD API using go programming.
8. Build a Multilayer perceptron neural network for classification.
9. Build an API to construct a Neural network to implement Linearly separable problem.
10. Build an API to construct a Neural network to implement feature extraction.

ROBOTIC PROCESS AUTOMATION

Course	B.Tech.-VIII-Sem.	L	T	P	C
Subject Code	22CSA81M	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO6	PO12	PO13
CO1	outline the basics of RPA	3	3	2	3	3	3
CO2	implement RPA	3	3	3	3	3	3
CO3	demonstrate RPA tools and automation techniques	2	2	2	3	3	3
CO4	adapt RPA BOT Models	3	3	3	3	3	3
CO5	execute Orchestrator	3	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction to Automation & Robotic Process Automation**	9
Automation and History - RPA vs Automation - Business Processes & Use Cases- Scope & Limitations of RPA with Real world Industry use cases-Various Types of RPA Implementation Methodologies – RPA Centre of Excellence - Standardization of processes – Automation Life Cycle - Difference from SDLC - Robotic control flow architecture. ***Task:*** *Draw Robotic control flow architecture.*		
II	**RPA Initiation & Implementation**	10
Initiation of RPA- Limitations & factors affecting in Implementing the RPA at the enterprise level - Environments setup for RPA Implementation- Infra types to implement the RPA – Automation Life Cycle in detail- RPA Feasibility Analysis- Process Design Document/Solution Design Document - Industriesbest suited for RPA Implementation - Risks & Challenges with RPA - RPA and an emerging ecosystem- Leaders in RPA - Future of RPA. ***Task:*** *Perform feasibility analysis for RPA.*		
III	**RPA Tools and Automation**	5+5=10
Part-A: Introduction to RPA Tool Uipath & Basics The User Interface - Variables - Managing Variables - Selectors- Type of Selectors- Customizing the Selectors-RPA Project Maintenance – Arguments-Managing Arguments - Control Flow Activities & Importance - Data Manipulation- Data Manipulation Introduction - Scalar variables, collections and Tables - Data Manipulation - Gathering and Assembling Data. ***Task:*** *Perform a case study on Uipath tools.*		
Part-B: Advanced Automation concepts & Techniques: Recorders in Uipath - Input/Output Method-Debugging - RPA Challenge - Image, Text & Advanced Citrix Automation - Introduction to Image & Text Automation - Keyboard based automation -Advanced Citrix Automation challenges –PDF Automation- App Integration & Excel Automation- Email Automation & Database Automation. ***Task:*** *Perform a case study on Email Automation & Database Automation.*		
IV	**RPA BOT Models -Exception Handling**	9
RPA BOT Models: Attended Vs Unattended Bots- Monitor Events Triggers for Attended Automation. **Exception Handling:** Debugging and Exception Handling - Debugging Tools & best practices. **Deploying and Maintaining the BOT:** Publishing the automation solution using publish utility - creating a provision robot from the server - connecting a Robot to server - deploy the robot to server. ***Task:*** *Prepare a white paper on RPA BOT models.*		
V	**Orchestrator**	10
UiPath Orchestrator Introduction-Robots Configuration and Management-Connecting Robots to Orchestrator- Environment Configuration & Management -Managing Packages-Managing Processes-Managing Assets in Orchestrator and Studio -Managing Schedules & triggers -Managing Logs in Orchestrator- Practical use case scenarios. ***Task:*** *Perform a case study on Orchestrator.*		
Textbooks		
1. Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant - Tom Taulli. 2. Becoming Strategic with Robotic Process Automation - by Leslie P. Willcocks, John Hindle, Mary C. Lacity.		

NATURAL LANGUAGE PROCESSING

Course	B.Tech.-VIII-Sem.	L	T	P	C
Subject Code	22CSA82M	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO8	PO12	PSO1
CO1	explain fundamentals of NLP and morphology	3	2	3	3	3	3
CO2	demonstrate word level statements and syntactic analysis	3	2	3	3	3	3
CO3	make use of context free grammar and parsing techniques	3	3	3	3	3	3
CO4	apply semantic analysis techniques to solve various problems	3	3	3	3	3	3
CO5	illustrate language generation and discourse analysis	3	2	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Overview and Morphology**	9
Introduction: Models and Algorithms - Regular Expressions - Basic Regular Expression Patterns - Finite State Automata. **Morphology:** Inflectional Morphology - Derivational Morphology - Finite-State Morphological Parsing -Porter Stemmer. ***Task:*** *Convert the text into tokens.*		
II	**Word Level and Syntactic Analysis**	10
N-grams Models of Syntax - Counting Words - Unsmoothed N- grams, Smoothing- Backoff Deleted Interpolation – Entropy - English Word Classes - Tagsets for English, Part of Speech Tagging-Rule Based Part of Speech Tagging - Stochastic Part of Speech Tagging - Transformation-Based Tagging. ***Task:*** *Find the word frequency.*		
III	**Context Free Grammars and Parsing**	5+4=9
PART-A: Context Free Grammars for English Syntax- Context- Free Rules and Trees – Sentence-Level Constructions– Agreement – Sub Categorization. ***Task:*** *Find the synonym of a word using WordNet*		
PART-B: Parsing – Top-down – Earley Parsing - feature Structures – Probabilistic Context-Free Grammars. ***Task:*** *Resolve the ambiguity.*		
IV	**Semantic Analysis**	10
Representing Meaning - Meaning Structure of Language - First Order Predicate Calculus; Representing Linguistically Relevant Concepts -Syntax- Driven Semantic Analysis - Semantic Attachments -Syntax- Driven Analyzer; Robust Analysis - Lexemes and Their Senses - Internal Structure - Word Sense Disambiguation -Information Retrieval ***Task:*** *Implement semantic role labeling to identify named entities.*		
V	**Language Generation and Discourse Analysis**	10
Discourse -Reference Resolution - Text Coherence - Discourse Structure - Coherence; Dialog and Conversational Agents - Dialog Acts - Interpretation -Conversational Agents - Language Generation – Architecture - Surface Realizations - Discourse Planning; Machine Translation - Transfer Metaphor–Interlingua – Statistical Approaches. ***Task:*** *Create a chatbot for CMRIT.*		
Textbooks		
1. Speech and Language Processing, Daniel Jurafsky and James H. Martin, Prentice Hall; 2nd Edition, 2008. 2. Foundations of Statistical Natural Language Processing, Christopher D. Manning and Hinrich Schuetze, MIT Press, 1999.		
References		
1. James Allen, Natural Language Understanding, Addison Wesley; 2nd Edition, 1994.		

COMPUTER VISION AND ROBOTICS

Course	B.Tech.-VIII-Sem.	L	T	P	C
Subject Code	22CSA83M	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO6	PO12	PSO1
CO1	explain the concepts of geometric camera models	3	2	2	3	2	3
CO2	demonstrate light and shading	3	3	3	3	2	3
CO3	illustrate the concepts of colour in computer vision	3	3	2	3	2	3
CO4	make use of linear filters and kinematics	3	3	2	3	2	3
CO5	adapt Stereopsis and Robotics	3	2	2	3	2	3

Syllabus

Unit	Title/Topics	Hours
I	**Geometric Camera Models**	10
Image Formation – Pinhole Perspective, Weak Perspective, Cameras with Lenses, The Human Eye, Intrinsic and Extrinsic Parameters - Rigid Transformations and Homogeneous Coordinates, Intrinsic Parameters, Extrinsic Parameters, Perspective Projection Matrices, Weak-Perspective Projection Matrices, Geometric Camera Calibration - A Linear Approach to Camera Calibration, A Nonlinear Approach to Camera Calibration. ***Task:*** *Program to calculate Windows and Plots of geometric camera model.*		
II	**Light and Shading**	10
Modelling Pixel Brightness - Reflection at Surfaces, Sources and Their Effects, The Lambertian + Specular Model, Area Sources, Inference from Shading – Radiometric Calibration and High Dynamic Range Images, The Shape of Specularities, Inferring Lightness and Illumination, Photometric Stereo: Shape from Multiple Shaded Images. ***Task:*** *Program to change the Brightness of Image.*		
III	**Colour**	4+5=9
Part-A: Human Colour Perception - Colour Matching, Colour Receptors, The Physics of Colour – The Colour of Light Sources, The Colour of Surfaces, Representing Colour – Linear Colour Spaces, Non-linear Colour Spaces. ***Task:*** *Program to find threshold of gray scale and RGB image.*		
Part-B:A Model of Image Colour – The Diffuse Term, The Specular Term, Inference from Colour – Finding Specularities Using Colour, Shadow Removal Using Colour, Colour Constancy: Surface Colour from Image Colour. ***Task:*** *Program to convert color image to gray and hsv.*		
IV	**Linear Filters and Convolution**	10
Convolution, Shift Invariant Linear Systems – Discrete Convolution, Continuous Convolution, Edge Effects in Discrete Convolutions, Spatial Frequency and Fourier Transforms, Fourier Transforms, Sampling and Aliasing – Sampling, Aliasing, Smoothing and Re-sampling. **Robot Kinematics**: iCub Physical Description, DH Parameters of the iCub, Computer vision, Inverse Homography, Offline Analysis of the Maze, Selection of the Grid Size, Online Analysis. ***Task:*** *Program for Image Filtering.*		
V	**Stereopsis and Robotics**	9
Stereopsis, Binocular Camera Geometry and the Epipolar Constraint - Epipolar Geometry, The Essential Matrix, The Fundamental Matrix, Binocular Reconstruction - Image Rectification. Human Stereopsis, Robot Navigation. ***Task:*** *Perform a case study on robot navigation.*		
Textbooks		
1. Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall Robot Vision, by B. K. P. Horn, McGraw-Hill, 2012. 2. Autonomous Robotics and Deep Learning, by Vishnu Nath, Stephen E. Levinson, Springer, 2014.		

SOFT COMPUTING

Course	B.Tech.-VIII-Sem.	L	T	P	C
Course Code	22CSA84M	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO7	PO12	PSO1
CO1	use search techniques in AI problems	3	2	2	2	2	3
CO2	describe various supervised learning techniques	3	2	3	3	2	3
CO3	apply special networks in soft computing problems	3	3	3	3	3	3
CO4	implement fuzzy systems in engineering applications	3	2	3	3	3	3
CO5	perform various operations of genetic algorithms	3	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	9
AI Problems, The Underlying Assumption, AI Techniques, The Level of the Model, Criteria for Success. Problems, Problem spaces and Search, Heuristic Search Techniques: Generate-and-test, Hill Climbing, Best First Search, Problem Reduction, Constant Satisfaction, Means Ends Analysis, Logic Rules. ***Task:*** *Write a Program to implement Best First Search.*		
II	**Supervised Learning Techniques**	10
Perceptron, Back Propagation Algorithm- classification. Problem Speech processing. Unsupervised learning Network- Introduction, Fixed Weight, Competitive Nets, MaxNet, Hamming Network, Kohonen self - organizing Feature Maps, Learning Vector Quantization. ***Task:*** *Write a program to implement artificial neural network with back propagation*		
III	**Special Networks**	5+5=10
Part-A: Boltzmann Machine, Gaussian Machine, Probabilistic Neural Net. ***Task:*** *Write a Program to implement Bayes Rule.*		
Part-B: Cellular Neural Network, Spatio-Temporal Connectionist Neural Network, Neuroprocessor Chips. ***Task:*** *Write a Program to implement a neural network.*		
IV	**Fuzzy Logic, Classical Sets and Fuzzy Sets**	10
Fuzzy Sets, Fuzzy Relations, Fuzzy Logic, Fuzzy Rule-Based Systems ***Task:*** *Write a Program to implement various operations on fuzzy sets.*		
V	**Genetic Algorithms**	9
Basic Concepts, Basic Operators for Genetic Algorithms, Crossover and Mutation Properties, Genetic Algorithm Cycle, Fitness Function, Applications of Genetic Algorithm. ***Task:*** *Write a Program to implement Simple Genetic Application.*		
Textbooks		
1. S. N. Sivanandam & S. N. Deepa, "Principles of Soft Computing", 3rd Edn, Wiley India, 2018.		
References		
1. Soft Computing – Advances and Applications B.K. Tripathy and J. Anuradha, Cengage Learning, Jan 2015. 2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", MGH International Editions, 1995.		

MINI PROJECT

Course	B.Tech.-VIII-Sem.	L	T	P	C
Course Code	22CSA85M	-	-	4	2

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1 to PSO2
CO1	apply domain knowledge to solve identified industrial problem	3
CO2	use industrial processes involved in end product/service	3
CO3	exhibit communication skills, professional ethics and social responsibility	3
CO4	manage and lead project in coordination with functional team-members	3
CO5	execute the project that meets industry requirements	3

Guidelines

S. No.	Title
1	Students should start the project under approved internal guide immediately after B.Tech. VII Semester End Examinations and complete before B.Tech. VIII Semester End Examinations in any reputed organization without effecting regular classwork.
2	The students have to obtain NOC from both HOD and internship organization and submit the same to the guide for commencement of project.
3	Upon commencement of work, the guide visits the Project organization periodically to monitor the performance of the student.
4	The students have to report the guide periodically on progress of work and seek advice.
5	On completion of project, the students should submit the project report to the guide along with Certificate of Completion.
6	The project work is evaluated before commencement of VIII-Semester End Examinations.
7	The student should give presentation before the Evaluation Committee for 10-15 minutes.
8	The Evaluation Committee awards the marks based on the student's performance.

Evaluation Procedure

External Committee Evaluation (SEE for 100 Marks)

S. No.	Item	Marks
1	Problem Justification/Observation	05
2	Content and Innovation	10
3	Use of Modern tools	15
4	Execution	15
5	Technical Presentation	30
6	Viva-Voce (Q & A)	10
7	Technical Report	15
Total		**100**

ANNEXURE – C

B.Tech. Minor in Cyber Security - R22 Course Structure

(Applicable from the batch admitted during 2022-23 and onwards)

(*Which is not studied in regular B.Tech. course*)

S. No.	Course Code	Subject	POs	PSOs	Hours Per Week			Credits
					L	T	P	
V – Semester								
1	22CSC51M	Principles of Information Security	1,2,3,6,12	1	3	-	-	3
2	22CSC52M	Principles of Information Security Lab	4,5,9	2	-	-	3	1.5
Total (A)					**3**	**-**	**3**	**4.5**
VI - Semester								
3	22CSC61M	Foundations of Cyber Security	2,3,6,8,12	1	4	-	-	4
Total (B)					**4**	**-**	**-**	**4**
VII - Semester								
Either online through MOOCS or off-line Class								
4	22CSC71M	Ethical Hacking	2,3,5,8,12	1	3	-	-	3
5	22CSC72M	Ethical Hacking Lab	4,5,9	2	-	-	3	1.5
or								
4	22CSC73M	Digital Forensics	2,3,5,8,12	1	3	-	-	3
5	22CSC74M	Digital Forensics Lab	4,5,9	2	-	-	3	1.5
Total (C)					**3**	**-**	**3**	**4.5**
VIII - Semester								
6	**Any one of the following**				3	-	-	3
	22CSC81M	Security Incident & Response Management	2,3,5,6,12	1				
	22CSC82M	Mobile and Wireless Security	2,3,5,6,8,12	1				
	22CSC83M	Blockchain and Cryptocurrency	2,3,5,8,12	1				
	22CSC84M	Cloud Security	2,3,5,6,8,12	1				
7	22CSC85M	Mini Project	1 to 12	1,2			4	2
Total (D)					**3**	**-**	**4**	**5**
TOTAL CREDITS (A + B + C + D)								**18**

PRINCIPLES OF INFORMATION SECURITY

Course	B.Tech.-V-Sem.	L	T	P	C
Subject Code	22CSC51M	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO6	PO12	PSO1
CO1		3	3	2	3	3	3
CO2		3	3	2	3	3	3
CO3		3	3	3	3	3	3
CO4		3	3	3	3	3	3
CO5		3	3	2	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	9
Introduction to Computer Networks, Network hardware, Network software, OSI and TCP/IP Reference models, Security attacks, Security Services and Mechanisms.		
II		10
Integer Arithmetic, Modular Arithmetic, Traditional Symmetric Key Ciphers, Data Encryption Standard (DES), Advanced Encryption Standard (AES).		
III	**Mathematics of Cryptography and Asymmetric Cryptography**	5+4=9
PART-A: Mathematics of Cryptography: Primes, Primality Testing, Factorization, Chinese Remainder Theorem.		
PART-B: Asymmetric Cryptography: Introduction, RSA Cryptosystem, Rabin Cryptosystem, Elliptic Curve Cryptosystem.		
IV	**Message Integrity and Message Authentication**	10
Message Authentication Code (MAC), SHA-512 - Digital Signatures.		
V	**Security at the Application Layer**	10
PGP and S/MIME. Security at Transport Layer: SSL and TLS. - Principles of IDS and Firewalls.		
Textbooks		
1. Computer Networks, Andrew S Tanenbaum, David. j. Wetherall, 5th Ed, Pearson Education, PHI. 2. Cryptography & Network Security by Behrouz A. Forouzan. Special Indian Edition, TMH.		
References		
1. Network Security Essentials (Applications & Standards), William Stallings Pearson Education.		

PRINCIPLES OF INFORMATION SECURITY LAB

Course	B.Tech.-V-Sem.	L	T	P	C
Subject Code	22CSC52M	-	-	3	1.5

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PO9	PSO2
CO1		3	3	3	3
CO2		3	3	3	3
CO3		3	3	3	3
CO4		3	3	3	3
CO5		3	3	3	3

List of Experiments

Week	Title/Experiment
1	Write a program to perform encryption and decryption using the following substitution ciphers.
2	Caeser cipher
3	Play fair cipher
4	Hill Cipher
5	Write a program to implement the DES algorithm.
6	Write a program to implement RSA algorithm.
7	Calculate the message digest of a text using the SHA-1 algorithm.
8	Working with sniffers for monitoring network communication (Wireshark).
9	Configuring S/MIME for email communication.
10	Using Snort, perform real time traffic analysis and packet logging.

References

1. Principles of Information Security Lab Manual, Dept. of CSE, CMRIT, Hyd.

Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab internal examination.

1. Java Security Features.
2. Secure Back-up software system.
3. Practicing good password management.
4. How to keep an eye on third party accessing your data.
5. Unauthorized disclosure.
6. Investigation of information security.
7. Authentication in Kerberos.
8. Make a LAN massager app. To chat with people connected to the same LAN network without using Internet and at the same time provides data encryption, privacy and security.
9. Digital –Watermarking to hide text messages.
10. Android Video encryption and sharing.

FOUNDATIONS OF CYBER SECURITY

Course	B.Tech.-VI-Sem.	L	T	P	C
Subject Code	22CSC61M	4	-	-	4

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO6	PO8	PO12	PSO1
CO1		3	2	3	3	3	3
CO2		3	2	3	3	3	3
CO3		3	3	3	3	3	3
CO4		3	3	3	3	3	3
CO5		3	2	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	9
Overview: Computer Security Concepts, Threats, Attacks, and Assets, Security Functional Requirements, Fundamental Security Design Principles, Attack Surfaces and Attack Trees, Computer Security Strategy. Access Control: Access Control Principles, Subjects, Objects, and Access Rights, Discretionary AccessControl, Example: UNIX File Access Control, Role-Based Access Control, Attribute-Based Access Control, Identity, Credential, and Access Management, Trust Frameworks, Case Study: RBAC Systemfor a Bank.		
II		10
Malicious Software: Types of Malicious Software (Malware), Advanced Persistent Threat, Propagation-Infected Content-Viruses, Propagation-Vulnerability Exploit-Worms, Propagation-Social Engineering-Spam E-Mail, Trojans, Payload-System Corruption, Payload-Attack Agent-Zombie, Bots, Payload-Information Theft-Keyloggers, Phishing, Spyware, Payload-Stealthing-Backdoors, Rootkits, Counter measures. Denial-of-Service Attacks: Denial-of-Service Attacks, Flooding Attacks, Distributed Denial-of-Service Attacks, Application-Based Bandwidth Attacks, Reflector and Amplifier Attacks, Defenses Against Denial-of-Service Attacks, Responding to a Denial-of-Service Attack. Buffer Overflow: Stack Overflows, Defending Against Buffer Overflows, Other Forms of Overflow Attacks.		
III		5+4=9
PART-A: Intrusion Detection: Intruders, Intrusion Detection, Analysis Approaches, Host-Based Intrusion Detection, Network-Based Intrusion Detection, Distributed or Hybrid Intrusion Detection, Intrusion Detection Exchange Format, Honeypots, Example System: Snort.		
PART-B: Firewalls and Intrusion Prevention Systems: The Need for Firewalls, Firewall Characteristics and Access Policy, Types of Firewalls, Firewall Basing, Firewall Location and Configurations, Intrusion Prevention Systems, Example: Unified Threat Management Products.		
IV		10
Software Security: Software Security Issues, Handling Program Input, Writing Safe Program Code, Interacting with the Operating System and Other Programs, Handling Program Output. Physical and Infrastructure Security: Overview, Physical Security Threats, Physical Security Prevention and Mitigation Measures, Recovery from Physical Security Breaches, Example: A Corporate Physical Security Policy, Integration of Physical and Logical Security.		
V		10
Human Resources Security: Security Awareness, Training, and Education, Employment Practices andPolicies, E-Mail and Internet Use Policies, Computer Security Incident Response Teams. Legal and Ethical Aspects: Cybercrime and Computer Crime, Intellectual Property, Privacy, EthicalIssues.		
Textbooks		
1. William Stallings, “Computer Security: Principles and Practice”, Prentice Hall, 2014.		

ETHICAL HACKING

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	22CSC71M	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO8	PO12	PSO1
CO1	illustrate ethical hacking framework and security issues	3	2	2	3	3	3
CO2	plan and execute controlled attacks	3	3	3	3	3	3
CO3	identify security lapses and prepare for an ethical hack	3	3	3	3	3	3
CO4	make use of enumeration and exploitation techniques	3	3	3	3	3	3
CO5	adapt integrated security practices for deliverables	3	2	2	3	3	3

Syllabus

Unit	Title/Topics	Hours
I		10
Introduction: Hacking impacts, the hacker; **Framework:** Planning the test, sound operations, reconnaissance, enumeration, vulnerability, analysis, exploitation. **Information Security Models:** Computer security, network security, service security. **Information Security Program:** The process of information security, component parts of information security program, risk analysis and ethical hacking. ***Task:*** *Develop SOP for Ethical Hacking.*		
II		10
Planning for a Controlled Attack: Inherent limitations, imposed limitations, timing, attack type, source point, required knowledge, multi-phased attacks, teaming and attack structure, engagement planner, security consultant, tester, logistics, intermediates, law enforcement. ***Task:*** *Perform a case study on imposed limitations in controlled attack.*		
III		4+4=8
Part-A: Preparing for a Hack: Technical preparation, managing the engagement. ***Task:*** *Develop SOP on Technical Preparation of hacking.*		
Part-B: Reconnaissance: Social engineering, physical security, internet reconnaissance. ***Task:*** *Perform a case study on Internet Reconnaissance.*		
IV		10
Enumeration: Enumeration techniques, soft objective, looking around or attack, elements of enumeration. **Exploitation:** Intuitive testing, evasion, threads and groups, operating systems, password. crackers, rootkits, applications, network, services and areas of concern. ***Task:*** *Perform a case study on enumeration techniques.*		
V		10
Deliverable: Deliverable, document, overall structure, aligning findings, presentation. **Integration:** integrating the results, integration summary, mitigation, defence planning, incident, management, security policy, conclusion. ***Task:*** *Develop SOP for incident management.*		
Textbooks		
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.		

ETHICAL HACKING LAB

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	22CSC72M	-	-	3	1.5

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PO9	PSO2
CO1		3	3	3	3
CO2		3	3	3	3
CO3		3	3	3	3
CO4		3	3	3	3
CO5		3	3	3	3

List of Experiments

Week	Title/Experiment
1	Set Up a honey pot and monitor the honey pot on network
2	Write a script or code to demonstrate SQL injection attacks
3	Create a social networking website login page using phishing techniques
4	Write a code to demonstrate DoS attacks
5	Install rootkits and study variety of options
6	Study of Techniques uses for Web Based Password Capturing.
7	Install jcrypt tool (or any other equivalent) and demonstrate Asymmetric, Symmetric Crypto algorithm, Hash and Digital/PKI signatures studied in theory Network Security And Management
8	Implement Passive scanning, active scanning, session hijacking, cookies extraction using Burp suit tool

References

1. Ethical Hacking and Prevention Lab Manual, Dept. of CSE, CMRIT, Hyd.

Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab internal examination.

1. Intelligent vehicles using Artificial Intelligence.
2. Smart ICU Predictive detection of deterioration of seriously ill patients using Artificial Intelligence.
3. Artificial Intelligence Innovation.
4. Prevention against Cyber security Threats using Artificial Intelligence.
5. Efficient, Scalable Processing of Patient Data using Artificial Intelligence.
6. Smart Bike Share Programs using Artificial Intelligence.
7. Automatic Document Classification using Bayesian theorem.
8. Automated Geophysical Feature Detection using Artificial Intelligence.
9. Artificial Intelligence for Records Management.
10. Artificial Intelligence in e-Commerce.

DIGITAL FORENSICS

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	22CSC73M	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO8	PO12	PSO1
CO1		3	2	2	3	3	3
CO2		3	3	3	3	3	3
CO3		3	3	3	3	3	3
CO4		3	3	3	3	3	3
CO5		3	2	2	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	10
Digital Forensics Science: Forensics science, computer forensics, and digital forensics. **Computer Crime:** Criminalistics as it relates to the investigative process, analysis of cyber criminalisticsarea, holistic approach to cyber-forensics		
II	**Cyber Crime Scene Analysis**	10
Discuss the various court orders etc., methods to search and seizure electronic evidence, retrieved and un-retrieved communications, Discuss the importance of understanding what court documents would be required for a criminal investigation.		
III	**Evidence Management & Presentation**	4+4=8
Part-A: Create and manage shared folders using operating system, importance of the forensic mindset, define the workload of law enforcement.		
Part-B: Explain what the normal case would look like, Define who should be notified of a crime, parts of gathering evidence, Define andapply probable cause.		
IV	**Computer and Network Forensics**	10
Computer Forensics: Prepare a case, Begin an investigation, Understand computer forensics, workstations and software, Conduct an investigation, Complete a case, Critique a case. **Network Forensics:** open-source security tools for network forensic analysis, requirements for preservation of network data.		
V	**Mobile Forensics and Legal Aspects of Digital Forensics**	10
Mobile Forensics: mobile forensics techniques, mobile forensics tools. **Legal Aspects of Digital Forensics: IT** Act 2000, amendment of IT Act 2008. Recent trends in mobile forensic technique and methods to search and seizure electronic evidence		
Textbooks		
1. John Sammons, The Basics of Digital Forensics, Elsevier. 2. John Vacca, Computer Forensics: Computer Crime Scene Investigation, Laxmi Publ.		
References		
1. William Oettinger, Learn Computer Forensics: A beginner's guide to searching, analyzing, and securing digital evidence, Packt Publishing; 1st edition (30 April 2020), ISBN: 1838648178. 2. Thomas J. Holt, Adam M. Bossler, Kathryn C. Seigfried-Spellar, Cybercrime and Digital Forensics: An Introduction, Routledge.		

DIGITAL FORENSICS LAB

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	22CSC74M	-	-	3	1.5

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PO9	PSO2
CO1		3	3	3	3
CO2		3	3	3	3
CO3		3	3	3	3
CO4		3	3	3	3
CO5		3	3	3	3

List of Experiments

Week	Title/Experiment
1	**Perform email analysis** using the tools like Exchange EDB viewer, MBOX viewer and View user mailboxes and public folders, Filter the mailbox data based on various criteria, Search forparticular items in user mailboxes and public folders
2	**Perform Browser history analysis** and get the downloaded content, history saved logins, searches, websites visited etc using Foxton Forensics tool, Dumpzilla.
3	**Perform mobile analysis** in the form of retrieving call logs, SMS log, all contacts list using theforensics tool like SAFT
4	**Perform Registry analysis** and get boot time logging using process monitor tool
5	**Perform Disk imaging and cloning the** using the X-way Forensics tools
6	**Perform Data Analysis i.e** History about open file and folder, and view folder actions using List view activity tool
7	**Perform Network analysis** using the Network Miner tool**.**
8	**Perform information for incident response** using the crowd Response tool
9	**Perform File type detection using** Autopsy tool
10	**Perform Memory capture and analysis** using the Live RAM capture or any forensic tool

References

1. Digital Forensics Lab Manual, Dept. of CSE, CMRIT, Hyd.

Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab internal examination.

1. Intelligent vehicles using Artificial Intelligence.
2. Smart ICU Predictive detection of deterioration of seriously ill patients using Artificial Intelligence.
3. Artificial Intelligence Innovation.
4. Prevention against Cyber security Threats using Artificial Intelligence.
5. Efficient, Scalable Processing of Patient Data using Artificial Intelligence.
6. Smart Bike Share Programs using Artificial Intelligence.
7. Automatic Document Classification using Bayesian theorem.
8. Automated Geophysical Feature Detection using Artificial Intelligence.
9. Artificial Intelligence for Records Management.
10. Artificial Intelligence in e-Commerce.

SECURITY INCIDENT & RESPONSE MANAGEMENT

Course	B.Tech.-VIII-Sem.	L	T	P	C
Subject Code	22CSC81M	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO6	PO12	PSO1
CO1	outline the importance of incident response	2	3	3	2	3	3
CO2	use incident detection and characterization	2	2	3	2	3	3
CO3	identify evidence and collect data	3	3	3	3	2	2
CO4	examine web based infrastructure	3	3	3	3	3	3
CO5	apply investigation methods for investigating MAC OS	3	3	3	3	2	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	8
Introduction: Preparing for the Inevitable incident: Concept of the Attack Life cycle Real world incident, The Incident Response Process, IR management incident, Pre-incident preparation, Preparing the Organization for Incident Response, Preparing the IR team, Preparing the Infrastructure for Incident Response. ***Task:*** *Perform a case study on the incident response process.*		
II	**Incident Detection and Characterization**	8
Getting the investigation started on the right foot, collecting initial facts, Maintenance of Case Notes, Understanding Investigative Priorities. Discovering the scope of incident: Examining initial data, Gathering and reviewing preliminary evidence, determining a course of action, Customer data loss scenario, Automated clearing fraud scenario. ***Task:*** *Perform investigation by collecting facts from a sample incident.*		
III	**Data Collection & Network Evidence**	8+6=14
Part-A: Data Collection: Live Data Collection: When to perform live response, Selecting a live response tool, what to collect, collection best practices, Live data collection on Microsoft Windows Systems, Live Data Collection on Unix-Based Systems. ***Task:*** *Perform a case study of live response tool.*		
Part-B: Network Evidence: The case for network monitoring, Types for network monitoring, Setting up a Network Monitoring System, Network Data, Analysis, Collect Logs Generated from Network Events. ***Task:*** *Collect evidence from any network.*		
IV	**Website Essentials**	9
Data Analysis: Analysis Methodology: Define objectives, Know your data, access your data, Analyze your data, Evaluate Results. Investigating Windows Systems: NTFS and File System analysis, Prefetch, Event logs, Scheduled Tasks, The Windows Registry, Other Artifacts of Interactive Sessions, Memory Forensics, alternative persistence mechanisms. ***Task:*** *Perform a case study of NTFS.*		
V	**Applications**	9
Investigating Mac OS X Systems: HFS+ and File System Analysis, Core Operating systems data. Investigating Applications: What is Application Data?, Where is application data stored?, General Investigation methods, Web Browser, Email Clients, Instant Message Clients. ***Task:*** *Perform a case study of* Mac OS X Systems.		
Textbooks		
1. Incident Response & Computer Forensics, 3rd Edition, J Luttgens, M Pepe, K Mandia, 2014. 2. Cyber Security Incident Response-How to Contain, Eradicate, and Recover from Incidents, Eric. C. Thompson, Apress, 2014.		
References		
1. The Computer Incident Response Planning Handbook: Executable Plans for Protecting Information at Risk, N.K. McCarthy, TMH, 2012.		

MOBILE AND WIRELESS SECURITY

Course	B.Tech.-VIII-Sem.	L	T	P	C
Subject Code	22CSC82M	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO6	PO8	PO12	PSO1
CO1	illustrate mobile and wireless network security	3	3	3	3	2	3	3
CO2	demonstrate vulnerabilities of wired/wireless networks	3	3	3	3	3	3	3
CO3	make use of fundamental security mechanisms	3	3	3	3	3	3	3
CO4	adapt dedicated architectures for Wi-Fi security	3	3	2	3	3	3	3
CO5	develop security mechanism for Wi-Fi network	3	3	2	3	2	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	9
Mobile cellular networks - Introduction, Cellular network basic concepts, IEEE wireless networks - WLAN: IEEE 802.11, WPAN: IEEE 802.15, WMAN: IEEE 802.16, WMAN mobile: IEEE 802.20, MIH: IEEE 802.21, WRAN: IEEE 802.22. Mobile Internet networks - Macro mobility, Micro mobility, Personal mobility and SIP, Identity based mobility, NEMO and MANET networks, Current trends - All-IP, IMS and FMC, B3G, 4G and 5G. ***Task:*** *Conduct call drop analysis of a mobile network.*		
II	**Vulnerabilities of Wired and Wireless Networks**	9
Introduction, Security in the digital age - Private property: from vulnerabilities to risks, Security - Definition, Services, Trust and subjectivity, Threats and risks to telecommunication systems - Role, Threat models, Homogeneity vs. Heterogeneity, The Internet and security, The role of the medium, Risks to the infrastructure, Personal risks, From wire line vulnerabilities to wireless vulnerabilities, communications - Changing the medium, Wireless terminals, New services. ***Task:*** *Perform Vulnerability of a wired/wireless network.*		
III	**Fundamental Security Mechanisms**	6+7=13
Part-A: Discrete Probability Distributions: Introduction, Basics on security - Security services, Symmetric and asymmetric, Hash functions, Electronic signatures and MAC, Public Key Infrastructure (PKI) and electronic, Management of cryptographic keys, Secure Socket Layer (SSL) and Transport Layer Security (TLS). ***Task:*** *Implement SHA algorithm.*		
Part-B: Authentication: Authentication mechanism, AAA protocols to control access to a private network or an operator's network, Access control - Firewalls, Intrusion detection. ***Task:*** *Perform penetration testing on any IDS.*		
IV	**Wi-Fi Security Dedicated Architectures**	8
Introduction - Hot spot architecture: captive portals - Overview, Captive portal overview, Security analysis, Wireless intrusion detection systems (WIDS) - architectures, Wireless intrusion detection, WIDS example, Rogue access point detection, Wireless intrusion prevention systems. ***Task:*** *Install snort IDS.*		
V	**Wi-Fi Security**	9
Attacks on wireless networks - Passive attacks, Active attacks, Denial-of-service attacks, TCP attacks, Trojan attack, Security in the IEEE 802.11 - IEEE 802.11 security mechanisms, WEP (Wired Equivalent Privacy), WEP shortcomings. ***Task:*** *Perform comparative analysis of various security attacks in Wi-Fi networks.*		
Textbooks		
1. HakimaChaouchi et.al, "Wireless and Mobile Network Security", Wiley, 2009. 2. Shafiullah Khan, "Security for Multihop Wireless Networks", CRC Press, 2014.		
References		
1. Bhabani P. Sinha, "Wireless Networks and Mobile Computing", CRC Press, 2015.		

BLOCKCHAIN AND CRYPTOCURRENCY

Course	B.Tech.-VIII-Sem.	L	T	P	C
Course Code	22CSC83M	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO8	PO12	PSO1
CO1	explain the fundamentals of Blockchain techniques	3	2	2	3	3	3
CO2	analyze various consensus problems	3	3	3	3	3	3
CO3	adapt Blockchain technology to improve business	3	3	3	3	3	3
CO4	make use of Ethereum frameworks to write smart contract	3	3	3	3	3	3
CO5	interpret Blockchain technology in real time applications	3	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	10
Introduction to Blockchain: Basics, History, Architecture, Conceptualization, Blockchain components, Creation of blocks, Merkle Tree, Gas Limit, Transactions, Bitcoin basics, characteristics of cryptocurrencies, Altcoins (Alternative cryptocurrencies), Peer-to-Peer Networks, Distributed Ledger Technology, Blockchain types: Public, Private, and Hybrid Blockchain. ***Task:*** *Blockchain architecture demo, installation, and usage of Cryptocurrency wallets.*		
II	**Mining and Consensus Protocols**	8
Miners, Bitcoin Mining, Consensus Protocols: Miners in Bitcoin network, steps in Bitcoin mining, Bitcoin – Wallet, hardness of mining - transaction verifiability - anonymity - forks - double spending - mathematical analysis of properties of Bitcoin, Bitcoin scripts. Distributed Consensus. ***Task:*** *Bitcoin wallet and querying API to get real time transactions.*		
III	**Consensus in Bitcoin and Ethereum**	6+6=12
Part-A: Consensus in Bitcoin: The basics, Proof of Work (PoW), 51% attacks on Bitcoin network, Sybil attacks, Proof of Stake (PoS), PoW vs PoS and Beyond, Miners in Blockchain, Permissioned Blockchain (Basics, Consensus), Permissioned Blockchain (RAFT Consensus, Byzantine General Problem, Practical Byzantine Fault Tolerance), Proof-of-authority. ***Task:*** *Installation and mining using GETH.*		
Part-B: Ethereum Blockchain: Characteristics of Ethereum Blockchain, Ethereum Virtual Machine (EVM)-Wallets for Ethereum: Ether and MetaMask wallets, Smart Contracts, introduction to Solidity programming, key concepts in solidity: value types, arrays, functions, structs and solidity mapping, building the Blockchain based decentralized applications (Dapps). ***Task:*** *Designing and deploying solidity contracts on Ethereum Blockchain.*		
IV	**Transform Business with Blockchain**	8
Hyperledger Frameworks: Introduction to Hyperledger fabric, Indy, Aries, Quilt, Ursa, and Caliper. Hyperledger Fabric – Transaction Flow, Hyperledger Fabric Details, Fabric – Membership and Identity Management, Hyperledger Fabric Network Setup. ***Task:*** *Installation of Hyperledger Aries and Indy demo.*		
V	**Blockchain trends and use cases**	10
Non-fungible Tokens (NFTs), Decentralized Autonomous Organization (DAOs), Soulbound Tokens (SBT), Zero Knowledge proofs, layer-2 protocols: Optimism and ZK-rollups, Para chains, substrate Blockchain. Blockchain industry use cases: Market place, supply chain, decentralized identity using Blockchain, Blockchain based certificate management, Blockchain-based E-voting, Dune analytics. ***Task:*** *Building decentralized applications (DApps) using Blockchain.*		
Textbooks		

1. Narayanan, Arvind, et al. Bitcoin and Cryptocurrency technologies: A comprehensive introduction. Princeton University Press, 2016.
2. Thompsons, Josh. "Blockchain: The Blockchain for Beginners Guide to Blockchain Technology and Leveraging Blockchain Programming.", 2017.

CLOUD SECURITY

Course	B.Tech.-VIII-Sem.	L	T	P	C
Subject Code	22CSC84M	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO6	PO8	PO12	PSO1
CO1	explain the concepts cloud security	3	2	3	2	3	3	3
CO2	demonstrate cloud asset management and protection	3	3	3	2	3	3	3
CO3	make use of identity access management	3	3	3	3	3	3	3
CO4	adapt security as a service	3	3	3	3	3	3	3
CO5	illustrate mobile cloud forensics	3	2	3	2	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	9
Threat actors, Diagrams and trust boundaries, Cloud delivery models, Risk management, Data asset management and protection - Data identification and classification, Relevant industry or regulatory requirements, Data asset management in the cloud - Tagging cloud resources, Protecting data in the cloud - Tokenization, Encryption. ***Task:*** *Detect data leakage in the cloud.*		
II	**Cloud Asset Management and Protection**	9
Differences from traditional IT, Types of cloud assets - Compute assets, Storage assets, Network assets, Asset management pipeline - Procurement leaks, Processing leaks, Tooling leaks, Finding leaks, Tagging cloud assets. ***Task:*** *Protect data leakage in the cloud.*		
III	**IAM and Digital Identity**	6+7=13
Part-A: Identity and Access Management: Lifecycle for identity and access, Request, Approve, Create, Delete, Grant, or Revoke, Authentication - Cloud IAM identities, Passwords and API keys, Shared IDs, Federated identity, Single sign-on, Instance metadata and identity documents, secret management, Authorization - Centralized authorization, Roles, Revalidate. ***Task:*** *Implement identity and access management on Zoom.*		
Part-B: Protecting Digital Identity in the Cloud: The rise of digital identity - Composition and functions of digital identity, The impact of cloud computing and cross-border data, Protecting digital identity in the era of cloud computing. ***Task:*** *Perform case study on Digilocker.*		
IV	**Security as a Service (SecaaS)**	8
Security as a service, Outsourcing model, Traditional security - On-premise, SecaaS categories of service – System security, Network security, Web security, Data security. Gaps - Gaps in SecaaS web technologies, Lack of true risk evaluation, Lack of a data-centric approach. ***Task:*** *Perform comparative analysis of SecaaS platforms.*		
V	**Mobile Cloud Forensics**	9
An analysis of seven popular android apps - Dropbox, Box, OneDrive, Owncloud, Evernote, OneNote, Universal password manager, Further app analysis. ***Task:*** *Perform comparative analysis of mobile cloud platforms - Dropbox and OneDrive.*		
Textbooks:		
1. Chris Dotson, "Practical Cloud Security: A Guide for Secure Design and Development", O'Reilly Media, 2019. 2. Ryan Ko, "The Cloud Security Ecosystem: Technical, Legal, Business and Management Issues", Syngress, 2015		
References:		
1. Zeal Vora, "Enterprise Cloud Security and Governance: Efficiently Set Data Protection and Privacy Principles", Packt Publishing, 2017		

MINI PROJECT

Course	B.Tech.-VIII-Sem.	L	T	P	C
Course Code	22CSC85M	-	-	4	2

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1 to PSO2
CO1	apply domain knowledge to solve identified industrial problem	3
CO2	use industrial processes involved in end product/service	3
CO3	exhibit communication skills, professional ethics and social responsibility	3
CO4	manage and lead project in coordination with functional team-members	3
CO5	execute the project that meets industry requirements	3

Guidelines

S. No.	Title
1	Students should start the project under approved internal guide immediately after B.Tech. VII Semester End Examinations and complete before B.Tech. VIII Semester End Examinations in any reputed organization without effecting regular classwork.
2	The students have to obtain NOC from both HOD and internship organization and submit the same to the guide for commencement of project.
3	Upon commencement of work, the guide visits the Project organization periodically to monitor the performance of the student.
4	The students have to report the guide periodically on progress of work and seek advice.
5	On completion of project, the students should submit the project report to the guide along with Certificate of Completion.
6	The project work is evaluated before commencement of VIII-Semester End Examinations.
7	The student should give presentation before the Evaluation Committee for 10-15 minutes.
8	The Evaluation Committee awards the marks based on the student's performance.

Evaluation Procedure

External Committee Evaluation (SEE for 100 Marks)

S. No.	Item	Marks
1	Problem Justification/Observation	05
2	Content and Innovation	10
3	Use of Modern tools	15
4	Execution	15
5	Technical Presentation	30
6	Viva-Voce (Q & A)	10
7	Technical Report	15
Total		**100**

ANNEXURE – D

B.Tech. Minor in Data Science - R22 Course Structure

(Applicable from the batch admitted during 2022-23 and onwards)

(Which is not studied in regular B.Tech. course)

S. No.	Course Code	Subject	POs	PSOs	Hours Per Week			Credits
					L	T	P	
V – Semester								
1	22CSD51M	Introduction to Data Science	1,2,3,8,12	1	3	-	-	3
2	22CSD52M	R Programming Lab	4,5,9	2	-	-	3	1.5
Total (A)					**3**	**-**	**3**	**4.5**
VI - Semester								
3	22CSD61M	Data Science Applications	2,3,5,8,12	1	4	-	-	4
Total (B)					**4**	**-**	**-**	**4**
VII - Semester								
Either online through MOOCS or off-line Class								
4	22CSD71M	Data Wrangling and Visualization	2,3,8,12	1	3	-	-	3
5	22CSD72M	Data Wrangling and Visualization Lab	4,5,9	2	-	-	3	1.5
or								
4	22CSD73M	Big Data Analytics	2,3,8,12	1	3	-	-	3
5	22CSD74M	Big Data Analytics Lab	4,5,9	2	-	-	3	1.5
Total (C)					**3**	**-**	**3**	**4.5**
VIII - Semester								
6	**Any one of the following**				3	-	-	3
	22CSD81M	Mining Massive Datasets	2,3,5,6,12	1				
	22CSD82M	Predictive Analytics	2,3,5,6,12	1				
	22CSD83M	Web & Social Media Analytics	2,3,5,8,12	1				
	22CSD84M	Video Analytics	2,3,5,8,12	1				
7	22CSD85M	Mini Project	1 to 12	1,2			4	2
Total (D)					**3**	**-**	**4**	**5**
TOTAL CREDITS (A + B + C + D)								**18**

INTRODUCTION TO DATA SCIENCE

Course	B.Tech.-V-Sem.	L	T	P	C
Subject Code	22CSD51M	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO8	PO12	PSO1
CO1		3	3	2	3	3	3
CO2		3	3	2	3	3	3
CO3		3	3	3	3	3	3
CO4		3	3	3	3	3	3
CO5		3	3	2	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	9
What is Data Science? - Big Data and Data Science hype – and getting past the hype - Datafication - Current landscape of perspectives - Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model – Over fitting. Basics of R: Introduction, R-Environment Setup, Programming with R, Basic Data Types.		
II	**Data Types & Statistical Description**	10
Types of Data: Attributes and Measurement, What is an Attribute? The Type of an Attribute, The Different Types of Attributes, Describing Attributes by the Number of Values, Asymmetric Attributes, Binary Attribute, Nominal Attributes, Ordinal Attributes, Numeric Attributes, Discrete versus Continuous Attributes. Basic Statistical Descriptions of Data: Measuring the Central Tendency: Mean, Median, and Mode, Measuring the Dispersion of Data: Range, Quartiles, Variance, Standard Deviation, and Inter-quartile Range, Graphic Displays of Basic Statistical Descriptions of Data.		
III		5+4=9
PART-A: Vectors: Creating and Naming Vectors, Vector Arithmetic, Vector sub setting, Matrices: Creating and Naming Matrices, Matrix Sub setting, Arrays, Class. Factors and Data Frames: Introduction to Factors: Factor Levels, Summarizing a Factor, Ordered Factors, Comparing Ordered Factors.		
PART-B: Introduction to Data Frame, sub setting of Data Frames, Extending Data Frames, Sorting Data Frames. Lists: Introduction, creating a List: Creating a Named List, Accessing List Elements, Manipulating List Elements, Merging Lists, Converting Lists to Vectors.		
IV		10
Conditionals and Control Flow: Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements. Iterative Programming in R: Introduction, While Loop, For Loop, Looping Over List. Functions in R: Introduction, writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R.		
V	**Data Reduction and Visualization**	10
Data Reduction: Overview of Data Reduction Strategies, Wavelet Transforms, Principal Components Analysis, Attribute Subset Selection, Regression and Log-Linear Models: Parametric Data Reduction, Histograms, Clustering, Sampling, Data Cube Aggregation. Data Visualization: Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.		
Textbooks		
1. Doing Data Science, Straight Talk from The Frontline. Cathy O'Neil and Rachel Schutt, O'Reilly, 2014. 2. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd ed. The Morgan Kaufmann Series in Data Management Systems. 3. K G Srinivas, G M Siddesh, "Statistical programming in R", Oxford Publications.		

R PROGRAMMING LAB

Course	B.Tech.-V-Sem.	L	T	P	C
Subject Code	22CSD52M	-	-	3	1.5

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PO9	PSO2
CO1		3	3	3	3
CO2		3	3	3	3
CO3		3	3	3	3
CO4		3	3	3	3
CO5		3	3	3	3

List of Experiments

Week	Title/Experiment
1	R Environment setup: Installation of R and R Studio in Windows
2	Write R commands for a. Variable declaration and retrieving the value of the stored variables, b. Write an R script with comments, c. Type of a variable using class () Function.
3	Write R command to a. illustrate summation, subtraction, multiplication, and division operations on vectors using vectors. b. Enumerate multiplication and division operations between matrices and vectors in R console
4	Write R command to a. Illustrate the usage of Vector sub setting& Matrix sub setting b. Write a program to create an array of 3×3 matrixes with 3 rows and 3 columns. c. Write a program to create a class, object, and function
5	Write a command in R console a. to create a tshirt_factor, which is ordered with levels ‘S’, ‘M’, and ‘L’. Is it possible to identify from the examples discussed earlier, if blood type ‘O’ is greater or less than blood type ‘A’? b. Write the command in R console to create a new data frame containing the ‘age’ parameter from the existing data frame. Check if the result is a data frame or not. Also R commands for data frame functions cbind(), rbind(), sort()
6	Write R command for a. Create a list containing strings, numbers, vectors and logical values b. To create a list containing a vector, a matrix, and a list. Also give names to the elements in the list and display the list also access the list elements c. To add a new element at the end of the list and delete the element from the middle display the same d. To create two lists, merge two lists. Convert the lists into vectors and perform addition on the two vectors. Display the resultant vector.
7	Write R command for a. logical operators - AND (&), OR (|) and NOT (!). b. Conditional Statements c. Create four vectors namely patient_id, age, diabetes, and status. Put these four vectors into a data frame patient data and print the values using a for loop& While loop d. Create a user-defined function to compute the square of an integer in R e. Create a user-defined function to compute the square of an integer in R f. Recursion function for a) factorial of a number b) find nth Fibonacci number
8	Write R code for i) Illustrate Quick Sort ii) Illustrate Binary Search Tree
9	Write R command to

	a. illustrate Mathematical functions & I/O functions b. Illustrate Naming of functions and sapply(), lapply(), tapply() &mapply()
10	Write R command for i. Pie chart& 3D Pie Chart, Bar Chart to demonstrate the percentage conveyance of various ways for traveling to office such as walking, car, bus, cycle, and train ii. Using a chart legend, show the percentage conveyance of various ways for traveling to office such as walking, car, bus, cycle, and train. a. Walking is assigned red color, car – blue color, bus – yellow color, cycle – green color, and train – white color; all these values are assigned through cols and lbls variables and the legend function. b. The fill parameter is used to assign colors to the legend. c. Legend is added to the top-right side of the chart, by assigning iii. Using box plots, Histogram, Line Graph, Multiple line graphs and scatter plot to demonstrate the relation between the cars speed and the distance taken to stop, Consider the parameters data and x Display the speed and dist parameter of Cars data set using x and data parameters

References

1. R Programming Lab Manual, Dept. of CSE, CMRIT, Hyd.

Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab internal examination.

1. Intelligent vehicles using Artificial Intelligence.
2. Smart ICU Predictive detection of deterioration of seriously ill patients using Artificial Intelligence.
3. Artificial Intelligence Innovation.
4. Prevention against Cyber security Threats using Artificial Intelligence.
5. Efficient, Scalable Processing of Patient Data using Artificial Intelligence.
6. Smart Bike Share Programs using Artificial Intelligence.
7. Automatic Document Classification using Bayesian theorem.
8. Automated Geophysical Feature Detection using Artificial Intelligence.
9. Artificial Intelligence for Records Management.
10. Artificial Intelligence in e-Commerce.

DATA SCIENCE APPLICATIONS

Course	B.Tech.-VI-Sem.	L	T	P	C
Subject Code	22CSD61M	4	-	-	4

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO8	PO12	PSO1
CO1		3	2	3	3	3	3
CO2		3	2	3	3	3	3
CO3		3	3	3	3	3	3
CO4		3	3	3	3	3	3
CO5		3	2	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I		9
Data Science Applications in various domains, Challenges and opportunities, tools for data scientistsRecommender systems - Introduction, methods, application, challenges.		
II		10
Time series data – stock market index movement forecasting. Supply Chain Management - Real world case study in logistics		
III		5+4=9
PART-A: Data Science in Education		
PART-B: Data Science Social media		
IV		10
Data Science in Healthcare, Bioinformatics		
V	**Data Reduction and Visualization**	10
Case studies in data optimization using Python.		
Textbooks		
1. Aakanksha Sharaff, G.K.Sinha , "Data Science and its applications ", CRC Press, 2021. 2. Q.A.Menon, S.A.Khoja, "Data Science: Theory, Analysis and Applications", CRC Press, 2020.		

DATA WRANGLING AND DATA VISUALIZATION

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	22CSD71M	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO8	PO12	PSO1
CO1		3	2	3	3	3
CO2		3	2	3	3	3
CO3		3	3	3	3	3
CO4		3	3	3	3	3
CO5		3	2	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Data Wrangling**	9
Need of data cleanup, data clean up basics – formatting, outliers, duplicates, Normalizing and standardizing data.		
II		10
Introduction of visual perception, visual representation of data, Gestalt principles, information overloads. Creating visual representations, visualization reference model, visual mapping, visual analytics, Designof visualization applications.		
III		5+4=9
PART-A: Classification of visualization systems, Interaction and visualization techniques misleading.		
PART-B: Visualization of one, two and multi-dimensional data, text and text documents.		
IV		10
Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization.		
V	**Data Reduction and Visualization**	10
Visualization of volumetric data, vector fields, processes and simulations, Visualization of maps, geographic information, GIS systems, collaborative visualizations, evaluating visualizations		

Textbooks

1. Jacqueline Kazil and Katharine Jarmul, Data Wrangling with Python: Tips and Tools to Make Your Life Easier, O'Reilly.
2. Ward, Grinstein Keim, Interactive Data Visualization: Foundations, Techniques, and Applications. Natick A K Peters, Ltd.

References

1. E. Tufte, The Visual Display of Quantitative Information, Graphics Press.

DATA WRANGLING AND DATA VISUALIZATION LAB

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	22CSD72M	-	-	3	1.5

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PO9	PSO2
CO1	create python shell script for data validation	3	3	3	3
CO2	demonstrate how to import data into tableau	3	3	3	3
CO3	apply the tableau concepts of dimensions and measures	3	3	3	3
CO4	develop programs, map visual layouts and graphical properties	3	3	3	3
CO5	create a dashboard that links multiple visualizations	3	3	3	3

List of Experiments

Week	Title/Experiment
	Data Wrangling
1	Understanding Data, what is data, where to find data, data wrangling, data clean up basics - formatting, outliers, duplicates, normalizing and standardizing data.
2	Develop the python script to parse the pdf files using pdfminer.
3	Develop the python Shell Script to do the basic data cleanup on child labour and child marriagedata.xlsx a) check duplicates and missing data b) eliminate mismatches c) cleans line breaks, spaces, and special characters.
4	Draw the chart between perceived corruption scores compared to the child labour percentages using matplotlib.
5	Write a python program to download & display content of robot.txt for en.wikipedia.org.
	Data Visualization
6	Foundations for building data visualizations, Creating first visualization.
7	Getting started with tableau software using data file formats, connecting data to tableau,creating basic charts (line, bar charts, tree maps) using the show me panel.
8	Tableau calculations, overview of SUM, AVG and aggregate features, creating custom calculations and fields.
9	Applying new data calculations to visualizations, formatting visualizations, formatting tools and menus, formatting specific parts of the view.
10	Editing and formatting axes, manipulating data in tableau data, pivoting tableau data.
11	Structuring the data, sorting and filtering tableau data, pivoting tableau data.
12	Advanced visualization tools: using filters, using the detail panel, using the size panels, customizing filters, using and customizing tooltips, formatting data with colors.
13	Creating dashboards and storytelling, design for different displays, adding interactivity in the dashboard, distributing, publishing data visualization.
14	Creating custom charts, cyclical data and circular area charts, dual axis charts.

References

1. Data Wrangling & Visualization - Python/R Programming/Power BI Manual, Dept. of CSE, CMRIT.

Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab internal examination.

1. Apply the raw data set, and implement the different data wrangling functionalities.
2. Perform Exploratory Data Analysis (EDA) and Data Wrangling in Pandas.
3. Perform Feature Engineering, one-hot encoding and deal with missing data.
4. Import Datasets and Perform Basic Statistical Data Analysis.
5. Develop a Scatter Plot with Matplotlib.
6. Basic Interactive Binned Scatter Plot with Altair.
7. Histogram with Plotnine (ggplot).
8. Create a Viz on Cricket Stadium.
9. Creating common visualizations on various charts and assembling a dashboard layout.
10. Develop data visualization on interactive plot with Plotly (using Cufflinks).

BIG DATA ANALYTICS

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	22CSD73M	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO8	PO12	PSO1
CO1	identify big data and its business Implications	3	2	2	2	2
CO2	illustrate access and process data on distributed file system	3	3	3	2	3
CO3	demonstrate Hadoop Eco system using Pig	3	3	3	2	3
CO4	develop big data solutions using , Hive and Hbase	3	2	3	2	3
CO5	apply machine learning techniques using R	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction to Big Data**	7
Introduction – distributed file system – Big Data Definition, Four Vs, Characteristic Features - Big Data Life Cycle – Big Data Applications –Big Data vs Traditional Data - Risks of Big Data - Structure of Big Data - Challenges of Conventional Systems - Web Data – Evolution of Analytic Scalability - Evolution of Analytic Processes, Tools and methods - Analysis vs Reporting - Modern Data Analytic Tools.		
II	**HDFS (Hadoop Distributed File System)**	10
The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Map Reduce Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features, Matrix-Vector Multiplication and Case Studies.		
III	**Hadoop Eco Systems**	7+7=14
Part-A: Pig: Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Installing and Running PIG, Pig Latin-Structure, Expressions, Types, Functions, Macros, Schemas.		
Part-B: User Defined Functions-Filter UDF, Eval UDF, Load UDF, Data Processing operators, parallelism and parameter substitution and Case Studies.		
IV	**Hive and Hbase**	9
Hive : Introduction to Hive, Installing and Running Hive, HiveQL -Data Types, Operators and functions, File Formats , Hive Shell, Hive Services, Hive Meta Store, Comparison with Traditional Databases, Tables, Querying Data , User Defined Functions, Case studies. HBase(Column-oriented) : Introduction to HBase, , Installing and Running HBase, Concepts, Clients, Example-schemas, Loading Data , Web Queries, HBase Versus RDBMS and Case studies.		
V	**R Programming**	8
Introduction, Data types, Reading and getting data into R - ordered and unordered factors - arrays and matrices - lists and data frames - reading data from files - probability distributions - statistical models in R - manipulating objects - data distribution- Regression (Linear modeling)**,** Hypothesis testing-graphical analysis-complex Statistics , Data Analytics with R-classification and clustering examples.		
Textbooks		
1. Tom White “Hadoop: The Definitive Guide” Third Edit on, O’reily Media, 2012. 2. Mark Gardener, “Beginning R - The Statistical Programming Language”, John Wiley & Sons, Inc., 2012.		
References		
1. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015. 2. Richard Cotton, "Learning R – A Step-by-step Function Guide to Data Analysis, O‘Reilly Media, 2013.		

BIG DATA ANALYTICS LAB

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	22CSD74M	-	-	3	1.5

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PO9	PSO2
CO1	identify big data and its business Implications	3	3	3	3
CO2	demonstrate Job Execution in Hadoop Environment	3	3	3	3
CO3	develop big data Solutions using Hadoop Eco System	3	3	3	3
CO4	use cassandra to perform social media analytics	3	3	3	3
CO5	apply machine learning techniques using R	3	3	3	3

List of Experiments

Week	Title/Experiment
1	Install, configure and run Hadoop and HDFS– pig, Hive and Hbase.
2	Implement a simple map-reduce job that builds an inverted index on the set of input documents (Hadoop).
3	Process big data in HBase.
4	Store and retrieve data in Pig.
5	Perform Social media analysis using Cassandra.
6	Buyer event analytics using Cassandra on suitable product sales data.
7	Using Power Pivot (Excel) Perform the following on any dataset: a) Big Data Analytics b) Big Data Charting
8	Implement one of the following case study using big data analytics: a) Healthcare Data b) Web Click stream Data c) Social Media Data d) Educational Data
9	Use R-Project to carry out statistical analysis of big data.
10	Use R-Project for data visualization of social media data.

References

1. Big Data Analytics Lab Manual, Department of CSE (DS), CMRIT, Hyd.

Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab internal examination.

1. Big Data to study food-related illnesses and disease patterns.
2. Perform banking risk analysis.
3. In-depth understanding of consumer behaviour and their needs.
4. monitoring store-level demand in real-time
5. Find the best areas for natural resource explorations.
6. Link prediction for social media sites
7. Movie Review Sentiment Analysis
8. Machine learning in credit card fraud detection
9. Predicting Flight Delays
10. Detecting Fake News in Social Media

MINING MASSIVE DATASETS

Course	B.Tech.-VIII-Sem.	L	T	P	C
Subject Code	22CSD81M	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO6	PO12	PSO1
CO1	explain the concepts of dataset mining	3	2	2	3	3	3
CO2	use mapreduce for large scale file systems	3	3	3	3	3	3
CO3	select similar items of a large dataset	3	3	2	3	3	3
CO4	make use of web advertising	3	3	3	3	3	3
CO5	sketch social network graphs for mining	3	2	2	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	8
Statistical Modeling, Machine Learning, Computational Approaches to Modeling, Feature Extraction, Statistical Limits on Data Mining - Total Information Awareness, Bonferroni's Principle, Things Useful to Know - Importance of Words in Documents, Hash Functions, Indexes, Secondary Storage, The Base of Natural Logarithms, Power Laws. ***Task:*** *Perform a case study on Bonferroni's Principle.*		
II	**MapReduce and the New Software Stack**	8
Distributed File Systems - Physical Organization of Compute Nodes, Large-Scale File-System Organization, MapReduce - The Map Tasks, Grouping by Key, The Reduce Tasks, Combiners, Details of MapReduce Execution. ***Task:*** *Perform a case study on Mapreduce.*		
III	**Finding Similar Items**	8+6=14
Part-A: : Applications of Near-Neighbor Search: Jaccard Similarity of Sets, Similarity of Documents, Collaborative Filtering as a Similar-Sets Problem, Shingling of Documents - k-Shingles, Choosing the Shingle Size, Hashing Shingles, Shingles Built from Words. ***Task:*** *Perform a case study on Jaccard Similarity of Sets.*		
Part-B: Similarity-Preserving Summaries of Sets, Matrix Representation of Sets, Minhashing, Minhashing and Jaccard Similarity, Minhash Signatures, Computing Minhash Signatures. ***Task:*** *Perform a case study on similarity preserving.*		
IV	**Advertising on the Web**	9
Issues in On-Line Advertising - Advertising Opportunities, Direct Placement of Ads, Issues for Display Ads, On-Line Algorithms - On-Line and Off-Line Algorithms, Greedy Algorithms, The Competitive Ratio, The Matching Problem - Matches and Perfect Matches, The Greedy Algorithm for Maximal Matching, Competitive Ratio for Greedy Matching. ***Task:*** *Perform a case study on web advertising opportunities.*		
V	**Mining Social-Network Graphs**	9
Social Networks as Graphs - Varieties of Social Networks, Graphs with Several Node Types, Clustering of Social-Network Graphs - Distance Measures for Social-Network Graphs, Applying Standard Clustering Methods, Betweenness, The Girvan-Newman Algorithm, Using Betweenness to Find Communities. ***Task:*** *Perform a case study onSocial-Network Graphs.*		
Textbooks		
1. Jure Leskovec, Anand Rajaraman, Jeff Ullman, Mining of Massive Datasets, 3rd Edition.		
References		
1. Jiawei Han & Micheline Kamber, Data Mining - Concepts and Techniques 3rd Edition Elsevier.		

PREDICTIVE ANALYTICS

Course	B.Tech.-VIII-Sem.	L	T	P	C
Subject Code	22CSD82M	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO6	PO12	PSO1
CO1	explain the concepts of predictive analytics	3	2	3	2	3	3
CO2	demonstrate malware detection in context of immunity	3	3	3	3	3	3
CO3	make use of modelling toolkits and software solutions	3	3	3	3	3	3
CO4	demonstrate IBM Watson computer	3	2	3	3	3	3
CO5	illustrate use of persuasion in prediction	3	2	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	7
Introduction, The analytical model, Two types - predictive and descriptive, The profitability seesaw, Applying predictive analytics to e-mail marketing, Generating customer knowledge, Competing on analytics, Data protection and privacy issues.		
II	**Using data mining to build predictive models**	10
Data mining and its stakeholders, The data-mining process, Involvement of the stakeholders, The relationship between data mining, data science and statistics. **Managing the data for predictive analytics**: Roles, useful data, data sources, types of data - structured and unstructured, Data quality checks - the data audit, data preparation.		
III	**Modelling Toolkits and Software Solutions**	7+9=16
Part-A: The Analytical Modelling Toolkit: Types of techniques, Widely used predictive models, Widely used descriptive methods, The Bayesian approach, Combining models together.		
Part-B: Software Solutions for Predictive Analytics: The architecture required for data mining, Software for analytical modelling, Communicating models between development and deployment, Model management, Scalable analytics in the Cloud.		
IV	**Watson and the Jeopardy**	7
Watson - IBM's Jeopardy! Playing computer, Why does it need predictive modelling in order to answer questions, and what secret sauce empowers its high performance? How does the iPhone's Siri compare? Why is human language such a challenge for computers?		
V	**Persuasion by the Numbers**	8
What is the scientific key to persuasion? Why does some marketing fiercely backfire? Why is human behaviour the wrong thing to predict? What voter predictions helped Obama win in 2012 more than the detection of swing voters? How could doctors kill fewer patients inadvertently?		
Textbooks		
1. Barry Leventhal, "Predictive Analytics for Marketers - Using Data Mining for Business Advantage", KaganPage, 2018. 2. Eric Siegel, "Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, Or Die", Wiley, 2016.		
References		
1. Anasse Bari, Mohamed Chaouchi, and Tommy Jung, Predictive Analytics For Dummies", John Wiley & Sons", 2014.		

WEB AND SOCIAL MEDIA ANALYTICS

Course	B.Tech.-VIII-Sem.	L	T	P	C
Subject Code	22CSD83M	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO6	PO12	PO13
CO1	illustrate the basics of web and social media data	3	2	2	3	3	3
CO2	explain the value of online data	3	3	2	3	3	3
CO3	adapt collaboration in data and business	3	3	3	3	3	3
CO4	make use of business data for prediction	3	3	3	3	3	3
CO5	outline the importance of system and data	3	3	2	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	7
Introduction to Social Network Data Analytics and WWW, Analytics in the Enterprise - Put employees first, Pilot, Experiment, Learn, Alstom's pillars of collaboration, Governance, How to measure success, Success is more than metrics. ***Task:*** *Perform data analytics on Facebook ad promotion platform.*		
II	**Social Business Intelligence and Valuable Data**	10
Social analytics and business intelligence integration, Four Steps - Creating and engaging social media presence, Tie social media to business goals, Decide on collaboration, Examine analytics for insights, Understanding social data types, Location/geographic data, Rich media data. ***Task:*** *Perform analysis on location and geographic data.*		
III	**Data, Business Intelligence and Collaboration**	7+8=15
Part-A: Accessing the online Data: Abstract, Acquire, Refine, Classify, Categorize, Discovery, Metricize, Challenges in data quality, Delivering the infrastructure, Delivering web access to data, How does the enterprise use this data, Social Platforms. ***Task:*** *Perform sorting, split, compute and select from any dataset.*		
Part-B: Social Business Intelligence and Collaboration: Increasing customer focus and transforming to customer-driven enterprise, An integrated approach, Enabling a better cross-sell and up-sell opportunity, Business benefits, Social media and software, Social intelligence, Solution architecture. ***Task:*** *Analyze privacy issues in Social Platforms.*		
IV	**Customer Care and Predictions**	8
New Voice of the Customer, Customer Care 2.0, Dos and Don'ts, Social Customer Care the New Commodity, Automation and Business Intelligence, Predicting the Future, Prediction of Learning, Predicting Elections, Predicting Box Offices, Predicting the Stock Market, Closing Predictions. ***Task:*** *Perform the prediction of stock market using Money control.*		
V	**Gaming the System, Right Data and Measurement**	8
Spam and Robots, Creating Reach, How to Spot Bots, Smearing Opponents, Creating Influence and Intention, Spreading Paid Opinions: Grassroots and Astroturfing, Contagiousness. ***Task:*** *Write a program for Spambot.*		
Textbooks		
1. Krish Krishnan Shawn Rogers, 'Social Data Analytics', 1st Edition, Elsevier, 2014. 2. Lutz Finger, Soumitra Dutta, "Ask, Measure, LearnUsing Social Media Analytics to Understand and Influence Customer Behavior", O'reilly, 2014		
References		
1. Matthew A. Russell, Mining the Social Web, O'Reilly, 2nd Edition, ISBN: 10:1449367615.		

VIDEO ANALYTICS

Course	B.Tech.-VIII-Sem.	L	T	P	C
Course Code	22CSD84M	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO8	PO12	PSO1
CO1	explain the basics of video-signals and systems	3	3	2	2	2	3
CO2	Use motion estimation in optimization	3	3	3	3	3	3
CO3	operate video surveillance systems	3	3	3	3	2	3
CO4	identify human activity from a video	3	3	3	3	3	3
CO5	demonstrate GAIT analysis	3	3	2	2	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	7
Multidimensional signals and systems: signals, transforms, systems, sampling theorem. Digital Images and Video: human visual system and color, digital video, 3D video, digital-video applications, image and video quality. ***Task:*** *Perform a case study of human visual system.*		
II	**Motion Estimation**	11
Image formation, motion models, 2D apparent motion estimation, differential methods, matching methods, non-linear optimization methods, transform domain methods, 3D motion and structure estimation. ***Task:*** *Perform a case study of matching methods in motion estimation.*		
III	**Video Analytics, Object Detection and Tracking**	6+6=12
Part-A: Video Analytics: Introduction- Video Basics - Fundamentals for Video Surveillance-Scene Artifacts, Intelligent video surveillance, IBM smart surveillance system. ***Task:*** *List out the importance of video analytics.*		
Part-B: Object Detection and Tracking: Adaptive Background Modelling and Subtraction-Pedestrian Detection and Tracking Vehicle Detection and Tracking- Articulated Human Motion Tracking in Low- Dimensional Latent Spaces. ***Task:*** *Perform a case study of Human motion tracking.*		
IV	**Behavioral Analysis and Activity Recognition**	9
Event Modelling- Behavioral Analysis- Human Activity Recognition-Complex Activity Recognition Activity modelling using 3D shape, Video summarization, shape-based activity models- Suspicious Activity Detection. ***Task:*** *Perform a case study of behavioural analysis & activity recognition.*		
V	**Human Face Recognition & GAIT Analysis**	9
Introduction: Overview of Recognition algorithms – Human Recognition using Face: Face Recognition from still images, Face Recognition from video, Evaluation of Face Recognition Technologies- Human Recognition using gait: HMM Framework for Gait Recognition, View Invariant Gait Recognition, Role of Shape and Dynamics in Gait Recognition. ***Task:*** *Perform a case study of GAIT analysis.*		
Textbooks		
1. Murat Tekalp, "Digital Video Processing", second edition, Pearson, 2015. 2. Rama Chellappa, Amit K. Roy-Chowdhury, Kevin Zhou. S, "Recognition of Humans and their Activities using Video", Morgan & Claypool Publishers, 2005. 3. Yunqian Ma, Gang Qian, "Intelligent Video Surveillance: Systems and Technology", CRC Press (Taylor and Francis Group), 2009.		
Reference		
1. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer, 2011.		

MINI PROJECT

Course	B.Tech.-VIII-Sem.	L	T	P	C
Course Code	22CSD85M	-	-	4	2

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1 to PSO2
CO1	apply domain knowledge to solve identified industrial problem	3
CO2	use industrial processes involved in end product/service	3
CO3	exhibit communication skills, professional ethics and social responsibility	3
CO4	manage and lead project in coordination with functional team-members	3
CO5	execute the project that meets industry requirements	3

Guidelines

S. No.	Title
1	Students should start the project under approved internal guide immediately after B.Tech. VII Semester End Examinations and complete before B.Tech. VIII Semester End Examinations in any reputed organization without effecting regular classwork.
2	The students have to obtain NOC from both HOD and internship organization and submit the same to the guide for commencement of project.
3	Upon commencement of work, the guide visits the Project organization periodically to monitor the performance of the student.
4	The students have to report the guide periodically on progress of work and seek advice.
5	On completion of project, the students should submit the project report to the guide along with Certificate of Completion.
6	The project work is evaluated before commencement of VIII-Semester End Examinations.
7	The student should give presentation before the Evaluation Committee for 10-15 minutes.
8	The Evaluation Committee awards the marks based on the student's performance.

Evaluation Procedure

External Committee Evaluation (SEE for 100 Marks)

S. No.	Item	Marks
1	Problem Justification/Observation	05
2	Content and Innovation	10
3	Use of Modern tools	15
4	Execution	15
5	Technical Presentation	30
6	Viva-Voce (Q & A)	10
7	Technical Report	15
Total		**100**

ANNEXURE – E

B.Tech. Minor in IoT - R22 Course Structure

(Applicable from the batch admitted during 2022-23 and onwards)

(*Which is not studied in regular B.Tech. course*)

S. No.	Course Code	Subject	POs	PSOs	Hours Per Week			Credits
					L	T	P	
V – Semester								
1	22ECI51M	Python Programming	1,2,3,12	1	3	-	-	3
2	22ECI52M	Python Programming Lab	4,5,9	2	-	-	3	1.5
Total (A)					**3**	**-**	**3**	**4.5**
VI - Semester								
3	22ECI61M	Introduction to IoT	1,2,3,5,12	1	3	-	-	3
4	22ECI62M	Smart Technologies	1,2,3,5,12	1	3	-	-	3
Total (B)					**6**	**-**	**-**	**6**
VII - Semester								
5	22ECI71M	Programming Languages for IoT	2,3,6,7,12	1	3	-	-	3
6	22ECI72M	IoT Automation with Raspberry-PI Lab	4,5,9	2	-	-	3	1.5
Total (C)					**3**	**-**	**3**	**4.5**
VIII - Semester								
7	22ECI81M	Fog & Edge Computing for IoT	2,3,5,8,12	1	3	-	-	3
Total (D)					**3**	**-**	**-**	**3**
TOTAL CREDITS (A + B + C + D)								**18**

PYTHON PROGRAMMING

Course	B.Tech.-V-Sem.	L	T	P	C
Subject Code	22ECI51M	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO12
CO1	perceive the fundamentals of python programming	3	3	2	2
CO2	develop programs using control statements	3	3	2	2
CO3	analyze the programming performances using functions	3	3	2	2
CO4	make use of collections in python programming	3	3	3	2
CO5	design classes and build error-free codes	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction**	10
Introduction to Python, Installing Python. How a Program Works, Using Python, Program Development Cycle, Input and Output, Comments, Variables, Data types, Reading Input from the Keyboard, Displaying Output with the Print Function, Performing Calculations, Operators, Type conversions, Expressions.		
II	**Control Flow, Functions and Modules**	10
Control Flow Statements: Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Repetition Structures: Introduction, while loop, for loop, Input Validation Loops, Nested Loops, control statements-break, continue, pass. **Functions and Modules:** Introduction, Defining and Calling a Void Function, Designing a Program to Use Functions, Local Variables, Passing Arguments to Functions, Global Variables and Global Constants, Value-Returning Functions-Generating Random Numbers, The math Module, Storing Functions in Modules.		
III	**Strings and Collections**	4+5=9
Part-A: Strings: Accessing Characters and Substrings in a String, String Methods, Basic String Operations, String Slicing, Testing, Searching, Comparing and Manipulating Strings.		
Part-B: Collections: Lists, Introduction to Lists, List slicing, Finding Items in Lists with the in Operator, List Methods and Useful Built-in Functions, Copying Lists, Processing Lists, Two-Dimensional Lists, Tuples, Tuple methods. Sets, Operations on Sets, Dictionaries and its methods.		
IV	**Classes and Exceptions**	10
Design with Classes: Classes and Objects, Classes and Functions, Classes and Methods, Working with Instances, Inheritance and Polymorphism. Object-Oriented Programming: Procedural and Object-Oriented Programming, Classes, techniques for Designing Classes. **Exceptions:** Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions.		
V	**GUI Programming**	9
Graphical User Interfaces: Behavior of terminal based programs and GUI-based programs, Coding simple GUI-based programs, other useful GUI resources. GUI Programming: Graphical User Interfaces, Using the Tkinter Module, Display text with Label Widgets, Organizing Widgets with Frames, Button Widgets and Info Dialog Boxes, Getting Input with Entry Widget, Using Labels as Output Fields, Radio Buttons, Check Buttons.		
Textbooks		
1. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning. 2. Think Python First Edition, by Allen B. Downey, Orielly publishing.		
References		
1. Introduction to Computation and Programming Using Python. John V. Guttag, The MIT Press. 2. James Payne, Beginning Python using Python 2.6 and Python 3, Wrox publishing.		

PYTHON PROGRAMMING LAB

Course	B.Tech.-V-Sem.	L	T	P	C
Subject Code	22ECI52M	-	-	3	1.5

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PO9	PSO2
CO1	write simple programs using python	3	3	3	3
CO2	develop programs using control statements	3	3	3	3
CO3	implement functions and file I/O operations	3	3	3	3
CO4	make use of lists and tuples in python	3	3	3	3
CO5	design simple GUI programs	3	3	3	3

List of Experiments

Week	Title/Experiment
1	a) Write a Python program to compute the GCD of two numbers. b) Write a Python program to find the maximum among a list of numbers. c) Write a Python program to display first "N" Fibonacci sequence.
2	a) Write a Python program to display first "N" prime numbers. b) Write a Python program to find the factorial value of a given number. c) Write a Python program to check whether the given string is palindrome or not.
3	a) Write a program to compute distance between two points taking input from the user (Pythagorean Theorem) b) Write a program add.py that takes 2 numbers as command line arguments and prints its sum. c) Write a Python program to read filename as command line argument and displays the character count, word count and line count.
4	a) Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, ..., 1/10. b) Write a Python program to simulate simple Calculator. c) Write a Python program to copy contents from one file to another file.
5	a) Write a program to count the numbers of characters in the string and store them in a dictionary data structure. b) Write a program to use split and join methods in the string and trace a birthday with a dictionary data structure.
6	a) Write a Python program to compute the matrix multiplication. b) Write a Python program to find the most frequent words in a text read from a file. c) Write a program to print each line of a file in reverse order.
7	a) Write a Python program to perform Linear Search. b) Write a Python program to perform Binary Search.
8	a) Write a Python program to implement Insertion sort. b) Write a Python program to implement Merge Sort.
9	a) Write a function nearly equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b. b) Find mean, median, mode for the given set of numbers in a list. c) Write two functions **dups** to find all duplicates in the list and **unique** to find all the unique elements of a list.
10	a) Write a Python function to compute "N"/0 and use try/except to catch the exceptions. b) Write a Python program to define a custom exception class which takes a string message as attribute.
11	a) Write a Python program which accepts a sequence of comma-separated numbers from user and generate a list and a tuple with those numbers. b) Write a function cumulative product to compute cumulative product of a list of numbers. c) Write a function reverse to reverse a list without using the reverse function.

12	a) Write a python program to design the login form using Tkinter module. b) Write a python program to design student application form for admission.

References

1. Python Programming Lab Manual, Department of CSE, CMRIT, Hyd.

Micro-Projects: Student must submit a report on one of the following Micro–Projects before commencement of second internal examination.

1. Install packages requests, flask and explore them using pip.
2. Write a python script to fetch the content(s) from the web pages. (Hint: use Wiki).
3. Write a python script that serves HTTP Response and HTML Page on request.
4. Create a class for ATM and implement its functions.
5. Create several modules and imports these modules in a new program.
6. Create a class for Library and implement its functions.
7. Write a python script for reading and writing data from local files. (.txt,.csv,.xls, .json, etc)
8. Write a python script for reading data from remote files.
9. Demonstrate the working of pandas data structures: Series and Data Frames.
10. Develop an application to access database with DB-API2.

INTRODUCTION TO IoT

Course	B.Tech.-VI-Sem.	L	T	P	C
Subject Code	22ECI61M	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO5	PO12	PSO1
CO1		2	2	3	3	3	3
CO2		2	2	3	3	3	3
CO3		2	2	3	3	3	3
CO4		3	2	3	3	3	3
CO5		3	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction to Internet of Things**	10
Definition and Characteristics of IoT, Sensors, Actuators, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Agriculture and Industry.		
II		10
IoT and M2M- Software defined networks, network function virtualization, difference between SDN and NFV for IoT, Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG,SNMP NETOPEER.		
III		4+5=9
Part-A: IoT Physical Devices and Endpoints- Introduction to Arduino and Raspberry Pi-Installation, Interfaces (serial, SPI, I2C).		
Part-B: Programming - Python program with Raspberry PI with focus on interfacing external gadgets, controlling output, reading input from pins.		
IV		10
Controlling Hardware- Connecting LED, Buzzer, Switching High Power devices with transistors, Controlling AC Power devices with Relays, Controlling servo motor, speed control of DC Motor, unipolar and bipolar Stepper motors Sensors- Light sensor, temperature sensor with thermistor, voltage sensor, ADC and DAC, Temperature and Humidity Sensor DHT11, Motion Detection Sensors, Wireless Bluetooth Sensors, Level Sensors, USB Sensors, Embedded Sensors, Distance Measurement with ultrasound sensor		
V		9
IoT Physical Servers and Cloud Offerings– Introduction to Cloud Storage models and communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application frameworkDesigning a RESTful web API		
Textbooks		

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 3. Raspberry Pi Cookbook, Software and Hardware Problems and solutions, Simon Monk, O'Reilly (SPD), 2016, ISBN 7989352133895 REFERENCE BOOKS: 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.

SMART TECHNOLOGIES

Course	B.Tech.-VI-Sem.	L	T	P	C
Subject Code	22ECI62M	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO5	PO12	PSO1
CO1		2	2	3	3	3	3
CO2		2	2	3	3	3	3
CO3		2	2	3	3	3	3
CO4		3	2	3	3	3	3
CO5		3	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Smart Technologies**	10
Scope and Applications, Cutting-Edge Digitization Challenges in Vehicle Cyber-Physical Systems and Cyber security, Big Data Analytics as an Enabler in Smart Governance for the Future Smart Cities.		
II		10
Digital Masters: Blueprinting Digital Transformation, UAVs/Drones-Based IoT Services, Role of Cyber Security in Drone Technology.		
III		4+5=9
Part-A: Bitcoins as an Implementation of Blockchain and Its Convergence with Internet of Things.		
Part-B: Tomorrow's AI-Enabled Banking, Exploring Connected Cars.		
IV		10
Vehicular Cyber security Through Intrusion Detection and Prevention Architecture, Mechanism Protecting Vehicle-to-Vehicle Communication, Advanced Driver Assistance Systems		
V	**Cyber care**	9
Role of Cyber Security in Healthcare Industry, Smart Agriculture: A Tango Between Modern IoT-Based Technologies and Traditional Agriculture Techniques, Importance of Being 'NICE' While Developing IoT-Based Smart Farming Solutions: A Case Study About 'NICE' Labs		
Textbooks:		
1. Smart Technologies-Scope and Applications by K. B. Akhilesh, Dietmar P. F. Möller, Springer publications, 2020.		

PROGRAMMING LANGUAGES FOR IOT

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	22ECI71M	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO6	PO7	PO12	PSO1
CO1		2	2	3	3	3	3
CO2		2	2	3	3	3	3
CO3		2	2	3	3	3	3
CO4		3	2	3	3	3	3
CO5		3	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I		10
Getting Started with Raspberry Pi: Basic functionality of Raspberry Pi B+ board, setting up the board, configuration and use, implications of an operating system on the behavior of the Raspberry Pi as an IoT device, booting Raspberry Pi 3, Downloading an Operating System, format an SD card and bootingthe OS, Basics of Linux and its use, main features including navigating the file system and managing processes, text based user interface through the shell, overview of the graphic user interface for Raspian Linux distribution.		
II		10
Interfacing Hardware with the Raspberry Pi, Raspberry Pi Remote Access, operates the Raspberry Pi in “headless mode”, Bash Command line, operating Raspberry Pi without needing a GUI interface. Basics of the Python programming language, programming on the Raspberry Pi. Python on Raspberry Pi, Python Programming Environment, Python Expressions, Strings, Functions and Function arguments, Lists, List Methods, Control Flow.		
III		4+5=9
Part-A: Communication with devices through the pins of the Raspberry Pi, RPi.GPIO library, Python Functions,setting up the pins, General purpose IO Pins, Protocol Pins.		
Part-B: GPIO Access, applying digital voltages, and generating Pulse Width Modulated signals, Tkinter Python library, accessing pins through a graphicuser interface		
IV		10
IoT Physical Servers and Cloud Offerings: Introduction to Cloud Storage models and communication APIs. Web Server – Web server for IoT, Cloud for IoT, Python web application framework. Designing aRESTful web API. Connecting to APIs		
V		9
IoT Design using Raspberry Pi IoT Applications based on Pi, LAMP Web-server, GPIO Control over Web Browser, Creating Custom Web Page for LAMP, Communicating data using on-board module, Home automation using Pi, Node-RED, MQTT Protocol, Using Node-RED Visual Editor on Rpi.		
Textbooks		
1. Simon Monk, “Programming the Raspberry Pi: Getting Started with Python”, January 2012, McGraw Hill Professional. 2. Raspberry Pi with Java: Programming the Internet of Things (IoT) (Oracle Press) 1st Edition. 3. The official raspberry Pi Projects Book, https://www.raspberrypi.org/magpiissues/Projects_Book_v1.pdf		
References		
1. Eben Upton and Gareth Halfacree, “Raspberry Pi User Guide”, August 2016, 4th edition, John Wiley & Sons. 2. Alex Bradbury and Ben Everard, “Learning Python with Raspberry Pi”, Feb 2014, JohnWiley &Sons. 3. Michael Margolis, “Arduino Cookbook”, First Edition, March 2011, O'Reilly Media, Inc.		

IOT AUTOMATION WITH RASPBERRY PI LAB

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	22ECI72M	-	-	3	1.5

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PO9	PSO2
CO1		3	3	3	3
CO2		3	3	3	3
CO3		3	3	3	3
CO4		3	3	3	3
CO5		3	3	3	3

List of Experiments

Week	Title/Experiment
Using Raspberry Pi	
1	Calculate the distance using a distance sensor
2	Basic LED functionality
3	Calculate temperature using a temperature sensor
4	Build an alarmed motion sensor
5	Make printer wireless
6	Add a power button to Raspberry pi
7	Build a network game server
8	Make music with sony Pi
9	Interface Pi Camera module with Raspberry Pi
10	Installing OS on Raspberry Pi a) Installation using Pilmager b) Installation using image File

References

1. IoT Automation with Raspberry PI Lab Manual, Department of CSE, CMRIT, Hyd.

Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab internal examination.

1. Big Data to study food-related illnesses and disease patterns.
2. Perform banking risk analysis.
3. In-depth understanding of consumer behaviour and their needs.
4. monitoring store-level demand in real-time
5. Find the best areas for natural resource explorations.
6. Link prediction for social media sites
7. Movie Review Sentiment Analysis
8. Machine learning in credit card fraud detection
9. Predicting Flight Delays
10. Detecting Fake News in Social Media

FOG & EDGE COMPUTING FOR IOT

Course	B.Tech.-VIII-Sem.	L	T	P	C
Subject Code	22ECI81M	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO8	PO12	PSO1
CO1		2	2	3	3	3	3
CO2		2	2	3	3	3	3
CO3		2	2	3	3	3	3
CO4		3	2	3	3	3	3
CO5		3	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I		10
II		10
III		4+5=9
Part-A:		
Part-B:		
IV		10
V		9
Textbooks		
1.		
References		
1.		

ANNEXURE – F

B.Tech. Minor in Innovation and Entrepreneurship - R22 Course Structure

(Applicable from the batch admitted during 2022-23 and onwards)

(*Which is not studied in regular B.Tech. course*)

S. No.	Course Code	Subject	POs	PSOs	Hours Per Week			Credits
					L	T	P	
V – Semester								
1	22MBI51M	Innovation and Design Thinking	1,2,3,6,11,12	1	3	-	-	3
2	22ECI52M	Design thinking and Ideation Lab	4,5,9,10	2	-	-	3	1.5
Total (A)					**3**	**-**	**3**	**4.5**
VI - Semester								
3	22MBI61M	Foundations of Entrepreneurship	1,2,7,8,11,12	1	4	-	-	4
Total (B)					**4**	**-**	**-**	**4**
VII - Semester								
4	22MBI71M	Business Ideation and Lean Startup	1,2,7,8,11,12	1	3	-	-	3
5	22MBI72M	B-Plan Development Lab	4,5,9,10	2	-	-	3	1.5
Total (C)					**3**	**-**	**3**	**4.5**
VIII - Semester								
6	**Any one of the following**				3	-	-	3
	22MBI81M	Product Development	1,2,8,9,11,12	1				
	22MBI82M	Market Research	1,2,8,9,11,12	1				
	22MBI83M	Engineering Design Process	1,2,8,9,11,12	1				
	22MBI84M	Financial and Legal Aspects of Business	1,2,8,9,11,12	1				
7	22MBI85M	Mini Project (Either on new venture establishment or launch of marketable product or patent publishing)	1 to 12	1,2			4	2
Total (D)					**3**	**-**	**4**	**5**
TOTAL CREDITS (A + B + C + D)								**18**

INNOVATION AND DESIGN THINKING

Course	B.Tech.-V-Sem.	L	T	P	C
Subject Code	22MBI51M	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO6	PO11	PO12	PSO1
CO1	illustrate design thinking process in light of PLC	3	3	3	3	3	3	3
CO2	identify creative thinking in the process design	3	3	3	3	3	3	3
CO3	find the role of stakeholders in prototype development	3	3	3	3	3	3	3
CO4	organize brainstorming and mind mapping sessions	3	3	3	3	3	3	3
CO5	make use of modern tools to test prototype viability	3	3	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Design Thinking For Innovation**	10
Introduction to Design Thinking, Understanding the principles of Design thinking, Business Model Innovation, Challenges Best-Suited for Design Thinking, Product Life Cycle (PLC).		
II	**Process of Design**	10
Creativity and Innovation in Design Process - Design limitation, Creative Thinking, Lean Canvas Model and other Business Models.		
III	**Phases in Design Thinking**	4+5=9
Part-A: Understand, Observe, Define, Ideate, Prototype, Test, Reflect. Problem Statement, Empathy.		
Part-B: The 5 Whys, stakeholder map, Empathy map, personas, peer observation, Trend analysis.		
IV	**Solution/Idea Generation**	10
Story Telling, Context mapping, Critical items diagram, Brainstorming, Matrix and Voting methods, Analogies, benchmarking, Utility maps.		
V	**Tools and Techniques for Prototype and Test**	9
Types of Prototype, Exploration Map, Blueprint, MVP, Testing Sheets, Solution Feedback Capturing Tools, Structured Usability Testing, A/B Testing, Design Thinking Applications Case Studies.		

Textbooks

1. An AVA Book, "Design Thinking", AVA Publishing, 2010.
2. David Ralzman, "History of Modern Design", 2nd Edn, Laurence King Publishing Ltd., 2010.
3. The Design Thinking Toolbox: A Guide to Mastering the Most Popular and Valuable Innovation Methods - Micheal Lewrick, Patrick Link, Larry Leifer, Wiley Publishing.

References

1. Design Thinking for Dummies - Wiley.
2. Tom Kelley, Jonathan Littman, "Ten Faces in Innovation", Currency Books, 2006.
3. G. Pahl, W.Beitz, J. Feldhusen, KH Grote, "Engineering Design: A Systematic Approach", 3rd Edition, Springer, 2007.
4. The field guide to human centered design by Design Kit.

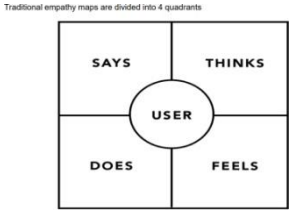
DESIGN THINKING AND IDEATION LAB

Course	B.Tech.-V-Sem.	L	T	P	C
Subject Code	22ECI52M	-	-	3	1.5

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PO9	PO10	PSO2
CO1	develop PLC strategies for a new design/features/functions	3	3	3	3	3
CO2	organize workshop sessions for ideation process of new designs	3	3	3	3	3
CO3	analyze empathy level of stakeholders in prototype development	3	3	3	3	3
CO4	make use of assistive technologies to build prototype	3	3	3	3	3
CO5	build a test-facility/plat-form to test prototype and apply patent	3	3	3	3	3

List of Experiments

Week	Title/Experiment
1	[Define]: frame a problem statement that helps designers to address the issue and work towards a feasible solution using tools such as four w's, five whys etc. A sample problem for which you can try the exercise is as follows i. Young patients who come for MRI in hospital have to undergo sedation because they are scared of the machine ii. People with visual impairment have difficulty in participating in email conversations.
2	[Empathize]: Create an empathy map using tools/techniques such as brainstorming, user interview, shadowing for the following case study.  i. Parents in India find it difficult to get nutritional, healthy, organic baby food because the market for organic baby food is not well established. ii. People with visual impairments have to dictate the entire content of the mail to a third person.
3	[Ideation]: Using tools such as Brain storming, SCAMPER model, Story Boarding, Analogies, Mind Map generate ideas for improving the sales of TATA NANO cars.
4	[Prototyping and Testing]: Using mock ups, story boarding, exploration map etc., design a prototype for the following (i). Voice based/gestured based emails for visually challenged (ii). Innovative face mask suitable for usage in times of pandemic.
5	[Presentation]: Team of 4-5 students choose a problem in one of the Sustainable Development Goals (SDG) as identified by United Nations General Assembly (UN-GA) and come up with a innovative idea proposing solution to the problem identified. Present your innovative idea highlighting the implementation of design thinking principles in arriving at the idea.
References	
1. Design Thinking and Ideation Lab Manual, Department of CSE, CMRIT, Hyd.	

FOUNDATIONS OF ENTREPRENEURSHIP

Course	B.Tech.-VI-Sem.	L	T	P	C
Subject Code	22MBI61M	4	-	-	4

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO7	PO8	PO11	PO12	PSO1
CO1	identify role of entrepreneur in economic development	3	3	3	3	3	3	3
CO2	illustrate behavioural barriers among entrepreneurs	3	3	3	3	3	3	3
CO3	apply innovative strategies in managing new ventures	3	3	3	3	3	3	3
CO4	outline challenges in commercialization of an IP	3	3	3	3	3	3	3
CO5	analyze strategies for venture growth and diversification	3	3	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Understanding Entrepreneurial Mindset**	10
The revolution impact of entrepreneurship - The evolution of entrepreneurship - Functions of Entrepreneurs – types of entrepreneurs -Approaches to entrepreneurship- Process approach- Role of entrepreneurship in economic development- Twenty firstcentury trends in entrepreneurship.		
II	**The individual entrepreneurial mind-set and Personality**	10
The entrepreneurial journey-Stress and the entrepreneur - the entrepreneurial ego - Entrepreneurial motivations- Motivational cycle - Entrepreneurial motivational behavior - Entrepreneurial competencies. Corporate Entrepreneurial Mindset, the nature of corporate entrepreneur-conceptualization ofcorporate entrepreneurship Strategy-sustaining corporate entrepreneurship.		
III	**Launching Entrepreneurial Ventures**	4+5=9
Part-A: Creativity and Business Idea, opportunities identification- Finding gaps in the market place - techniques for generating ideas- entrepreneurial Imagination and Creativity- the nature of the creativity process - Innovation and entrepreneurship.		
Part-B: Methods to initiate Ventures- Creating new ventures-Acquiring an Established entrepreneurial venture-Franchising- advantage and disadvantages of Franchising.		
IV	**Legal challenges of Entrepreneurship**	10
Intellectual property protection - Patents, copyrights - trademarks and trade secrets - avoiding trademark pitfalls. Feasibility Analysis - Industry and competitor analysis - formulation of the entrepreneurial plan- the challenges of new venture start-ups, developing an effective business model - sources of finance - critical factors for new venture development - the evaluation process.		
V	**Strategic perspectives in entrepreneurship**	9
Strategic planning - Strategic actions- strategic positioning- Business stabilization - Building the adaptive firms - Understanding the growth stage – Internal growth strategies and external growth strategies, Unique managerial concern of growingventures. Initiatives by the Government of India to promote entrepreneurship, Social and women entrepreneurship.		
Textbooks		
1. D F Kuratko and T V Rao, Entrepreneurship - A South-Asian Perspective, Cengage Learning, 2012. 2. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Entrepreneurship, MGH,2018. 3. Bruce R. Barringer/ R.Duane Ireland, Entrepreneurship Successfully launching new ventures,4th Edition, Pearson, 2015.		
References		
1. Stuart Read, Effectual Entrepreneurship, Routledge, 2013. 2. Rajeev Roy, Entrepreneurship, 2e, Oxford publications, 2012. 3. Nandan .H, Fundamentals of Entrepreneurship, PHI, 2013.		

BUSINESS IDEATION AND LEAN STARTUP

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	22MBI71M	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO7	PO8	PO11	PO12	PSO1
CO1	interpret entrepreneurial arena	3	3	3	3	3	3	3
CO2	illustrate the process of idea to action	3	3	3	3	3	3	3
CO3	explain entrepreneurial value addition and scalability	3	3	3	3	3	3	3
CO4	outline risk management strategies	3	3	3	3	3	3	3
CO5	analyze mission driven ventures lean start-ups	3	3	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Entrepreneurial Arena**	10
Entrepreneurial Skill Sets - Entrepreneurial Quotient-Entrepreneurial Psychology & Driving Forces - Identifying and Meeting the Resource Gaps - New Age Marketing and After Sales Services ICT - Strategies for Disruption - Legal Compliance. SWOT- IPR Issues Glance-Market Dynamics.		
II	**Enterprise Idea To Action**	10
The Entrepreneurial Ecosystem & Government Support-Monetizing Ideas- Bootstrapping-DPR for funding, Commercialization - Using Big Data Analytics – Revenue Budget-Start up to MNC.		
III	**Entrepreneurial Value Addition& Scalability**	4+4=8
Part-A: Value Addition: Process of Innovation- Design Thinking- Lean Start-Up & Customer Validation-Generating Market Traction-Positioning and Packaging-Start-up Models. Scalability, Scaling up and Stabilization**.**		
Part-B: Business Scalability –Validation and Roadmap - Pitching Document- Elevator Pitches-Funding Strategies- Start-up Valuation –Exit Strategies of Fund Houses- Role of Mergers & Acquisitions and Negotiations at each Milestone-origination of lean startups.		
IV	**Risk Management Strategies**	10
Predicting, Calculating and Mitigating Enterprise Risks- Project Monitoring and Controlling Techniques-PERT/CPM-Mean Variance Analysis Capital Budgeting-Start-up Audit- Bounce-Back from Failures.		
V	**Mission driven Ventures/Organisations a way to lean start-ups**	10
Leading to Mission Driven Ventures and Organizations- Business Ethics and Best Practices - Business Forecasting - Learning smart ways to create Competitive/Strategic Advantage Profile - Learn to deal with Ups and Downs and Lead Organizational Change -Building a Motivated Team-types of new age business.		
Textbooks		
1. Yousef Haik T M MShahin, Engineering design process, 2nd Edition, Cengage, 2013. 2. Shuchen B Thakore, Introduction to Process Engineering and Design, 2nd Edition, MGH, 2015.		

BUSINESS PLAN DEVELOPMENT LAB

Course	B.Tech.-VII-Sem.	L	T	P	C
Subject Code	22MBI72M	-	-	3	1.5

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PO9	PO10	PSO2
CO1	develop a business plan for market niche and consumer needs	3	3	3	3	3
CO2	identify flow-diagram for business ideation-to-implementation	3	3	3	3	3
CO3	prepare Strategic Advantage Profile Matrix for new businesses	3	3	3	3	3
CO4	outline cutting-edge-technologies for product development	3	3	3	3	3
CO5	organize a workshop to develop business plan for lean start-ups	3	3	3	3	3

List of Experiments

Week	Title/Experiment
1	Activity on finding your flow and debriefing.
2	Class Activity: Find Your Niche
3	Assignment: Drawing the Consumption Map.
4	Brainstorm on DISRUPT concept and Let's ID.
5	Activity on Mind Mapping and debriefing
6	Activity on Group discussions and idea presentations/demonstrations & debriefing
7	Assignment – Idea Bank
8	Activity on Decision Matrix Analysis and debriefing.
9	Activity on Paired Comparison Analysis and debriefing.
10	Class Activity - Apply 5Q Framework and debriefing.
11	Activity on Value Proposition Design
12	Activity Value Proposition and Assessing Fit
13	Conduction of Workshop/Seminar

References

1. Business Plan Development Lab Manual, Department of MBA, CMRIT, Hyd.

Micro-Projects: Student should submit a report on one of the following/any other micro-project(s) approved by the lab faculty before commencement of lab internal examination.

1. Activity flow debriefing and Find Your Niche and market niche
2. Demand Forecasting - Market Analysis
3. GD &Brainstorming sessions on new products and cosmetic changes.
4. Activity on idea presentations/demonstrations & debriefing
5. Idea Bank on various sectors and various categories of enterprises
6. How to Apply Porters Five force Models for new product development
7. How to Apply Hoofers Life Cycles for product existence
8. Apply TOWS/BCG/GE9 Grid Cell
9. Activity Value Proposition and Assessing venture and individual stability to perceive risk
10. Conduction of Workshop/Seminar

PRODUCT DEVELOPMENT

Course	B.Tech.-VIII-Sem.	L	T	P	C
Course Code	22MBI81M	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO8	PO9	PO11	PO12	PSO1
CO1	illustrate product development process	3	3	3	3	3	3	3
CO2	outline the process of opportunity identification	3	3	3	3	3	3	3
CO3	identify steps in product planning process	3	3	3	3	3	3	3
CO4	interpret the importance of industrial/product design	3	3	3	3	3	3	3
CO5	analyze process of prototyping and robust design	3	3	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction to Product Development**	10
Characteristics of Successful Product Development-Duration, Cost and Challenges of Product Development - Structured Methods - Industrial Examples - Organizational Realities – Development Processes and Organizations - Concept Development: The Front-End Process - Generic Product Development -Process Technology-Push Products - Platform Products - Process-Intensive Products - Customized Products - High-Risk Products - Quick-Build Products - Product-Service Systems - Complex Systems - Product Development Process Flows - The Tyco Product Development Process. ***Task:*** *draw a process-flow diagram for Product Development and The Tyco Product Development*		
II	**Organization and Opportunity Identification**	10
Product Development Organizations, Functions, Projects, Organizational Structure -Distributed PD Teams. Opportunity Identification Process -Types of Opportunities -Tournament Structure - Techniques for Generating Opportunities - Screen Opportunities - Develop Promising & Select Exceptional Opportunities - Reflect on the Results and the Process. ***Task:*** *perform a case study on opportunity identification process for an IT Consulting Firm*		
III	**Product Planning**	4+4=8
Part-A: Product Planning Process - Identification of Customer Needs - Product Specifications. ***Task:*** *prepare a report on customer needs & product specification in new product development*		
Part-B: Product Concept Generation & Selection- Product Testing and Architecture. ***Task:*** *draw a flow diagram for concept generation, selection, product testing and architecture*		
IV	**Industrial Design & Design for Product Development**	10
Industrial Design-Assessing Various Needs - Expenditures for Industrial Design Process-Investigation of Customer Needs - Conceptualization - Preliminary Refinement - Further Refinement and Final Concept Selection - Control Drawings or Models - Coordination with Engineering, Manufacturing and External Vendors - Computer-Based Tools on the ID Process - Management of the IDP - Timing of Industrial Design Involvement - Quality of Industrial Design. ***Task:*** *write a report on various international quality standards and its applicability to designs*		
V	**Design for Environment, Manufacturing, Prototyping & Robust**	10
Design for Environment-Two Life Cycles - Environmental Impacts - Process - Guidelines. Design for Manufacturing: DFM Requires a Cross-Functional Team - DFM Is Performed throughout the Development Process - Steps. Prototyping: Understanding Prototypes, Types & Uses - Principles – Analytical Prototypes, Physical Prototypes, Iterations, Expeditions and Prototyping Technologies - 3D CAD Modeling/Analysis and 3D Printing Robust Design: What Is Robust Design of Experiments and Process - Estimate the direct and indirect Costs to scale- Standardize Components and Processes Minimize Systemic Complexity & Error Proofing. ***Task:*** *write a report on* CAD Modeling/Analysis, 3D Printing and Robust Design tools		
Textbooks		
1. Karl Ulrich, Steven Eppinger, Product Design and Development, 6th Ed, MGH, 2019. 2. Dr. Ali Jamnia, Introduction to Product Design and Development for Engineers, CRC Press.		

MARKETING RESEARCH

Course	B.Tech.-VIII-Sem.	L	T	P	C
Subject Code	22MBI82M	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO8	PO9	PO11	PO12	PSO1
CO1	illustrate various marketing research methods	3	3	3	3	3	3	3
CO2	design a research programme	3	3	3	3	3	3	3
CO3	implement sampling techniques for data collection	3	3	3	3	3	3	3
CO4	identify suitable measurement, scaling and sampling	3	3	3	3	3	3	3
CO5	analyse testing of hypotheses to draw conclusions	3	3	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction to Marketing Research**	10
	Meaning and Scope of Marketing Research, Factors that Influence Marketing Research, Scope of Marketing Research, Limitations of Marketing Research, Marketing Research Process, Role of Marketing Research in Marketing Decision-making, International Marketing Research, Marketing Research in social media, Mobile Marketing Research, Ethics in Marketing Research, Use of Information Technology in Marketing Research. ***Task:*** *Wipro A Journey from Vanaspati product manufacturer to an information technology leader.*	
II	**Marketing Research Design**	10
	The Process of Defining the Problem and Developing an Approach, Defining a Marketing Research Problem, Exploratory, Descriptive, Casual Research Design, Marketing Research Proposal. ***Task:*** *Castrol India Limited: A Journey from Market Growth to Market Saturation.*	
III	**Sampling and Data Collection**	4+4=8
	Part-A: Sampling Design Process, Classification of Sampling Techniques, Probability and Non-Probability Sampling Techniques, Internet Sampling, Sampling Distribution, Sample Size Determination, Non-Response Issues in Sampling. ***Task:*** *Systematic Replacement of the Unorganized Sector by the Organized Sector.*	
	Part-B: Sources of Data Collection, Methods of Data Collection. ***Task:*** *TVS Motors Company Ltd.*	
IV	**Measurement and Scaling**	10
	Concept of Measurement, Types of Measurement Scales: Likert, Semantic Differential, Guttman, Interval, Q-Sort, Nature of Measurement, Characteristics of a Good Measurement, Nature of Attitude Scale, Rating Scale, Ranking Scale, Questionnaire Design, Editing, Coding and Tabulation of data. ***Task:*** *Sintex Industries Limited: Grooming with Increased Demand of Plastic.*	
V	**Analysis and Presentation of Data**	10
	Data Preparation, Data Preparation Process, Statistically Adjusting Data, Frequency Distribution, Cross Tabulation, Hypothesis Testing, Bi-Variate Analysis, Correlation, Regression, Multi-Variate Analysis, Discriminant, Logic Analysis, Factor Analysis, Cluster Analysis. Report Writing, Report Preparation and Presentation. ***Task:*** *ITC: A Long Way Journey from a Pure Tobacco Company to a Well-diversified FMCG Company.*	
Textbooks		
1. Naresh Malhotra, Satyabhushan Dash, Marketing Research, Pearson, 7e, 2019.		
References		
1. GC Beri, Marketing Research, 4e, 2018, Mc Graw Hill 2018. 2. Donald R Cooper, Marketing Research Concepts and Cases, MGH, 2005.		

ENGINEERING DESIGN PROCESS

Course	B.Tech.-VIII-Sem.	L	T	P	C
Subject Code	22MBI83M	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO8	PO9	PO11	PO12	PSO1
CO1	identify the importance of engineering design	3	3	3	3	3	3	3
CO2	illustrate the process of market analysis	3	3	3	3	3	3	3
CO3	explain scope of Organizational Structure in DP	3	3	3	3	3	3	3
CO4	develop concepts and evaluation of design alternatives	3	3	3	3	3	3	3
CO5	breakdown drawings for various components	3	3	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Introduction to Engineering Design**	10
Importance and Challenges of Engineering Design, Introduction to Systematic Design, Design Process, Professionalism and Ethics, Essential Transferable Skills- Objectives, Working in Teams, Team Dynamics, Research Skills, Technical Writing and Presentation, Presentation Style. ***Task:*** *write a report on life-skills, essential transferable skills and team dynamics*		
II	**Identifying Needs and Gathering Information (Market Analysis)**	10
Objectives, Problem Definition, Gathering Information, Conduct a Market Analysis, Relevant Information Resources- Web Tools, Societal Problems. Customer Requirements: Identifying Customer Requirements, Prioritizing Customer Requirements, Organizing Customer Requirements. ***Task:*** *conduct a marke-survey using web-tools to identify prospective customers needs*		
III	**Establishing Functional Structure and Specifications**	4+4=8
Part-A: Establishing Functional Structure: Function Decomposition and Structure, Detailed Procedure to Establish Functional Structures, Reverse Engineering. ***Task:*** *develop an organisation flow chart and reporting methodology for an IT project team*		
Part-B: Specifications: Performance-Specification Method**,** Quality-Function-Deployment Method. ***Task:*** *write a report on performance specification method and quality function importance*		
IV	**Developing Concepts and Evaluation**	10
Developing Working Structures, steps to Develop Concepts from Functions, Brainstorming, Creativity. Concepts Evaluation: Sketch Assembly of Alternatives, Evaluating Conceptual Alternatives. ***Task: write*** *a report on brain-storming sessions for creativity and concept evaluation*		
V	**Embodiment Design & Detailed Design**	10
Product Drawings, Prototype, Safety Considerations, Human Factors. Detailed Design: Material Selection. Selection of Design Projects, Design Project Rules. ***Task:*** *write a report on design project rules*		
Textbooks		
1. Yousef Haik T M MShahin, Engineering design process, 2nd Ed, Cengage, 2013. 2. Shuchen B Thakore, Introduction to Process Engineering and Design, 2nd Ed, MGH, 2015.		

FINANCIAL AND LEGAL ASPECTS OF BUSINESS

Course	B.Tech.-VIII-Sem.	L	T	P	C
Subject Code	22MBI84M	3	-	-	3

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO8	PO9	PO11	PO12	PSO1
CO1	interpret the overview of financial management	3	3	3	3	3	3	3
CO2	illustrate financial statement analysis	3	3	3	3	3	3	3
CO3	identify sources and methods of financing	3	3	3	3	3	3	3
CO4	outline import/export documentation process	3	3	3	3	3	3	3
CO5	find the importance of company administration	3	3	3	3	3	3	3

Syllabus

Unit	Title/Topics	Hours
I	**Basics of Finance & Financial Management**	10
Financial Management: An Overview, The Finance Function: Nature and Scope; Evolution of finance function – Its new role in the contemporary scenario -Goals of finance function – maximizing vs. satisfying; Profit vs. Wealth vs. Welfare; the Agency relationship and costs. ***Task:*** *write a report on functions of a Chief Finance Officer(CFO) of an MNC*		
II	**Financial Statement Analysis**	10
Introduction to Financial Statement - Analysis and interpretation of financial Statements-Horizontal Analysis, Vertical Analysis and trend analysis of company. ***Task: prepare a report on financial performance of an undertaking using moneycontrol.com***		
III	**Sources of Finance & Institutional Financing**	4+4=8
Part-A: Capital Structure-Debt-Equity-Estimation of capital requirements for Working Capital and Capital Budgeting-Cash Budget. ***Task: prepare quarterly assessment statement for a manufacturing unit on working capital***		
Part-B: Role of Institutions SFCs-NSIC-NBFCs-BFCs-SIDBI. ***Task:*** *prepare a list of various common functions of financing institutions in a matrix model*		
IV	**Import & Export Documentation**	10
Procedure for Imports and Exports, EXIM Policy, LOC, TRIPS & TRIMS, FEMA, ECGC and Customs Provisions. ***Task:*** *draft a document procedure for imports and exports with a list of document attachments*		
V	**Legal Aspects**	10
Introduction to Law of Contracts - Features of Negotiable Instruments Basics of Income Tax Act, GST Act - Company Administration – Features of Companies Act 2013. ***Task:*** *prepare a model MOA & AOA for a Public Limited Company*		
Textbooks		
1. M Pandey, Financial Management, 11 e/d, Vikas Publications , 2019.		
References		
1. Ravinder Kumar, Legal Aspects of Business, 4e,Cengage Learning, 2016. 2. International Business by Aswathappa, TMH.		

MINI PROJECT

Course	B.Tech.-VIII-Sem.	L	T	P	C
Course Code	22MBI85M	-	-	4	2

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1 to PSO2
CO1	apply domain knowledge to solve identified industrial problem	3
CO2	use industrial processes involved in end product/service	3
CO3	exhibit communication skills, professional ethics and social responsibility	3
CO4	manage and lead project in coordination with functional team-members	3
CO5	execute the project that meets industry requirements	3

Guidelines

S. No.	Title
1	Students should start the project under approved internal guide immediately after B.Tech. VII Semester End Examinations and complete before B.Tech. VIII Semester End Examinations in any reputed organization without effecting regular classwork.
2	The students have to obtain NOC from both HOD and internship organization and submit the same to the guide for commencement of project.
3	Upon commencement of work, the guide visits the Project organization periodically to monitor the performance of the student.
4	The students have to report the guide periodically on progress of work and seek advice.
5	On completion of project, the students should submit the project report to the guide along with Certificate of Completion.
6	The project work is evaluated before commencement of VIII-Semester End Examinations.
7	The student should give presentation before the Evaluation Committee for 10-15 minutes.
8	The Evaluation Committee awards the marks based on the student's performance.

Evaluation Procedure

External Committee Evaluation (SEE for 100 Marks)

S. No.	Item	Marks
1	Problem Justification/Observation	05
2	Content and Innovation	10
3	Use of Modern tools	15
4	Execution	15
5	Technical Presentation	30
6	Viva-Voce (Q & A)	10
7	Technical Report	15
Total		**100**