NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute)

Affiliated to

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY UTTAR PRADESH, LUCKNOW

Evaluation Scheme & Syllabus

For

Bachelor of Technology

Computer Science and Business System

Fourth Year

(Effective from the Session: 2024-25)

NOIDA INSTITUTE OF ENGG. & TECHNOLOGY, GREATER NOIDA, GAUTAM BUDDH NAGAR
(AN AUTONOMOUS INSTITUTE)

Bachelor of Technology
Computer Science and Business System
EVALUATION SCHEME
SEMESTER -VII

S. No.	Subject Codes	Subject Name	Type of Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
				L	T	P	CT	TA	TOTAL	PS	TE	PE		
	WEEKS COMPULSORY INDUCTION ROGRAM													
1	ACSBS0703	Usability Design of Software Applications	Mandatory	3	0	0	30	20	50		100		150	3
2	ACSBS0704	Services Science & Service Operational Management	Mandatory	3	0	0	30	20	50		100		150	3
3	ACSBS0701	Human Resource Management	Mandatory	2	0	0	30	20	50		50		100	2
4	ACSBS0702	IT Project Management	Mandatory	3	0	0	30	20	50		100		150	3
5		Departmental Elective-V	Departmental Elective	2	1	0	30	20	50		100		150	3
6		Departmental Elective-VI	Departmental Elective	2	1	0	30	20	50		100		150	3
7	ACSBS0753	Usability Design of Software Applications Lab	Mandatory	0	0	2				25		25	50	1
8	ACSBS0752	Services Science & Service Operational Management Lab	Mandatory	0	0	2				25		25	50	1
9	ACSBS0751	IT Project Management Lab	Mandatory	0	0	2				25		25	50	1
10	ACSBS0755	IT Workshop using MATLAB	Mandatory	0	0	4				25		25	50	2
11		Departmental Elective-V Lab	Departmental Elective	0	0	2				25		25	50	1
12		Departmental Elective-VI Lab	Departmental Elective	0	0	2				25		25	50	1
		*Massive Open Online Courses (For B.Tech. Hons. Degree)	*MOOCs											
		GRAND TOTAL											**1150**	**24**

Abbreviation Used:

L: Lecture, T: Tutorial, P: Practical, CT: Class Test, TA: Teacher Assessment, PS: Practical Sessional, TE: Theory End Semester Exam., PE: Practical End Semester Exam, CE: Core Elective,OE:Open Elective, DE: Departmental Elective, CA: Compulsory Audit, MOOCs: Massive Open Online Courses.

*** List of Recommended MOOCs (Massive Open Online Courses) for Final Year B. Tech Students (Semester-VII)**

S. No.	Subject Code	Course Name (Marketing)	University / Industry Partner Name	No of Hours	Credits
1.	AMC0278	Natural Language Processing using Python	Infosys Wingspan (Infosys Springboard)	15h 45m	1
2.	AMC0279	Spring Boot and Angular-React Stack -DevOps Tools and Capstone Project	Infosys Wingspan (Infosys Springboard)	107h 50m	4

PLEASE NOTE: -

- **Internship (3-4 weeks) shall be conducted during summer break after semester-VI and will be assessed during Semester-VII**

List of Departmental Electives (Theory)

Subject Codes	Subject Name	Type of Subject (Theory)	Branch	Semester
ACSBS0711	**Cognitive Science & Analytics**	**Departmental Elective-V**	**CSBS**	**7**
ACSBS0712	**Introduction to IoT**	**Departmental Elective-V**	**CSBS**	**7**
ACSBS0713	**Cryptology**	**Departmental Elective-V**	**CSBS**	**7**
ACSBS0714	**Quantum Computation & Quantum Information**	**Departmental Elective-VI**	**CSBS**	**7**
ACSBS0715	**Advanced Social, Text and Media Analytics**	**Departmental Elective-VI**	**CSBS**	**7**
ACSBS0716	**Mobile Computing**	**Departmental Elective-VI**	**CSBS**	**7**

List of Departmental Electives (Practical)

Subject Codes	Subject Name	Type of Subject (Practical)	Branch	Semester
ACSBS0711P	Cognitive Science & Analytics Lab	Departmental Elective-V	CSBS	7
ACSBS0712P	Introduction to IoT Lab	Departmental Elective-V	CSBS	7
ACSBS0713P	Cryptology Lab	Departmental Elective-V	CSBS	7
ACSBS0714P	Quantum Computation & Quantum Information Lab	Departmental Elective-VI	CSBS	7
ACSBS0715P	Advanced Social, Text and Media Analytics Lab	Departmental Elective-VI	CSBS	7
ACSBS0716P	Mobile Computing Lab	Departmental Elective-VI	CSBS	7

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SEMESTER - VIII

S. No.	Subject Codes	Subject Name	Type of Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
				L	T	P	CT	TA	TOTAL	PS	TE	PE		
1	ACBS0859	Project Evaluation	Mandatory	0	0	14					200	300	500	7
		*Massive Open Online Courses (For B.Tech. Hons. Degree)	*MOOCs											
		TOTAL											**500**	**7**

*** List of Recommended MOOCs (Massive Open Online Courses) for Final Year B. Tech Students (Semester-VIII)**

S. No.	Subject Code	Course Name	University/Industry Partner Name	No. of Hours	Credit
1	AMC0253	Artificial Intelligence	Infosys Wingspan (Infosys Springboard)	69h 39m	4
2	AMC0226	Oracle E-Business Suite Functional Foundation	Infosys Wingspan (Infosys Springboard)	22h	1.5
3	AMC0267	Internet of Things 201	Infosys Wingspan (Infosys Springboard)	15h 59m	1

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AICTE Guidelines in Model Curriculum:

A student will be eligible to get Under Graduate degree with Honours only, if he/she completes the additional MOOCs courses such as Coursera certifications, or any other online courses recommended by the Institute (Equivalent to 20 credits). During Complete B.Tech. Program Guidelines for credit calculations are as follows.

1. For 6 to 12 Hours =0.5 Credit
2. For 13 to18 =1 Credit
3. For 19 to 24 =1.5 Credit
4. For 25 to 30 =2 Credit
5. For 31 to 35 =2.5 Credit
6. For 36 to 41 =3 Credit
7. For 42 to 47 =3.5 Credit
8. For 48 and above =4 Credit

For registration to MOOCs Courses, the students shall follow Coursera registration details as per the assigned login and password by the Institute these courses may be cleared during the B. Tech degree program (as per the list provided). After successful completion of these MOOCs courses, the students shall provide their successful completion status/certificates to the Controller of Examination (COE) of the Institute through their coordinators/Mentors only.
The students shall be awarded Honours Degree as per following criterion.

i. If he / she secures 7.50 as above CGPA.
ii. Passed each subject of that degree program in the single attempt without any grace.
iii. Successful completion of MOOCs based 20 credits.

B. TECH FOURTH YEAR

Course Code	ACSBS0703	L T P	Credits
Course Title	**Usability Design of Software Applications**	3 0 0	3

Course objective: - After completion of this course, students will learn innovative techniques and creative thinking skills, acquaint themselves with the special challenges of starting new ventures and use IPR as an effective tool to protect their innovations and intangible assets from exploitation.

Pre-requisites: Basic knowledge of Software Design.

Course Contents / Syllabus

UNIT-I	INTRODUCTION TO USER-CENTRED DESIGN	8 HOURS

Introduction: Aspects of User-Centered Design Product Appreciation Assignment – Evaluating the product from user-centered design aspects such as functionality, ease of use, ergonomics, and aesthetics. Heuristic Evaluation: 10 Heuristic Principles, Examples, Heuristic Evaluation: Group Assignment initiation (Website and App), Evaluation for key tasks of the app or website for heuristic principles, severity, and recommendations.

UNIT-II	LOCATION AND HANDOFF MANAGEMENT	8 HOURS

Group Project identification such as a website or mobile app to redesign, Redesign project follows design lifecycle steps: Discover, Define, Design, Implement (Design Prototype), Usability Testing.

UNIT-III	UX RESEARCH	8 HOURS

Understanding users, their goals, the context of use, and the environment of use.

Research Techniques: Contextual Enquiry, User Interviews, Competitive Analysis for UX, Scenarios, and Persona Technique

UNIT-IV	PRESENTATION OF PERSONAS FOR THE GROUP PROJECT	8 HOURS

Design Thinking Technique, Discovery, and brainstorming, Concept development, Task flow detailing of the project

UNIT-V	PROTOTYPING TECHNIQUES	8 HOURS

Paper, Electronic, Prototyping Tools, Project Prototyping Iteration 1, Project Prototyping Iteration 2, Review and feedback, Final presentation.

Course outcome: After completion of this course students will be able to

CO 1	Explain the students to the fundamentals of User-Centered Design and Heuristics Techniques.	K2
CO 2	Understand and familiarize them to the facets of User Experience (UX) Design activities	K2
CO 3	Explore and Learn about the UX Research environment concepts.	K2
CO 4	Apply various activities in the design and development lifecycle	K3
CO 5	Analyze the various Prototype techniques.	K4

Textbooks:

1. Interaction Design: Beyond Human-Computer Interaction, 4th Edition, Jenny Preece, Helen Sharp and Yvonne Rogers.

2. Understanding Design Thinking, Lean, and Agile - Jonny Schneider	
Reference Books:	
1. About Face, 4th Edition, Alan Cooper and Robert Reimann	
2. Observing the User Experience, Second Edition: A Practitioner's Guide to User Research. Elizabeth Goodman, Mike Kuniavsky, Andrea Moed	
NPTEL/ Youtube/ Faculty Video Link:	
Unit 1	https://www.youtube.com/watch?v=Y_-HgmvF9Zc https://www.youtube.com/watch?v=MiSS_aEEf8w
Unit 2	https://www.youtube.com/watch?v=F3ZvWQMyj4I
Unit 3	https://www.youtube.com/watch?v=onWJQY5oFhs
Unit 4	https://www.youtube.com/watch?v=ecu8kreTwYM
Unit 5	https://www.youtube.com/watch?v=7ImSbCj8bRI https://www.youtube.com/watch?v=yKFaHFwTg00

B. TECH. FOURTH YEAR			
Course Code	**ACSBS0704**	**L T P**	**Credit**
Course Title	**Services Science & Service Operational Management**	**3 0 0**	**3**

Course Objective: This introductory course on service science and service operational management will familiarize the students with the basic concepts, roles, functional areas, and activities of operations management.

Prerequisites: Students must have a basic understanding of services.

Course Contents / Syllabus

UNIT-I	NATURE OF SERVICES	6 HOURS

Introduction: Introduction to course, Introduction to service operations, Role of service in economy and society, Introduction to the Indian service sector.

Nature of Services and Service Encounters: Differences between services and operations, Service package, characteristics, various frameworks to design service operation system, Kind of service encounter, importance of encounters.

Service-Dominant Logic: From Goods-Dominant logic to Service-Dominant logic, Value Co-creation.

UNIT-II	SERVICE DESIGN	6 HOURS

Service Strategy and Competitiveness: Development of Strategic Service Vision (SSV), Data Envelopment Analysis.

New Service Development: NSD cycle, Service Blueprinting, Elements of service delivery system.

Service Design: Customer Journey and Service Design, Design Thinking methods to aid Service Design.

Locating facilities and designing their layout: models of facility locations (Huff's retail model), Role of service-scape in layout design.

Service Quality: SERVQUAL, Walk through Audit, Dimensions of Service quality & other quality tools.

UNIT-III	SERVICE INNOVATION	6 HOURS

Service Guarantee & Service Recovery: How to provide Service guarantee? How to recover from Service failure?

Service Innovation: Services Productivity, Need for Services Innovation.

UNIT-IV	SERVICE CAPACITY PLANNING	6 HOURS

Forecasting Demand for Services: A review of different types of forecasting methods for demand forecasting.

Managing Capacity and Demand: Strategies for matching capacity and demand, Psychology of waiting, Application of various tools used in managing waiting line in services.

Managing Facilitating Goods: Review of inventory models, Role of inventory in services.

Managing service supply relationship: Understanding the supply chain/hub of service, Strategies for managing suppliers of service.

UNIT-V	**VEHICLE ROUTING PROBLEM**	**6 HOURS**

Vehicle Routing Problem: Managing after sales service, understanding services that involve transportation of people and vehicle, Techniques for optimizing vehicle routes.

Course outcome: At the end of course, the student will be able

CO 1	Develop in-depth knowledge about the service operations.	K6
CO 2	Develop service design for providing quality services.	K6
CO 3	Understanding the need and importance of service innovation.	K2
CO 4	Applying forecasting techniques to estimate the demand of services.	K3
CO 5	Understand the dimensions of Strategic HRM.	K2

Textbooks:

1. Wilson, A., Zeithaml, V. A., Bitner, M. J., & Gremler, D. D. (2012). *Services marketing: Integrating customer focus across the firm*. McGraw Hill.
2. Lovelock, C. (2011). *Services Marketing, 7/e*. Pearson Education India

Reference Books:

1. Reason, Ben, and Lovlie, Lavrans, (2016) Service Design for Business: A Practical Guide to Optimizing the Customer Experience, Pan Macmillan India,
2. Chesbrough, H. (2010). Open services innovation: Rethinking your business to grow and compete in a new era. John Wiley & Sons.

B. TECH. FOURTH-YEAR			
Course Code	**ACSBS0701**	**L T P**	**Credit**
Course Title	**Human Resource Management**	**2 0 0**	**2**

Course Objective:
This introductory course on Human Resource Management will familiarize the students with the basic concepts, roles, functional areas, and activities of HR and help students understand the organization's employees, their interest, motivation, and satisfaction, and their belief in fair treatment- all of which impact the firm's current performance and sustainability in the long run.

Prerequisites: Students must have a basic understanding of human resource management.

Course Contents / Syllabus

UNIT-I	**HUMAN RESOURCE MANAGEMENT**	**6 HOURS**

Human Resource Management: Concept and Challenges, HR Philosophy, Policies, Procedures and Practices.

UNIT-II	**HUMAN RESOURCE SYSTEM DESIGN**	**6 HOURS**

Human Resource System Design: HR Profession, and HR Department, Line Management Responsibility in HRM, Measuring HR, Human resources accounting and audit; Human resource information system.

UNIT-III	**FUNCTIONAL AREAS OF HRM**	**6 HOURS**

Functional Areas of HRM: Recruitment and staffing, benefits, compensation, employee relations, HR compliance, organizational design, training and development, human resource information systems (H.R.I.S.) and payroll.

UNIT-IV	**HUMAN RESOURCE PLANNING**	**6 HOURS**

Human Resource Planning: Demand Forecasting, Action Plans– Retention, Training, Redeployment & Staffing, Succession Planning

UNIT-V	**STRATEGIC MANAGEMENT OF HUMAN RESOURCES**	**6 HOURS**

Strategic Management of Human Resources: SHRM, the relationship between HR strategy and overall corporate strategy, HR as a Factor of Competitive Advantage, Managing Diversity in the Workplace. Human Resource Management in Service Sector, Flexible Working Practices

Course outcome: At the end of the course, the student will be able

CO 1	Develop in-depth knowledge about human resource management.	K6
CO 2	Apply the strategies on HR to gain a competitive advantage over its competitors.	K3
CO 3	Understand the various effective sources and techniques for recruitment and selection of employees.	K2
CO 4	Analyze and forecast the need for Human Resource Planning	K4
CO 5	Understand the dimensions of Strategic HRM.	K2

Textbooks

1. Gary Dessler& Biju Varkkey, Human Resource Management, Pearson
2. Edwin B. Flippo, Personnel Management, Tata McGraw Hill

Reference Books

1. V.S.P. Rao, Human Resource Management, Excel
2. RS Dwivedi, HRD in Indian Companies, Mc Millan
3. C.B. Memoria, Personnel Management, Himalaya

B. TECH FOURTH YEAR			
Course Code	**ACSBS0702**	**L T P**	**Credits**
Course Title	**IT Project Management**	**3 0 0**	**3**

Course objective: - After completion of this course, students will learn the techniques to effectively plan, manage, execute, and control projects within time and cost targets with a focus on Information Technology and Service Sector. Students will also learn agile project management techniques such as Scrum and DevOps.

Pre-requisites: Familiarity with software development methodologies such as Agile, Waterfall, or Scrum.

Course Contents / Syllabus

UNIT-I	**Project Overview, Feasibility Studies and Project Scheduling**	**8 HOURS**

Identification, Market and Demand Analysis, Project Cost Estimate, Financial Appraisal. Project Scheduling, Introduction to PERT and CPM, Critical Path Calculation, Precedence Relationship, Difference between PERT and CPM, Float Calculation and its importance, Cost reduction by Crashing of activity.

UNIT-II	**Cost Control and Scheduling**	**8 HOURS**

Cost Control (PERT/Cost), Resource Scheduling & Resource Leveling

UNIT-III	**Project Management Features and Agile Project Management**	**8 HOURS**

Project Management Features: Risk Analysis, Project Control, Project Audit and Project Termination.

Agile Project Management: Introduction, Agile Principles, Agile methodologies, Relationship between Agile Scrum, Lean, DevOps and IT Service Management (ITIL).

UNIT-IV	**Scrum**	**8 HOURS**

Various terminologies used in Scrum (Sprint, product backlog, sprint backlog, sprint review, retro perspective), various roles (Roles in Scrum), Best practices of Scrum.

UNIT-V	**DevOps and Other Agile Methodologies**	**8 HOURS**

Overview and its Components, Containerization Using Docker, Managing Source Code and Automating Builds, Automated Testing and Test Driven Development, Continuous Integration, Configuration Management, Continuous Deployment, Automated Monitoring. Introduction to XP, FDD, DSDM, Crystal.

Course outcome: After completion of this course students will be able to

CO 1	Understand the importance of project planning and Scheduling. Understand Feasibility in the context of Project Scheduling.	K2
CO 2	Familiarize them to the of Cost and Resource Scheduling. Understand the importance of Cost Controlling	K2
CO 3	Learn the concept of Project Management Features and get Familiar with Agile Project Management Methodology and Techniques.	K2
CO 4	Acquire the ability to engage in Scrum Technology constructively	K3
CO 5	Recall basic principles and concepts of DevOps and other Agile Methodologies	K1

Textbooks:	
1. Mike Cohn, Succeeding with Agile: Software Development Using Scrum	
2. Notes to be distributed by the course instructor on various topics	
Reference Books:	
2. Roman Pichler, Agile Product Management with Scrum	
3. Ken Schwaber, Agile Project Management with Scrum (Microsoft Professional)	
NPTEL/ Youtube/ Faculty Video Link:	
Unit 1	https://youtu.be/SUABxNDtbNQ https://youtu.be/c3KmE1WUTDg
Unit 2	https://youtu.be/Um-YZ2lsqcc
Unit 3	https://youtu.be/r5ZrPeQW8HQ https://youtu.be/wmJfx7zAfQI
Unit 4	https://youtu.be/n6q62DsxYXQ
Unit 5	https://youtu.be/Me3ea4nUt0U

B. TECH. FOURTH YEAR			
Course Code	**ACSBS0753**	**L T P**	**Credit**
Course Title	**Usability Design of Software Applications Lab**	**0 0 2**	**1**

List of Experiments:

Sr. No.	Name of Experiment	CO
1	Identifying interface connectivity and establishing interface connectivity between two different program modules. Creation of Basic Website.	CO1
2	Understand front-end and back-end interfacing and implementation of both interfacing.	CO1
3	Identifying interaction design and functional layout. Practical implementation of interaction design and functional layout. (Website/App)	CO1
4	Identify and analyze "what is navigation design" and implement of navigation design. (Website)	CO2
5	Create a working UI/UX prototype using prototyping tools	CO1
6	Study and analysis of sharing and exporting the UI/UX design.	CO3
7	Study about custom control and operational control their working and tools used.	CO1
8	Study the implementation of an information search module using UI/UX.	CO3
9	Study and analysis of navigation design and its implementation.	CO2
10	Creating Social media advertisements using online tools and applications	CO2

Lab Course Outcome: At the end of the semester, students will be able to:

CO 1	Understand interface design and basic UI/UX design.	K2
CO 2	Understand the navigation and development tools	K2
CO 3	Implement modules on UI/UX design	K3

B. TECH. FOURTH-YEAR			
Course Code	**ACSBS0752**	**L T P**	**Credit**
Course Title	**Services Science & Service Operational Management Lab**	**0 0 2**	**1**

List of Experiments:

Sr. No.	Name of Experiment	CO
1.	Write a program to simulate a customer service encounter. The program should consider various factors like customer behavior, service provider efficiency, and service quality. Analyze the results to identify areas for improvement.	CO1
2	Develop a program that helps design a service process for a specific scenario (e.g., restaurant, hospital, or transportation service). Implement the program to optimize the service process, considering customer needs and operational efficiency.	CO2
3	Create a program to conduct a SERVQUAL assessment for a service organization. The program should gather customer feedback on service dimensions and calculate the service quality gaps. Interpret the results and suggest improvements.	CO2
4	Design a program that presents different service failure scenarios. Implement a service recovery mechanism within the program and evaluate its effectiveness in restoring customer satisfaction.	CO3
5	Write a program to model service capacity planning for a specific service industry (e.g., a call center or a hotel). Use optimization algorithms to find the optimal number of resources needed to meet service demand while minimizing costs.	CO4
6	Develop a program that addresses the Vehicle Routing Problem (VRP) for a fleet of vehicles. Implement optimization algorithms (e.g., genetic algorithms or ant colony optimization) to find the most efficient routes for delivery or service operations.	CO5

Lab Course Outcome: After completion of this course students will be able to

CO 1	Design strategies for better service encounter	K6
CO 2	Understand the designing process of services	K2
CO 3	Design appropriate strategies for service recovery.	K6
CO 4	Execute service capacity planning process in an organization.	K6

B. TECH. FOURTH YEAR			
Course Code	**ACSBS0751**	**L T P**	**Credit**
Course Title	**IT Project Management Lab**	**0 0 2**	**1**

List of Experiments:

Sr. No.	Name of Experiment	CO
1	Write a program to estimate the project cost based on market and demand analysis.	CO1
2	Write a program to implement PERT and CPM techniques to calculate critical path and float time.	CO1
3	Write a program to implement cost reduction techniques by crashing activities.	CO1
4	Write a program to implement resource scheduling and resource leveling.	CO1
5	Write a program to implement PERT/Cost for cost control.	CO1
6	Write a program to categorize data and use it as an interdisciplinary framework for learning.	CO2
7	Write a program to analyze the Risk Analysis, Project Control, Project Audit and Project Termination of your project.	CO2
8	Study of various Devops Tools.	CO2
9	Write a program to implement various roles in scrum.	CO2
10	Write a program to implement sprint, product backlog, sprint backlog, sprint review, and retro perspective in scrum.	CO2
11	Write a program to implement containerization using Docker.	CO3
12	Write a program to manage source code and automate builds.	CO3
13	Write a program to implement automated testing and test-driven development.	CO3
14	Write a program to implement continuous integration and configuration management.	CO3
15	Write a program to implement continuous deployment and automated monitoring.	CO3

Lab Course Outcome: At the end of the semester, students will be able to:

CO 1	Analyze project requirements and apply critical thinking and problem-solving skills using feasibility studies and project management tools such as PERT and CPM.	K4
CO 2	Apply agile project management methodologies such as Scrum, utilizing higher-order thinking skills such as evaluation and creation, to improve project efficiency and manage project risks.	K3
CO 3	Demonstrate effective communication and teamwork skills to collaborate with project stakeholders and ensure project success, utilizing lower-order thinking skills such as comprehension and application.	K6

B. TECH. FOURTH YEAR			
Course Code	**ACSBS0755**	**L T P**	**Credit**
Course Title	**IT Workshop using MATLAB**	**0 0 4**	**2**

List of Experiments:

Sr. No.	Name of Experiment	CO
1	Introduction to MATLAB tool.	CO1
2	Practice of simple commands like creating variables, overwriting variable, error messages, making corrections etc.	CO1
3	Write a program for basic matrix operations, array, and basic mathematical functions.	CO1
4	Write a program for solving linear equation.	CO2
5	Write a program for basic graphic applications.	CO2
6	Write a program for generating and plotting of signals.	CO2
7	Write a program for basic looping.	CO2
8	Write a program for basic branching.	CO2
9	Write a program for user-defined functions.	CO3
10	Write a program for image importing, reading, displaying, extracting attributes etc.	CO3
11	Implementation and practice of important functions for image processing.	CO3
12	Implement and analyze different types of image filters, Image Compression etc. using image processing tool.	CO3

Lab Course Outcome: At the end of the semester, students will be able to:

CO 1	Understand and navigate the MATLAB environment, including its basic commands and operations.	K2
CO 2	Apply MATLAB functions and commands to implement equations, plots, loops, and branching for data analysis and visualization.	K3
CO 3	Analyzed and apply the user-defined functions and image processing techniques using MATLAB tools.	K4

B. TECH FOURTH YEAR

Course Code	ACSBS0711	L T P	Credits
Course Title	**Cognitive Science & Analytics**	2 1 0	3

Course objective: To develop algorithms that use AI and machine learning along with human interaction and feedback to help humans make choices/decisions and to understand how Cognitive computing supports human reasoning by evaluating data in context and presenting relevant findings along with the evidence that justifies the answers.

Pre-requisites: Basic knowledge of programming languages like Python/R, Engineering Statistics, and basic Artificial Intelligence techniques.

Course Contents / Syllabus

UNIT-I	FOUNDATIONAL AREAS OF ANALYTICS	8 HOURS

Introduction to Analytics: Definition, Description & Evolution of Analytics, History of Analytics, and Applicability of Analytics with development of Technology and Computer, How Analytics entered mainstream.
Concepts of Analytics: Various overlapping concepts and fields of Analytics such as Data Mining, Machine Learning, Artificial Intelligence and Simulation.

Emerging Areas in Analytics: Understanding of emerging research areas of Analytics: Mathematical programming, Evolutionary computation, Simulation, Machine learning/data mining, Logic-based models and, Combinations of categories.

Value Chain of Analytics: Descriptive Analytics Covering Exploratory Data Analysis & Basic of Statistics, Diagnostics Analytics: BI/Analysis, Trend, Pattern, Simultaneous Relationship, Predictive Analytics: Cause-Effect Relationship and Futuristic prediction in terms of probabilities, Continuous & Categorical Predictions, Simulation, Optimization, Multi-faceted Intelligent Technology driven Analytics combining Machine Intelligence with Human Brain Processing Abilities.

UNIT-II	FOUNDATIONAL AREAS OF COGNITIVE SCIENCE	8 HOURS

Introduction & Evolution of Cognitive Science: Introduction to the study of cognitive sciences, Brief history of cognitive science development and Methodological concerns in philosophy.

Understand Brain and Sensory Motor Information: Fundamentals of Neuro Science, Processing of sensory information in the brain, and Brain Imaging Elements.

Language & Linguistic Knowledge: Background and details of Syntax & Semantics, Understanding of Generative Linguistic.

Memory & Processing: Theory of Information Processing, Fundamentals of Short term Memory

UNIT-III	MULTIVARIATE DATA ANALYTICS & COGNITIVE ANALYTICS	8 HOURS

Data as a whole: Categorization of Data, Understanding Data as an interdisciplinary framework for learning methodologies: covering statistics, neural networks, and fuzzy logic, Various types of Scales: Nominal, Ordinal, Interval & Ratio Scales.

Overview: High level overview of Categorization of Techniques: Inter-dependence Relationship Techniques and Dependence Relationship Techniques.

Overview of Commonly Used Inter-Dependence Techniques: Factor Analysis, Principal Component Analysis (PCA), Cluster Analysis.

Overview of Commonly Used Dependence Techniques: Regression, Logistic Regression.

Analytics Value Chain & Application of Analytics across Value Chain: Basic statistical, Predictive analytics technique ,Prescriptive analytics Concepts, Cognitive analytics Concepts.

UNIT-IV	ARTIFICIAL INTELLIGENCE & MACHINE LEARNING	8 HOURS

Fundamentals of Artificial Intelligence: Various areas of AI:

a. Knowledge: Text Analytics, Topic Modelling, Natural Language Processing (NLP), Natural Language Generation (NLG), Natural Language Understanding (NLU), Named-entity recognition (NER)
b. Perception: Image Analytics, Video Analytics & Audio Analytics
c. Memory: Cognitive Engagement: BOTs, Virtual & Digital Assistants, Augmented Reality, Virtual Reality, Mixed Reality
d. Learning: Intelligent Automation

Spectrum of AI

a. Reactive Machine: Low memory, works on Known rules, such as Object Detection/Games/Recommendations specific to known Rules
b. Limited Memory: Memory used to learn and improve continuously such as Most ML Models, Automated Vehicles
c. Theory of Mind: Machine Understands and responds such as BoTs/Virtual/Digital Assistants
d. Self-Aware: Human like intelligence such as Super Robots in Space etc.

UNIT-V	APPROACH & METHODOLOGY	8 HOURS

World Standard Methodology: CRISP-DM Methodology, SEMMA Methodology.

Real Life Work around Multi-Variate Analytics: A few Selected Commonly used Techniques: Predictive & Classification Models, Regression, Clustering.

Real Life Work around Artificial Intelligence, Machine Learning and Deep Learning: A few Selected Commonly used Techniques & Algorithms: ANN (Artificial Neural Network), CNN (Convolutional Neural Network), RNN (Recurrent Neural Network).

RN Architecture: LSTM, Bidirectional LSTM, Gated Recurrent Unit (GRU), CTRNN (Continuous Time RNN) CNN Architectures: VGG16, Alexnet, InceptionNet, RestNet, Googlenet.

Object Detection models: R-CNN, Fast R-CNN, Faster R-CNN, cascade R-CNN. Mask RCNN, Single Shot MultiBox Detector (SSD), You Only Look Once (YOLO), Single-Shot Refinement Neural Network for Object Detection (RefineDet), Retina-Net.

Autoencoders: Denoising Autoencoder, GAN

Transformers: Attention based Encoder and Decoder: Eg- BERT(Bidirectional Encoder Representations from Transformers), Generative Pretrained Transformers GPT-3, GPT-2, BERT, XLNet, and RoBERTa

Course outcome: After completion of this course students will be able to

CO 1	Understand the basic analytic trend induced with Cognitive Computing.	K2
CO 2	Understand basics of Cognitive Computing and its differences from traditional	
CO 3	approaches of Computing.	K2

CO 4	Apply different machine learning techniques and plan the use of the primary tools associated with cognitive computing.	K3
CO 5	Apply and analyze the programming skill useful for developing AI based applications.	K4

Text books:

1. Hall, P., Phan, W., & Whitson, K. (2016). Evolution of Analytics. O'Reilly Media Incorporated.
2. Cognitive Science: An Introduction to the Science of the Mind by José Luis Bermúdez
3. Cognitive Computing and Big Data Analytics by Judith S. Hurwitz (Author), Marcia Kaufman (Author), Adrian Bowles (Author) .
4. Kumar, U. D. (2017). Business analytics: The science of data-driven decision making. Wiley.
5. Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). Multivariate data analysis. Englewood Cliff. New Jersey, USA, 5(3), 207-2019.
6. Kao, A., & Poteet, S. R. (Eds.). (2007). Natural language processing and text mining. Springer Science & Business Media.
7. Demystifying Artificial intelligence: Simplified AI and Machine Learning concepts for Everyone (English Edition) Paperback – Import, 5 January 2021by Prashant Kikani

Reference Books:

1. Seminal Paper: The evolution of analytics and implications for industry and academic programs MR Bowers, JD Camm, G Chakraborty - Interfaces, 2018 - pubsonline.informs.org.
2. Cognitive Analytics: Concepts, Methodologies, Tools, and Applications (4 Volumes) Information Resources Management Association (USA)A first course in Probability, S. M. Ross, Prentice Hall.
3. Seminal paper: Shneiderman, B. (2003). The eyes have it: A task by data type taxonomy for information visualizations. In The craft of information visualization (pp. 364-371). Morgan Kaufmann.C: The Complete Reference, (Fourth Edition), Herbert Schildt, McGraw Hill.
4. Practical Deep Learning for Cloud, Mobile, and Edge: Real-World AI & Computer-Vision Projects Using Python, Keras & TensorFlow 1st Edition,
5. Conversational Chatbots for Analytics Third Edition by Gerardus Blokdyk
6. BORNET, P. B. (2020). Intelligent automation: Welcome to the world of hyperautomation. World Scientific Publishing Company.

NPTEL/ Youtube/ Faculty Video Link:

Unit 1	https://www.youtube.com/watch?v=CaqJ65CIoMw
Unit 2	https://www.youtube.com/watch?v=SvBfAqk70LU
Unit 3	https://www.youtube.com/watch?v=Vs2bzT07GlM
Unit 4	https://www.youtube.com/watch?v=pKeVMlkFpRc&list=PLwdnzlV3ogoXaceHrrFVZCJKbm_laSHcH
Unit 5	https://www.youtube.com/watch?v=nTt_ajul8NY

B. TECH FOURTH YEAR			
Course Code	**ACSBS0712**	**L T P**	**Credits**
Course Title	**Introduction to IoT**	**2 1 0**	**3**

Course Objective: This course will help students understand basic principles and concepts of Internet-of-Things use cases, applications, architecture, and technologies. Students will get an overview of an end-to-end IoT system encompassing the edge, cloud, and application tiers.

Pre-requisites: History of Internet, Basics of programming.

Course Contents / Syllabus

UNIT-I	**INTRODUCTION TO IOT AND USE CASES**	**8 HOURS**

Understanding basic concepts of IoT, Consumer IoT vs Industrial Internet, Fundamental building blocks, Use Cases of IoT in various industry domains.

UNIT-II	**ARCHITECTURE**	**8 HOURS**

IoT reference architectures, Industrial Internet Reference Architecture, Edge Computing, IoT Gateways, Data Ingestion and Data Processing Pipelines, Data Stream Processing.

UNIT-III	**SENSORS AND INDUSTRIAL SYSTEMS**	**8 HOURS**

Introduction to sensors and transducers, integrating sensors to sensor processing boards, introduction to industrial data acquisition systems, industrial control systems and their functions

UNIT-IV	**NETWORKING AND COMMUNICATION FOR IOT**	**8 HOURS**

Recap of OSI 7-layer architecture and mapping to IoT architecture, Introduction to proximity networking technologies (ZigBee, Bluetooth, Serial Communication), Industrial network protocols (Modbus, CAN bus), Communicating with cloud applications (web services, REST, TCP/IP and UDP/IP sockets, MQTT, WebSocket, protocols. Message encoding (JSON, Protocol Buffers)

UNIT-V	**IOT DATA PROCESSING AND STORAGE**	**8 HOURS**

Time Series Data and their characteristics, time series databases, basic time series analytics, data summarization and sketching, dealing with noisy and missing data, anomaly and outlier detection,

Course outcome: After completion of this course students will be able to

CO 1	Understand basic principles and concepts of Internet-of-Things use cases and its application.	K2
CO 2	Recall basic principles and concepts of IOT reference architecture and technologies.	K1
CO 3	Describe Sensors, actuators and microcontrollers used in IoT implementation.	K2
CO 4	Analyze the hardware with network and basic knowledge about network protocols and data dissemination.	K4
CO 5	Apply visualisation techniques to show data generated from the IoT devices.	K3

Textbooks:

1. The Internet of Things, Samuel Greengard, MIT Press Essential Knowledge Series,

Reference Books:

1. Visualizing Data-Exploring and Explaining Data with the Processing Environment, By Ben Fry, Publisher: O'Reilly Media
2. Raspberry Pi Computer Architecture Essentials, by Andrew K Dennis
3. Getting Started with Arduino, M. Banzi, O Reilly Media

NPTEL/ YouTube/ Faculty Video Link:

1.	Industrial Internet Reference Architecture - http://www.iiconsortium.org/IIRA.htm
2.	World Economic Forum Report on Industrial Internet of Things - https://www.weforum.org/reports/industrial-internet-things
3.	50 Sensor Applications for a Smarter World - http://www.libelium.com/resources/top_50_iot_sensor_applications_ranking/
4.	GSMA IoT Security Guidelines & Assessment - https://www.gsma.com/iot/future-iot-networks/iot-security-guidelines/

B. TECH. FOURTH YEAR			
Course Code	**ACSBS0713**	**L T P**	**Credit**
Course Title	**Cryptology**	**2 1 0**	**3**

Course objective: Students will learn the concepts of cryptography, security, threats and vulnerabilities. Further the students will be taught to provide confidentiality to data by the use of Symmetric encryption techniques and Asymmetric encryption techniques. Data Integrity and authentication will be covered using MAC/HMAC and Digital signature algorithms. Finally, the course will cover the standard security protocols for user authentication, key management and network security.

Pre-requisites: Computer Networks

Course Contents / Syllabus

UNIT-I	INTRODUCTION TO CRYPTOGRAPHY, SECURITY SERVICES, THREATS AND VULNERABILITIES	8 HOURS

Introduction to Cryptography: Elementary number theory, Pseudo-random bit generation, Elementary cryptosystems.
Basic security services: Need of security, CIA Triad: Confidentiality, Integrity, Availability, Non-repudiation, Authentication, Privacy.
Overview of Security threats and Vulnerability: Types of attacks on Confidentiality, Integrity and Availability. Vulnerability and Threats, Malware: Virus, Worms, Trojan horse.
Security Counter Measures: Intrusion Detection and its categories, Antivirus Software.

UNIT-II	SYMMETRIC ENCRYPTION TECHNIQUES	8 HOURS

Symmetric Cryptography: Symmetric Cipher Model: Traditional Ciphers and Simple Modern Ciphers, Substitution ciphers and Transposition ciphers, Cryptanalysis, Steganography, Shannon's theory of confusion and diffusion, Fiestal structure.
Stream Cipher: Basic Ideas, Hardware and Software Implementations, Examples with some prominent ciphers: A5/1, Grain family, RC4, Salsa and ChaCha, HC128, SNOW family, ZUC;
Block Ciphers: Data encryption standard (DES), Strength of DES, Triple DES, AES, Hash Functions
Block Cipher Operations: Electronic Codebook Mode, Cipher Block Chaining Mode, Cipher Feedback Mode, Output Feedback Mode, Counter Mode.

UNIT-III	ASYMMETRIC ENCRYPTION TECHNIQUES	8 HOURS

Divisibility and the Division Algorithm, The Euclidean Algorithm, Modular Arithmetic, Prime Numbers, Fermat's and Euler's theorem, Testing for Primality, The Chinese Remainder Theorem, Discrete Logarithmic Problem, Trapdoor Function.
Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure.
Asymmetric Cryptography: Public and Private keys, Principles of Public Key Crypto Systems, RSA algorithm, Security of RSA, Elliptic Curve Cryptography, Digital Signatures.

UNIT-IV	DIGITAL INTEGRITY AND AUTHENTICATION	8 HOURS

Data Integrity and Authentication, Hash functions: Crypto Hash Functions, Crypto Hash Primitives, Birthday attack, Security of hash functions, Puzzle Friendly hash function, Message Digest, Secure hash algorithm (SHA), SHA-256, SHA-512.
Message Authentication Codes: Authentication functions, Message authentication code, HMAC.
User Authentication Mechanisms: Kerberos, Electronic mail security: pretty good privacy (PGP), S/MIME.

UNIT-V	WEB SECURITY AND APPLICATIONS	8 HOURS

Electronic commerce (anonymous cash, micro-payments), Zero-knowledge protocols, Cryptology in Contact Tracing Applications, Issues related to Quantum Cryptanalysis

Network Security: Security at IP layer, Transport layer Security (SSL/TLS), HTTPs and Hardware Security Module (HSM), Viruses, Worms, Firewalls, Firewall Characteristics, Types of Firewalls.

Course outcome: After completion of this course students will be able to

CO 1	Identify information security goals, vulnerabilities, threats, and attacks in the security environment.	K2
CO 2	Understand, compare, and apply different classical encryption and decryption techniques.	K3
CO 3	Elaborate the use of Asymmetric Encryption along with underlying mathematical concepts associated with modern cryptography.	K2
CO 4	Apply different hashing techniques to achieve data integrity and user authentication.	K3
CO 5	Describe the relation of Cryptography to Network Security and evaluate the performance of Security protocols.	K2

Textbooks:

1. William Stallings, "Cryptography and Network Security: Principles and Practice", Pearson Education.
2. Atul Kahate, "Cryptography and Network Security", Tata McGraw Hill
3. Behrouz A. Forouzan: Cryptography and Network Security, Tata McGraw Hill
4. Cryptography, Theory, and Practice. D. R. Stinson, CRC Press.
5. Handbook of Applied Cryptography. A. J. Menezes, P. C. van Oorschot, and S. A. Vanstone, CRC Press

Reference Books:

1. C K Shyamala, N Harini, Dr. T.R. Padmnabhan Cryptography and Security, Wiley.
2. Bruce Schiener, "Applied Cryptography". John Wiley & Sons.
3. Bernard Menezes," Network Security and Cryptography", Cengage Learning
4. A course in number theory and cryptography. N. Koblitz:, GTM, Springer.
5. Security Engineering, R. Anderson, Wiley
6. RC4 Stream Cipher and Its Variants. G. Paul and S. Maitra: CRC Press, Taylor & Francis Group, A Chapman & Hall Book, 2012
7. Design & Cryptanalysis of ZUC - A Stream Cipher in Mobile Telephony. C. S. Mukherjee, D. Roy, S. Maitra, Springer 2020
8. Contact Tracing in Post-Covid World - A Cryptologic Approach. P. Chakraborty, S. Maitra, M. Nandi, S. Talnikar, Springer 2020
9. Presskil Lecture notes: Available online: http://www.theory.caltech.edu/~preskill/ph229/

B. TECH FOURTH YEAR

Course Code	ACSBS0714	L T P	Credits
Course Title	Quantum Computation & Quantum Information	2 1 0	3

Course objective: To introduce the building blocks of Quantum computers and highlight the paradigm change between conventional computing and quantum computing by exploring Quantum state transformations and the algorithms entof angled quantum subsystems and properties of entangled states.

Pre-requisites: Algebra, Calculus, Probability theory and familiarity with programming and algorithms.

Course Contents / Syllabus

UNIT-I	INTRODUCTION TO QUANTUM INFORMATION	8 HOURS

States, Operators, Measurements, Quantum Entanglement: Quantum Teleportation, Super-dense coding, CHSH Game, Quantum gates and circuits

UNIT-II	QUANTUM ALGORITHMS	8 HOURS

Deutsch-Jozsa, Simon, Grover, Shor, Implication of Grover's and Simon's algorithms towards classical symmetric key cryptosystems, Implication of Shor's algorithm towards factorization and Discrete Logarithm based classical public key cryptosystems

UNIT-III	QUANTUM TRUE RANDOM NUMBER GENERATORS (QTRNG)	8 HOURS

Detailed design and issues of Quantumness, Commercial products and applications

UNIT-IV	QUANTUM KEY DISTRIBUTION (QKD)	8 HOURS

BB84, Ekert, Semi-Quantum QKD protocols and their variations, Issues of Device Independence, Commercial products

UNIT-V	INTRODUCTORY TOPICS IN POST-QUANTUM CRYPTOGRAPHY	8 HOURS

Introduction to Post-Quantum cryptography and its various cipher techniques or Types , Lattice-based cryptography, Code-based cryptography.

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

CO 1	Describe quantum systems using states, operators, and measurements, and understand the concept of quantum entanglement and its applications in quantum communication protocols such as quantum teleportation and superdense coding.	K2
CO 2	Analyze the quantum algorithms using tools such as quantum circuit design and quantum complexity theory.	K4
CO 3	Describe the concept of randomness and the different types of random number generators, and understand the limitations and its importance in cryptography.	K2
CO 4	Understand the concept of secure communication using QKD Protocols and its importance.	K2
CO 5	Understand the principles of cryptography and how quantum computing can impact its security	K2

Text books:

1. *Quantum Computation and Quantum Information.* M. A. Nielsen and I. L. Chuang, Cambridge University Press
2. Presskil Lecture notes: Available online: http://www.theory.caltech.edu/~preskill/ph229/

Reference Books:

1. *An Introduction to Quantum Computing.* P. Kaye, R. Laflamme, and M. Mosca, Oxford University Press, New York
2. *Quantum Computer Science.* N. David Mermin:, Cambridge University Press
3. *NIST Post Quantum Cryptography*, Available online: https://csrc.nist.gov/projects/post-quantum-cryptography/round-2-submissions
4. *Quantum Algorithms for Cryptographically Significant Boolean Functions - An IBMQ Experience*. SAPV Tharrmashastha, D. Bera, A. Maitra and S. Maitra, Springer 2020.
5. *Quantum Algorithm Zoo.* https://quantumalgorithmzoo.org/
6. *Handbook of Applied Cryptography.* A. J. Menezes, P. C. van Oorschot, and S. A. Vanstone. CRC Press

B.TECH. FOURTH YEAR			
Course code	**ACSBS0715**	**L T P**	**Credits**
Course title	**Advanced Social, Text and Media Analytics**	**2 1 0**	**3**

Course objective: To introduction to the fundamental concepts in social media analytics and web analytics Tools. To understand various social media Models.

Pre-requisites: Basic Knowledge of Machine learning.

Course Contents / Syllabus

UNIT-I	**TEXT MINING**	**8 HOURS**

Text Mining: Introduction, Core text mining operations, Preprocessing techniques, Categorization, Clustering, Information extraction, Probabilistic models for information extraction, Text mining applications

UNIT-II	**METHODS & APPROACHES**	**8 HOURS**

Methods & Approaches: Content Analysis; Natural Language Processing; Clustering & Topic Detection; Simple Predictive Modeling; Sentiment Analysis; Sentiment Prediction

UNIT-III	**WEB ANALYTICS**	**8 HOURS**

Web Analytics: Web analytics tools, Clickstream analysis, A/B testing, online surveys; Web search and retrieval, Search engine optimization, Web crawling and Indexing, Ranking algorithms, Web traffic models

UNIT-IV	**SOCIAL MEDIA ANALYTICS**	**8 HOURS**

Social Media Analytics: Social network and web data and methods. Graphs and Matrices. Basic measures for individuals and networks. Information visualization;

UNIT-V	**MAKING CONNECTIONS**	**8 HOURS**

Making connections: Link analysis. Random graphs and network evolution. Social contexts: Affiliation and identity; Social network analysis

Course outcome: After completion of this course students will be able to:

CO1	Define and describe Data Mining methods and Probabilistic models for information extraction	K2
CO2	Understand the use of social network analysis to understand the growing connectivity and complexity in the world around us on different scales – ranging from small groups to the World Wide Web.	K2
CO3	Analyse social network to identify important social actors, subgroups (i.e., clusters), and network properties in social media sites such as Twitter, Facebook, and YouTube .	K4
CO4	Interpret the terminologies, metaphors and perspectives of text summarization.	K2
CO5	Apply state of the art mining tools and libraries on realistic data sets as a basis for business decisions and applications.	K3

Text Books:

1. Ronen Feldman and James Sanger, “The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data”, Cambridge University Press, 2006.
2. Hansen, Derek, Ben Sheiderman, Marc Smith. 2011 Analyzing Social Media Networks with NodeXL: Insights from a Connected World, Morgan Kaufmann, 304
3. Avinash Kaushik. 2009. Web Analytics 2.0: The Art of Online Accountability.
4. Hanneman, Robert and Mark Riddle. 2005. Introduction to Social Network Method

Reference Books:

1. Wasserman, S. & Faust, K. (1994). Social network analysis: Methods and applications. New York: Cambridge University Press.
2. Monge, P. R. & Contractor, N. S. (2003). Theories of communication networks. New York: Oxford University Press. http://nosh.northwestern.edu/vita.html

Links:

Unit 1	https://www.youtube.com/watch?v=Uqs0GewlMkQ https://www.youtube.com/watch?v=tUNwSH7671Y&t=2s https://www.youtube.com/watch?v=zz1CFBS4NaY
Unit 2	https://slideplayer.com/slide/14222744/
Unit 3	https://www.youtube.com/watch?v=KjWu1-dZn00
Unit 4	https://www.youtube.com/watch?v=ntOaoW0T604
Unit 5	https://www.youtube.com/watch?v=otoXeVPhT7Q&list=PL34t5iLfZddt0tt5GdDy3ny6X5RQvwrp6&index=2

B. TECH FOURTH YEAR			
Course Code	**ACSBS0716**	**L T P**	**Credits**
Course Title	**Mobile Computing**	**3 0 0**	**3**

Course objective: - The objective of this course will be on creating a learning system through which students can enhance their knowledge of Communication systems, Data communications and networking, and wireless networks. To learn the basic concepts of the GSM, SMS, and GPRS Architecture. To have exposure to wireless protocols –Wireless LAN, Bluetooth, WAP. To Know the LEACH Protocol, Radio Network, and Introduction of 5G networks

Pre-requisites: Basic Knowledge of the concepts of Computer networking and Communication devices

Course Contents / Syllabus

UNIT-I	**INTRODUCTION AND OVERVIEW OF MOBILE COMPUTING ARCHITECTURE**	**8 HOURS**

Introduction: Overview of wireless and mobile infrastructure; Preliminary concepts on cellular architecture; Design objectives and performance issues; Radio resource management and interface; Propagation and path loss models; Channel interference and frequency reuse; Cell splitting; Channel assignment strategies; Overview of generations:- 1G to 5G.

UNIT-II	**LOCATION AND HANDOFF MANAGEMENT**	**8 HOURS**

Introduction to location management (HLR and VLR); Mobility models characterizing individual node movement (Random walk, Fluid flow, Markovian, Activity based); Mobility models characterizing the movement of groups of nodes (Reference point based group mobility model, Community-based group mobility model); Static (Always vs. Never update, Reporting Cells, Location Areas) and Dynamic location management schemes (Time, Movement, Distance, Profile Based); Terminal Paging (Simultaneous paging, Sequential paging).

Location management and Mobile IP; Overview of handoff process; Factors affecting handoffs and performance evaluation metrics; Handoff strategies; Different types of handoffs (soft, hard, horizontal, vertical).

UNIT-III	**WIRELESS TRANSMISSION FUNDAMENTALS**	**8 HOURS**

Introduction to narrow and wideband systems; Spread spectrum; Frequency hopping; Multiple access control (FDMA, TDMA, CDMA, SDMA); Wireless local area network; Wireless personal area network (Bluetooth and Zigbee).

Mobile Ad-hoc networks: Characteristics and applications; Coverage and connectivity problems; Routing in MANETs.

UNIT-IV	**WIRELESS SENSOR NETWORKS**	**8 HOURS**

Concepts, basic architecture, design objectives, and applications; Sensing and communication range; Coverage and connectivity; Sensor placement; Data relaying and aggregation; Energy consumption; Clustering of sensors; Energy efficient Routing (LEACH).

Cognitive radio networks: Fixed and dynamic spectrum access; Direct and indirect spectrum sensing; Spectrum sharing; Interoperability and co-existence issues; Applications of cognitive radio networks.

UNIT-V	**D2D COMMUNICATIONS IN 5G CELLULAR NETWORKS**	**8 HOURS**

Introduction to D2D communications; High-level requirements for 5G architecture; Introduction to the radio resource management, power control, and mode selection problems; Millimeter wave communication in 5G		
Course outcome: After completion of this course students will be able to		
CO 1	Explain and discuss issues in mobile computing and illustrate an overview of wireless telephony and channel allocation in cellular systems.	K4
CO 2	Understand the concept of Location handoff management.	K2
CO 3	Analyze and Understand the Wireless Networking and Wireless Ad-hoc Networks with routing in MANET's	K4
CO 4	Analyze the concept of Wireless sensor network and adaptive clustering for mobile wireless networks and Disconnected operations	K4
CO 5	Explore the D2D communications and 5G architecture devices.	K2
Text books:		
1. J. Schiller, ―Mobile Communications, 2nd edition, Pearson, 2011.		
2. Raj Kamal ―Mobile Computing Oxford Higher Education, Second Edition, 2012.		
Reference Books:		
1. Asoke K Talukder, Hasan Ahmed,Roopa R Yavagal ―Mobile Computing, Tata McGraw Hill Pub ,Aug – 2010		
2. M. V. D. Heijden, M. Taylor, Understanding WAP, Artech House.		
NPTEL/ Youtube/ Faculty Video Link:		
Unit 1	https://www.youtube.com/watch?v=GT-tYP8RGIs https://www.youtube.com/watch?v=zp3KtaICq2U	
Unit 2	https://www.youtube.com/watch?v=sXKSze4uCOg	
Unit 3	https://www.youtube.com/watch?v=onWJQY5oFhs	
Unit 4	https://www.youtube.com/watch?v=ecu8kreTwYM	
Unit 5	https://www.youtube.com/watch?v=7ImSbCj8bRI https://www.youtube.com/watch?v=yKFaHFwTg00	

B. TECH FOURTH YEAR			
Course Code	**ACSBS0711P**	**L T P**	**Credit**
Course Title	**Cognitive Science & Analytics Lab**	**0 0 2**	**1**

List of Experiments

Sr. No.	Name of Experiment	CO
1	Write a program in python to implement and show Segmentation & Clustering, Classification & Prediction, Forecasting Association Mining & Sequence Mining using sample data set.	CO1
2	Write a program in python to implement and show Forecasting Association Mining & Sequence Mining using sample data set.	CO1
3	Write a program in python to implement Natural Language Processing (NLP), Natural Language Generation (NLG), Natural Language Understanding (NLU) using sample data set.	CO1
4	Write a program in python to implement and show Named-entity recognition (NER) driven Analytics such as Key Word Extraction, Text Summarization, Insight Generation using sample data set.	CO1
5	Write a program in python to implement and show on sample dataset Malaria/Carcinoma/COVID detection and also Visual inspection for QA/QC.	CO2
6	Write a program in python to implement and show on sample dataset Motion based Behavior Recognition, Behavioral Observations, and Parkinson's Disease Prediction	CO2
7	Write a program in python to implement analytics on sample dataset to show Speech to Text, Text to Speech and Transcript Services	CO2
8	Write a program in python to implement and show Banking Process Automation using a sample dataset.	CO3
9	Write a program in python to implement Artificial Intelligence/ Machine Learning using various deep learning algorithms on a sample data set also record observations using a comparison chart.	CO3
10	Write a program to implement Chat-BOT/Program-BOT or Email-BOT.	CO3

Lab Course Outcome: After the completion of this course students will be able to:

CO 1	Apply basic and advanced analytics, including machine learning techniques, to understand and make observations for better predictions and forecasting..	K3
CO 2	Analyze the performance and semantics of cognitive learning and apply cognitive analytics to generate real-time models for improved predictions.	K4
CO 3	Apply artificial intelligence using diversified algorithms for cognitive learning, including basic use and understanding of AI for better forecasting and predictions.	K3

B. TECH. FOURTH-YEAR					
Course Code	**ACSBS0712P**	**L**	**T**	**P**	**Credit**
Course Title	**Introduction to IoT Lab**	**0**	**0**	**2**	**1**

List of Experiments

Sr. No.	Name of Experiment	CO
1.	Setting up the Arduino Development Environment, connecting analog sensors to an Arduino Boarding and reading analog sensor data.	CO1
2.	Digital Input and Output reading using and Arduino board and Arduino Development Environment.	CO1
3.	Integrate an Arduino Board to a Raspberry Pi computer and send sensor data from Arduino to the R Pi.	CO2
4.	Setup Python on the R Pi and run sample R Pi programs on the R Pi. Read the data from Arduino using Python language.	CO2
5.	Connect a R Pi Camera module to the Raspberry Pi and using Python programming capture still images and video.	CO2
6.	Set up TCP/IP socket server on a PC. Send a message from the R Pi to the PC using socket communication.	CO3
7.	Set up a MQTT broker on the PC. Send data from R Pi to PC using MQTT protocol. Receive data from PC to R Pi using MQTT protocol.	CO3
8.	Connect LED lights to an Arduino. Connect the Arduino to the R Pi. Send Message from PC to R Pi via MQTT protocol. On receipt of the message, toggle the LED lights on the Arduino.	CO2
9.	Set up an account in a cloud service (such as Google / AWS or Azure). Set up a simple Http server using a language of your choice. Push the image captured from the R Pi camera to this web service. On receiving the image, store the image in a database or file.	CO1
10.	Develop a mobile application to view the images captured by the R Pi camera	CO1

Lab Course Outcome: Upon the completion of the course, the student will be able to

CO1	Describe hardware components including Arduino, Raspberry Pi and sensors.	K2
CO2	Implement programs in Arduino IDE using python programming for IO operations.	K3
CO 3	Develop real time mini projects using R Pi along with sensors and actuators.	K6

B. TECH. FOURTH YEAR			
Course Code	**ACSBS0713P**	**L T P**	**Credit**
Course Title	**Cryptology Lab**	**0 0 2**	**1**

List of Experiments

Sr. No.	Name of Experiment	CO
1.	Implementing Shift Cipher	CO1
2.	Implementing Mono-alphabetic Substitution Cipher	CO1
3.	Implementing One-Time Pad and Perfect Secrecy	CO2
4.	Implementing Message Authentication Codes	CO2
5.	Implementing Cryptographic Hash Functions and Applications	CO2
6.	Implementing Symmetric Key Encryption Standards (DES)	CO3
7.	Implementing Symmetric Key Encryption Standards (AES)	CO3
8.	Implementing Diffie-Hellman Key Establishment	CO2
9.	Implementing Public-Key Cryptosystems (PKCSv1.5)	CO1
10.	Implementing Digital Signatures	CO1

Lab Course Outcome: Upon the completion of the course, the student will be able to

CO1	Apply various Cryptographic Techniques	K3
CO2	Analyze the vulnerabilities in any computing system and hence be able to design a security solution.	K4
CO 3	Evaluate security mechanisms using rigorous approaches by key ciphers and Hash functions.	K5

B. TECH. FOURTH-YEAR					
Course Code	**ACSBS0714P**	**L**	**T**	**P**	**Credit**
Course Title	**Quantum Computation & Quantum Information Lab**	**0**	**0**	**2**	**1**

List of Experiments:

Sr. No.	Name of Experiment	CO
1	Introduction to various Quantum computing frameworks/ Tools/Simulators	CO1
2	Program for Quantum teleportation using Qiskit, for quantum computing framework.	CO1
3	Implementation of Various Quantum Gates	CO1
4	Program to implement CSHS game in quantum computing	CO1
5	Program for implementing Grover's search algorithm	CO2
6	Program to implement Shor’s algorithm using	CO2
7	Program for random number generation in quantum computing	CO3
8	Program that demonstrates the BB84 protocol for QKD	CO3

Lab Course Outcome: After completion of this course students will be able to

CO 1	Implement Quantum teleportation, Gates and CSHS game using quantum states, operators, and measurements.	K3
CO 2	Apply quantum algorithms and analyze them using tools like quantum circuit design and complexity theory.	K3
CO 3	Implement random number generators and understand their limitations and importance in cryptography, as well as implement quantum key distribution for secure communication.	K3

B. TECH. FOURTH YEAR					
Course Code	**ACSBS0715P**	**L**	**T**	**P**	**Credit**
Course Title	**Advanced Social, Text and Media Analytics Lab**	**0**	**0**	**2**	**1**

List of Experiments:

Sr. No.	Name of Experiment	CO
1.	Write a program to implement social media listening and monitoring.	CO1
2	Write a program to implement social implement media sentiment analysis	CO1
3	Write a program to implement social media trend analysis	CO1
4	Write a program to implement Influencer identification and tracking	CO1
5	Write a program to implement Competitor analysis.	CO2
6	Write a program to implement social media content analysis.	CO2
7	Write a program to implement social media campaign tracking and analysis	CO2
8	Write a program to implement social media audience segmentation and targeting.	CO2
9	Write a program to implement social media network analysis.	CO2
10	Write a program to implement social media advertising planning and analysis	CO3
11	Write a program to implement social media customer service analysis	CO3
12	Write a program to implement social media benchmarking and performance analysis	CO3
13	Write a program to implement social media engagement tracking and analysis.	CO3

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

CO 1	Create programs for social media monitoring and analysis, including sentiment analysis, trend analysis, and competitor analysis.ss	K6
CO 2	Apply social media analytics to optimize marketing efforts, including audience segmentation, targeting, advertising planning, and engagement tracking.	K3
CO 3	Evaluate and improve customer service efforts through social media analysis, benchmarking, and performance analysis.	K5

B. TECH. FOURTH YEAR			
Course Code	**ACSBS0716P**	**L T P**	**Credit**
Course Title	**Mobile Computing Lab**	**0 0 2**	**1**

List of Experiments:

Sr. No.	Name of Experiment	CO
1	To learn the basics of mobile computing tools and Software	CO1
2	Learn and study Tool Kits: WAP Developer tool kit and application environment, Android Mobile Applications Development Tool kit	CO1
3	Write a mobile application that creates an alarm clock	CO2
4	Write a mobile application that creates a Calendar system	CO2
5	Write a mobile application that creates Tik Tak game	CO2
6	Develop a native calculator application	CO2
7	Develop a native application that uses GPS location information.	CO2
8	Design a basic text editor phone system	CO2
9	Design MANETS, use of NS2/NS3 simulator	CO3

Lab Course Outcome: At the end of the semester, students will be able to:

CO 1	Learn analysis of the various paradigm of mobile computing tools and its configuration	K1
CO 2	Implement the various mobile applications on computing tools	K3
CO 3	Discuss and develop the network simulator environments	K6