



MOOGAMBIGAI CHARITABLE AND EDUCATIONAL TRUST

Rajarajeswari College of Engineering

(An Autonomous Institution under Visvesvaraya Technological University, Belagavi)

#14, Ramohalli Cross, Kumbalagodu, Mysore Road, Bengaluru-560074



Bachelor of Computer Applications

V & VI Semester Scheme and Syllabus

(2024 Scheme)

VISION

To empower young minds through technology, research and innovation, to produce technically competent and socially responsible professionals in higher education.

MISSION

1. To deliver excellence in education through innovative teaching, impactful research, and continuous skill development, preparing students to meet global challenges with technical expertise and ethical responsibility.
2. To foster a transformative learning environment that integrates technology, research and practical experience, empowering students to become skilled professionals and socially conscious leaders.
3. To cultivate a culture of lifelong learning and professional excellence by encouraging creativity, research, and community engagement, equipping students with the skills to thrive in a dynamic world.
4. To provide a holistic educational experience that combines advanced technology, hands-on research, and community-focused learning, shaping students into competent, ethical professionals who contribute positively to society.

QUALITY POLICY

Rajarajeswari College of Engineering is committed to imparting quality technical education that nurtures competent, ethical professionals with global relevance. We ensure academic excellence through a dynamic, outcome-based curriculum, experienced faculty, and cutting-edge infrastructure. Continuous improvement is driven by innovation, research and strong industry collaboration. We foster holistic development and a progressive environment that supports lifelong learning, teamwork, and professional growth.

CORE VALUES

Academic Excellence, Integrity, Innovation, Global Competence, Continuous Improvement.

Bachelor of Computer Applications

DEPARTMENT VISION

To be a department of excellence in technical education, widely known for the development of application developers, IT professionals, entrepreneurs, researches creates benefit all of humanity.

DEPARTMENT MISSION

1. To ensure diverse knowledge integration with industry for creative learning and application.
2. To nurture talent in usage of application of Digital Intelligence and use of Power of technology.
3. To create entrepreneurs thro incubating technology businesses and committee to create and sustaining to be societal relevant education
4. To ensure the student connect at personal level and focus on to holistic development with Intellectual, Emotional, Spiritual and Behavioral traits.

PROGRAM OUTCOMES (POs)

PO 1 Knowledge: Able to understand and apply the fundamental principles, concepts and methods in diverse areas of computer applications, mathematics, statistics etc.

PO 2 Problem analysis and Development of Solutions: Identify, formulate, research literature and analyze real- time problems. Attain substantiated conclusions to solve the problems using fundamental principles of mathematics, computing sciences by adopting various tools and techniques.

PO 3 Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required.

PO 4 Ethics and Social Responsibility: Understand and commit to professional ethics and cyber regulations, responsibilities and norms of professional computing practice.

PO 5 Communication and Team Building: Possess interpersonal skills and communicate effectively with the professionals and with society at large on system activities. Able to comprehend and write effective reports, design documentation, make effective presentations, and give/understand instructions.

PO 6 Project Management and Finance: Innovation, Employability and Entrepreneurial skills Identify opportunity; pursue that opportunity to create value and wealth for the betterment of the individual and society at large. Develop the capacity to study and research independently that will help to develop skills for transition to employment in hardware/software companies.

PO 7 Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO 8 Life Long Learning: Recognize the need and have the ability, to engage in continuous reflective learning in the context of technological advancement. Create, select, adapt and apply appropriate techniques, resources, and computing tools to complex computing activities. Able to learn, adapt and apply emerging tools and technologies to meet the demand.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To progress into the software industry, academia, research, entrepreneurial pursuit, government, consulting firms, and other recent trends in technology enabled services.

PEO2: To achieve peer recognitions an individual or team; by adopting ethics and professionalism and communicating effectively to perform well in cross-culture and interdisciplinary teams.

PEO3: To continue lifelong professional development in computing for the benefit of self- and societal growth

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: Understand the principles of Computer Applications and enrich knowledge in recent advancements and developments in Software Industries.

PSO2: Competent in programming and computing skills, ability to apply software development methodologies and modeling to solve real world problems.

PSO3: To motivated the Students to learn through various programs about emerging technologies.

PSO4: To impart comprehensive knowledge with equal emphasis on theory and practice.

PSO5: To train future industry professionals.

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Bachelor of Computer Applications



Scheme of Teaching and Examinations – 2024 Scheme
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the Academic Year 2024-25)

SEM: V

S. No	Course Category and Course Code		Course Title	TD / PSB	Teaching Hours / Week			Examination				
					Lecture	Practical / Seminar	Tutorial / SDA	Duration in Hours	CIE Marks	SEE Marks	Total Marks	Credits
1.	PCC	B24PYP501	Python Programming	BCA	3	0	0	3	50	50	100	3
2.	PLC	B24IAI502	Introduction to Artificial Intelligence	BCA	2	2	0	3	50	50	100	3
3.	PCC	B24IOT503	Fundamentals of Internet of Things	BCA	3	0	0	3	50	50	100	3
4.	PCC	B24DCN504	Data Communications and Networking	BCA	3	0	0	3	50	50	100	3
5.	PEC	B24YYY55X	Professional Elective 1	BCA	3	0	0	3	50	50	100	3
6.	PCCL	B24PYPL506	Python Programming Lab	BCA	0	2	0	3	50	50	100	1
7.	PCCL	B24IOTL507	Internet of Things Lab	BCA	0	2	0	3	50	50	100	1
8.	MPRJ	B24MPJ508	Mini Project	BCA	-	4	0	3	50	50	100	2
9.	AEC	B24SOP509	Societal Technical Project	BCA	-	2	0	3	50	50	100	1
10.	AUD/AEC	B24xxx510	NPTEL / VTU Online Course	BCA	-	-	-	-	-	-	PP	-
TOTAL									450	450	900	20

Note: AEC-Ability Enhancement Courses, PCC – Professional Core Courses, PCCL – Professional Core Course Laboratory, VAC – Value Added Courses, Y – courses initials, X- 1/2/3/4.



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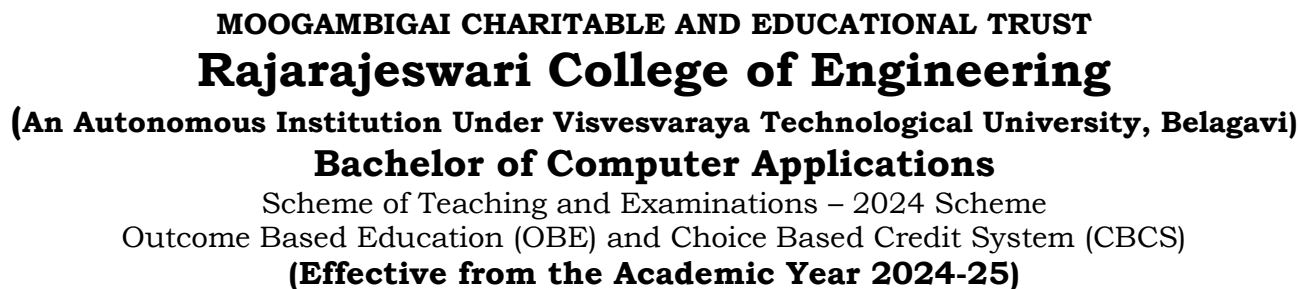


Professional Elective Course-I	
Course Code	Course Title
B24DIM551	Digital Marketing
B24ECT552	E Commerce Technologies
B24OOM553	Object Oriented Modelling and Design
B24NOS554	No SQL
B24WIC555	Wireless Communication

HOD

Dean-Academics

Principal


SEM: VI

S. No	Course Category and Course Code		Course Title	TD / PSB	Teaching Hours / Week			Examination				Credits
					Lecture	Practical / Seminar	Tutorial / SDA	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
1.	PLC	B24DAP601	Introduction to Data Analytics using Python	BCA	2	2	0	3	50	50	100	3
2.	PCC	B24CLC602	Cloud Computing	BCA	3	0	0	3	50	50	100	3
3.	PEC	B24YYY63X	Professional Elective II	BCA	3	0	0	3	50	50	100	3
4.	PEC	B24YYY64X	Professional Elective III	BCA	3	0	0	3	50	50	100	3
5.	INTR	B24INT605	Internship	BCA	0	10	0	3	50	50	100	4
6.	PROJ	B24PROJ606	Main Project	BCA	0	10	0	3	50	50	100	4
TOTAL								300	300	600	20	
Note: PCC – Professional Core Courses, INTR – Internship, PROJ – Project, Y – courses initials, X- 1/2/3/4.												



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Professional Elective Course-II	
Course Code	Course Title
B24CNS631	Cryptography and Network Security
B24DIP632	Digital Image Processing
B24MAD633	Mobile Application Development
B24FSD634	Full Stack Development

Professional Elective Course-III	
Course Code	Course Title
B24DMW641	Data Mining and Warehousing
B24SOT642	Software Testing
B24ETH643	Ethical Hacking
B24IDS644	Introduction to Data Science

HOD

Dean-Academics

Principal



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Department of Bachelors of Computer Administration

Semester - V					
Python Programming					
Category: PCC					
Course Code	:	B24PYP501	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	3:0:0	SEE	:	50 Marks
Total Hours/Semester	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To understand basic concepts of Python programming and its syntax.
2.	To apply conditional and looping statements to solve computational problems.
3.	To demonstrate use of functions, strings, lists and other data structures.
4.	To implement Python programs using tuples, sets and dictionaries.
5.	To develop object-oriented programs using classes, inheritance and polymorphism.

Module – 1	No. of Hours
Introduction: Python programming, history, features, Installing Python, Python Interpreter, IDLE, Keywords, Variables, Constants, Literals, Data Types, Data type conversion, Indentation, Comments, expression, statements, Input & Output functions, range () function, Operators: assignment (single value, multiple values), arithmetic, relational, logical.	9
Module – 2	No. of Hours
Conditional statements: if, if-else, elif, nested if; Looping statements: while, for, for each, nested loops; break, continue; Else statement with loop; Functions Basics: Built-in Functions, Declaring and calling user defined functions, Parameters and default arguments, Fruitful functions and void functions, recursive functions	9
Module – 3	No. of Hours
Strings: Creating and Storing Strings; Accessing String Characters; the str() function; Operations on Strings Concatenation, Comparison, Slicing and Joining, Traversing; Python built-in String Methods. List: Creating Lists; Operations on Lists; Built-in Functions on Lists, Python built-in Methods, Nested Lists	9
Module – 4	No. of Hours
Tuple: Creating Tuples; Operations on Tuples; Built-in Functions on Tuple; Set: Creating Sets; Operations on Sets; Built-in Functions on Sets; Set Methods. Dictionaries: Creating Dictionaries; Operations on Dictionaries; Built-in Functions on Dictionaries; Dictionary Methods	9
Module – 5	No. of Hours
Object Oriented Programming: Defining a class, Instance members, Constructors, Inheritance (single, multi-level, multiple), Special methods (__init__(), __str__()), Polymorphism (method overloading, operator overloading)	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Understand Python fundamentals including data types, operators, expressions, and input/output operations.
CO2	Apply conditional and looping constructs to develop simple Python programs.
CO3	Use functions, strings and lists for structured problem solving.
CO4	Implement programs using tuples, sets and dictionaries.
CO5	Develop object-oriented Python applications using classes, inheritance and polymorphism.

Text Books	
1.	Title: Core Python Programming Author: Dr.R.Nageswara Rao Publisher: Dream tech Press Edition: second Module-I : Chapter 1,3,4,5,6 Module -II : Chapter 10,11,19 Module -III : Chapter 16,13 Module -IV : Chapter 14,22



Module -V : Chapter 24,25

Reference Text Books	
1.	E. Balagurusamy – <i>Introduction to Computing and Problem Solving using Python</i>
2.	ReemaThareja – <i>Python Programming using Problem Solving Approach</i>

Web links and Video lectures (e-Resources)	
•	https://youtu.be/b093aqAZiPU?si=d9A1tpNfQ0Qv7uV
•	https://docs.python.org
•	https://www.w3schools.com/python
•	https://www.learnpython.org

ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE FOR THE THEORY:

1. Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
2. Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes/ Weekly test / project work for 40 marks, scaled down to 20 marks.
4. Total marks scored (30+20 = 50 marks).
5. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50).

SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

CO-PO Mapping

PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	-	1	-	-	-	-
CO2	3	3	2	1	-	-	-	-
CO3	2	3	3	2	1	-	-	-
CO4	1	2	3	3	2	-	-	-
CO5	2	2	3	3	1	-	-	2

Level 1-High, Level 2-Moderate, Level 3-Low



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Department of Bachelors of Computer Administration

Semester - V					
Introduction to Artificial Intelligence					
Category: PLC					
Course Code	:	B24IAI502	CIE	:	50 Marks
Teaching Hours L:T:P	:	2:2:0	SEE	:	50 Marks
Total Hours/Semester	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To understand the fundamental concepts of Artificial Intelligence, its history, importance, knowledge-based systems, and AI programming languages such as LISP and PROLOG.
2.	To apply knowledge representation techniques using propositional logic, first-order predicate logic, resolution, and reasoning under uncertainty.
3.	To analyze and solve problems using search strategies, AND-OR graphs, matching techniques, and indexing and retrieval methods.
4.	To explain and design basic Natural Language Processing systems and expert systems, including parsing, semantic analysis, and rule-based architectures.
5.	To understand knowledge acquisition and learning techniques such as perceptrons, learning automata, genetic algorithms, and performance evaluation models.

Module – 1	No. of Hours
Overview of AI and General Concepts: AI, Importance, History of AI, Related fields, Importance of Knowledge, Knowledge based systems, Representation of Knowledge, Knowledge Organization, Manipulation and acquisition. LISP Programming: Syntax and Numerical functions, Manipulation functions in LISP, Functions predicates and conditionals, PROLOG and other AI programming Languages.	9
Module – 2	No. of Hours
Knowledge Representation: Formalized symbolic Logics- Syntax and semantics for propositional logic, Syntax and semantics for FOPL, Properties of Wffs, Inference rules, Resolution principles, Dealing with Inconsistency – Truth maintenance systems, Default reasoning and closed world assumption, Predicate completion and circumscription, Modal and temporal logics.	9
Module – 3	No. of Hours
Knowledge Organization and Manipulation: Search and Control strategies: Primary concept, Examples of search problems, Uniformed and blind search, Informed search, Search AND OR graphs. Matching techniques: Structures used in matching, Measures of matching, Matching patterns, Partial matching, Fuzzy matching algorithm, RETE matching algorithm, Indexing and retrieval Techniques.	9
Module – 4	No. of Hours
Natural Language Processing and Expert systems: Overview of Linguistics, Grammars and Languages, Basic Parsing techniques, Semantic analysis and representation structures, Natural Language systems, Recognition and classification process, Learning classification patterns, Speech recognition and understanding, rule based system architectures, Non production system architecture, Knowledge system building tools	9
Module – 5	No. of Hours
Knowledge Acquisition: Types of Learning, General Learning model, Performance measures, Perceptron's, Checker playing, Learning automata and genetic algorithms.	9

LABORATORY

Practical Component of IPCC (10 Experiments)

Sl. No	List of experiments
1.	Write a Python program to check whether a person is eligible to vote.
2.	Write a Python program to find the largest of three numbers.
3.	Write a Python program to calculate the grade of a student based on marks.



4.	Write a Python program to implement a simple calculator using if-elif-else.
5.	Write a Python program to determine whether a given year is a leap year.
6.	Write a Python program to create a simple chatbot that answers predefined questions such as “Hello”, “How are you?”, and “Bye”.
7.	Write a Python program to simulate a basic recommendation system that suggests carrying an umbrella based on weather input.
8.	Write a Python program to check whether a password entered by the user meets basic validation rules.
9.	Write a Python program to recommend a mode of transport based on the distance entered by the user.
10.	Write a Python program to implement a simple rule-based career guidance system based on the user’s interests.

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

CO1	Aware of the Important of Artificial Intelligence and Knowledge based systems.
CO2	Analyze the various AI programming languages and its functionalities
CO3	Study in depth about the Knowledge Representation and Knowledge Organization and its techniques
CO4	Implement natural language processing techniques and its pattern recognition
CO5	Demonstrate the detailed concepts of knowledge acquisition and machine learning principles

Text Books

1.	Introduction to Artificial Intelligence and Expert systems “DAN. W. PATTERSON”, 2005-06, PRENTICE HALL OF INDIA Pvt Ltd.
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Reference Text Books

1.	Nilson N.J., (1980). Principles of Artificial Intelligence, Berlin: Springer Verlag.
2.	Rich, E & Knight, (2003). Artificial Intelligence, Tata McGraw Hill Publications

Web links and Video lectures (e-Resources)

- <https://libguides.wilmu.edu/AI/library>
- https://libguides.mskcc.org/artificial_intelligence/libraryresources
- https://www.researchgate.net/publication/327831852_Artificial_Intelligence_and_its_applications_in_Libraries
- <https://www.elsevier.com/connect/resource-center/artificial-intelligence>

ASSESSMENT DETAILS BOTH (CIE AND SEE)

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CONTINUOUS INTERNAL EVALUATION (CIE)

CIE FOR THE THEORY:

1. Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
2. Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes/ Weekly test / project work for 40 marks, scaled down to 20 marks.
4. Total marks scored (30+20 = 50 marks).
5. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50).

SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.



3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

CO-PO Mapping

PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	3	2	3	2	-	-
CO2	3	2	2	3	2	2	-	-
CO3	3	2	2	3	1	1	-	-
CO4	2	3	3	2	2	1	-	-
CO5	2	3	2	1	3	1	-	-

Level 1-High, Level 2-Moderate, Level 3-Low



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Semester - V					
Fundamentals of Internet of Things					
Category: PCC					
Course Code	:	B24IOT503	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	3:0:0:3	SEE	:	50 Marks
Total Hours/Semester	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To understand about the fundamentals of Internet of Things and its building blocks along with their characteristics.
2.	Understand the recent application domains of IoT in everyday life.
3.	To understand the protocols and standards designed for IoT and the current research on it.
4.	To understand the other associated technologies like cloud and fog computing in the domain of IoT.
5.	To improve their knowledge about the various cutting-edge technologies in the field IoT and machine learning applications.

Module – 1	No. of Hours
Introduction to Internet of Things: Introduction, Physical design of IOT, Logical Design of IOT, IOT enabling technologies, IOT Levels & Deployment Templates.	9
Module – 2	No. of Hours
IOT and M2M: Introduction: M2M, Difference between IoT and M2M, SDN and NFV for IOT, IOT System Management with NETCONF-YANG, Need for IOT Systems Management, Simple Network Management Protocol (SNMP), Network operator requirements, NETCONF, YANG, IoT Systems Management with NETCONF-YANG.	9
Module – 3	No. of Hours
IoT Platforms Design Methodology: Introduction, IoT Design Methodology, Case Study on IoT System for Weather Monitoring, IoT Systems - Logical Design using Python: Introduction, Installing Python, Python Data Types and Data structures, Control flow, Functions, Modules, Packages, File Handling, Operations, Classes, Python Packages of Interest for IoT.	9
Module – 4	No. of Hours
IoT Physical Devices & End points: What is a IoT Device, Raspberry Pi, About the Board, Linux on Raspberry Pi, Raspberry Pi interfaces, Programming Raspberry Pi with Python, Case Studies illustrating IoT design – Home Automation, Cities, Agriculture.	9
Module – 5	No. of Hours
Data Analytics for IoT: Introduction, Apache Hadoop, Using Hadoop MapReduce for Batch Data Analytics, Apache Oozie, Apache Spark, Apache Storm, Using Apache Storm for Real-time Data Analysis.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Explain the fundamental concepts of Internet of Things (IoT) including physical and logical design, enabling technologies, and IoT deployment levels and templates.
CO2	Differentiate between IoT and M2M systems and explain IoT system management concepts using SDN/NFV, SNMP, and NETCONF-YANG based management frameworks.
CO3	Apply IoT design methodology to develop logical IoT system models and implement IoT applications using Python, including data handling, control structures, classes, and IoT-specific Python packages.
CO4	Demonstrate the use of IoT physical devices and endpoints by programming Raspberry Pi with Python and designing real-world IoT solutions for home automation, smart cities, and agriculture.
CO5	Analyze and process IoT data using big data and real-time analytics frameworks such as Apache Hadoop, Apache Spark, and Apache Storm for batch and streaming IoT analytics.

Text Books	
1.	ArshdeepBahga, Vijay Madiseti, “ Internet of Things- A Hands On Approach”, Universities press, 2014.



Reference Text Books

1.	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1 stEdition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978-9386873743)
2.	Srinivasa K G, "Internet of Things", CENGAGE Learning India, 2017.

Web links and Video lectures (e-Resources)

- <https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-cs31/>
- <https://docs.arduino.cc/>
- <https://www.arduino.cc/education/certification>
- <https://www.udemy.com/topic/arduino/>

ASSESSMENT DETAILS BOTH (CIE AND SEE)

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CONTINUOUS INTERNAL EVALUATION (CIE)

CIE FOR THE THEORY:

1. Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
2. Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes/ Weekly test / project work for 40 marks, scaled down to 20 marks.
4. Total marks scored (30+20 = 50 marks).
5. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50).

SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

CO-PO Mapping

PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	1	1	1	1	-	-
CO2	3	3	1	3	2	2	-	-
CO3	3	2	2	3	3	3	-	-
CO4	3	3	1	1	2	3	-	-
CO5	2	1	1	1	2	3	-	-

Level 1-High, Level 2-Moderate, Level 3-Low



MOOGAMBIGAI CHARITABLE AND EDUCATIONAL TRUST
Rajarajeswari College of Engineering
 (An Autonomous Institution under Visvesvaraya Technological University, Belagavi)
Department of Bachelors of Computer Administration

Semester - V					
Data Communications and Networking					
Category: PCC					
Course Code	:	B24DCN504	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	3:0:0:3	SEE	:	50 Marks
Total Hours/Semester	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	Understand the fundamentals of computer networks, including LAN, MAN, WAN, wireless networks, internetworking, and network software concepts
2.	Explain network architectures and reference models, particularly the OSI and TCP/IP models, along with physical layer transmission media.
3.	Analyze the functions of the Data Link and Network layers, including error control, flow control, packet switching, and routing services.
4.	Describe the Transport and Application layer protocols, including UDP, TCP, DNS, e-mail, web, and multimedia applications.
5.	Understand cryptographic techniques and network security services, including confidentiality, integrity, authentication, and digital signatures.

Module – 1	No. of Hours
Introduction: LAN, MAN, WAN - Wireless Networks - Home Networks - Internetwork. Network Software: Protocol Hierarchies - Design Issues for The Layers - Connection Oriented and Connectionless Services - Service Primitives. Reference Models: The OSI Reference Model - The TCP/IP Reference Model. Physical Layer: Guided Transmission Media - Magnetic Media - Twisted Pair - Coaxial Cable - Fiber Optics. Wireless Transmission: The Electronics Spectrum - Radio Transmission - Microwave Transmission.	9
Module – 2	No. of Hours
Data Link Layer: Data Link Layer Design Issues - Error Detection and Correction -Elementary Data Link Protocols - Sliding Window Protocol. Network Layer: Network Layer Design Issues: Store and Forward Packet Switching - Services Provided to The Transport Layer - Implementation of Connectionless Service - Implementation of Connection Oriented Service - Comparison of Virtual Circuit and Datagram Subnets.	9
Module – 3	No. of Hours
Transport Layer: The Transport Service - Services Provided to the Upper Layer – Transport Service Primitives - Elements of Transport Protocols - Internet Transport Protocols - UDP- Internet Transport Protocols - TCP.	9
Module – 4	No. of Hours
Application Layer: Domain Name System - Electronic Mail - World Wide Web - Multimedia.	9
Module – 5	No. of Hours
Cryptography: Introduction - Symmetric Key Cryptography - Asymmetric Key Cryptography. Network Security: Security Services - Message Confidentiality - Message Integrity - Message Authentication - Digital Signature - Entity Authentication.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Describe the network protocols, services and network security
CO2	Specify the OSI model and TCP/IP model in network layers
CO3	Use the Connection services, switching and network applications
CO4	Analyze the TCP Primitives, WWW, Digital Signature, and ServiceSecurity
CO5	Differentiate the role of the layers and protocols in networking

Text Books	
1.	Andrew S.Tanenbaum. Computer networks. Prentice –Hall of India, New Delhi, 4 th Edition, 2006.
2.	Behrouz A.Forouzan. Data Communications and Networking. McGraw Hill International Edition, 4 th Edition.



Reference Text Books

1.	William Stallings. Data and Computer Communications. Pearson Education, New Delhi, 8 th Edition, 2009.
2.	S.A AmuthaJeevakumari. Elements of Data Communication and Networks. Lakshmi Publications, Hyderabad, 1 st Edition, 2010.

Web links and Video lectures (e-Resources)

- <https://nptel.ac.in/courses/106/105/106105081/>
- https://onlinecourses.swayam2.ac.in/cec21_cs04/preview
- <http://zai.lecturer.pens.ac.id/Kuliah/Komunikasi%20Data/Buku%20Referensi/Data%20Communications%20and%20Networking%20By%20Behrouz%20A. Forouzan.pdf>

ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE FOR THE THEORY:

1. Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
2. Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes/ Weekly test / project work for 40 marks, scaled down to 20 marks.
4. Total marks scored (30+20 = 50 marks).
5. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50).

SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

CO-PO Mapping

PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	1	2	1	2	-	-
CO2	2	3	3	1	2	1	-	-
CO3	3	2	3	2	3	2	-	-
CO4	2	2	1	2	2	1	-	-
CO5	2	2	1	1	2	2	-	-

Level 1-High, Level 2-Moderate, Level 3-Low



MOOGAMBIGAI CHARITABLE AND EDUCATIONAL TRUST
Rajarajeswari College of Engineering
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Department of Bachelors of Computer Administration

Semester - V					
Digital Marketing					
Category: PEC					
Course Code	:	B24DIM551	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	3:0:0	SEE	:	50 Marks
Total Hours/Semester	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To understand the fundamentals of Digital Marketing and differentiate it from Traditional Marketing.
2.	To learn various online advertising methods and digital campaign strategies.
3.	To understand the concepts, tools, and process of Email Marketing.
4.	To gain knowledge of Social Media Marketing platforms and strategies.
5.	To understand Search Engine Optimization (SEO) techniques and tools to improve online visibility.

Module – 1	No. of Hours
Digital Marketing: Introduction to Digital Marketing, Traditional Vs. Digital Marketing, Technology behind Digital Marketing, Characteristics of Digital Marketing, Digital Marketing Strategy, Understanding Digital Consumer.	9
Module – 2	No. of Hours
Online Advertising: Introduction, Objective, Where to Advertise, Online AdFormat, Search Engine Ad, Network Advertising, Affiliate Programs, Landing Pages	9
Module – 3	No. of Hours
Email Marketing: Introduction, Types of Email, Email Marketing Campaign Process, Email marketing Tools, Advantages and Disadvantages, Opt-in Email Advertising, Email tracking	9
Module – 4	No. of Hours
Social Media Marketing (SMM): What is Social Media Marketing, Seven Myths of SMM, Characteristics of Successful Social Media Marketer, Social Media Marketing plan, Social Media marketing Tools, Publishing Blogs, Podcast and Webinars, Social Media Monitoring, Social Media: Facebook, Twitter.	9
Module – 5	No. of Hours
Search Engine Optimization (SEO): Understanding SEO, Search Engine Optimization Process – Goals, On-Page Optimization, Off-Page Optimization and Analyze, Search Engine Result Process (SERP), SEO Tools.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Explain the concepts, characteristics, strategies, and consumer behavior in Digital Marketing.
CO2	Analyze and design effective online advertising campaigns using search engines, display networks, affiliate marketing, and landing pages.
CO3	Develop and evaluate email marketing campaigns using appropriate tools and tracking methods.
CO4	Create and implement Social Media Marketing strategies using platforms like Facebook and Twitter and apply social media monitoring tools.
CO5	Apply SEO techniques including On-page and Off-page optimization and analyze Search Engine Result Pages (SERP) using SEO tools.

Text Books	
1.	Seema Gupta, “Digital Marketing”, McGraw Hill Education

Reference Text Books	
1.	P Module Singh Bhatia, “Fundamentals of Digital Marketing”, Pearson
2.	Philip Kotler, “Marketing 4.0: Moving from Traditional to Digital”, Wiley

Web links and Video lectures (e-Resources)	
•	https://www.youtube.com/watch?v=01Imoibt4as



ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE FOR THE THEORY:

1. Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
2. Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes/ Weekly test / project work for 40 marks, scaled down to 20 marks.
4. Total marks scored (30+20 = 50 marks).
5. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50).

SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

CO-PO Mapping

PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	1	1	1	1	1	2
CO2	2	3	-	1	2	2	2	2
CO3	2	2	2	1	2	2	1	2
CO4	2	2		2	-	2	-	-
CO5	3	3	2	1	1	2	1	-

Level 1-High, Level 2-Moderate, Level 3-Low



MOOGAMBIGAI CHARITABLE AND EDUCATIONAL TRUST
Rajarajeswari College of Engineering
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Department of Bachelors of Computer Administration

Semester - V					
E-Commerce Technologies					
Category: PEC-I					
Course Code	:	B24ECT552	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	3:0:0:3	SEE	:	50 Marks
Total Hours/Semester	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To understand the fundamentals of E-Commerce, its goals, components, applications, and business models such as B2B and B2C.
2.	To explain the Internet and web technologies supporting E-Commerce, including portals, ISPs, and website development and promotion.
3.	To analyze internet security issues and apply cryptographic techniques such as encryption, digital signatures, firewalls, and secure transactions.
4.	To describe Electronic Data Interchange (EDI) and electronic payment systems, including credit cards, EFT, and modern digital payment mechanisms.
5.	To understand E-Security concepts, legal aspects of E-Commerce, network security, and secure electronic transaction practices.

Module – 1	No. of Hours
Digital Marketing: Introduction to Digital Marketing. Traditional Vs. Digital Marketing, Technology behind Digital Marketing, Characteristics of Digital Marketing, Digital Marketing Strategy, Understanding Digital Consumer.	9
Module – 2	No. of Hours
The Internet: Evolution of Internet, Components of Internet world, Categories of Network, Internet Service Provider, Applications Service Providers, World Wide Web, Internet Functions. Portals: Electronic Commerce Portals, B2B Portals. Building own website: Reasons for building your own website –ideal website-Domain registration -Web promotion.	9
Module – 3	No. of Hours
Internet Security: Secure Transaction, Computer Monitoring, Privacy on Internet, Corporate Email privacy, Computer Crime, Specific Threats, Attack on Computer System, Software Packages, Hacking, Encryption and Decryption, DES, Public Key Encryption, RSA, Internet Security, Firewall, Digital Signature.	9
Module – 4	No. of Hours
Electronic Data Exchange: Introduction, Concepts of EDI and Limitation, Applications of EDI, Disadvantages of EDI, EDI model. Electronic Payment System: Introduction, Types of Electronic Payment System, Payment Types, Value Exchange System, Credit Card System, Electronic Fund Transfer, Paperless bill, Modern Payment system.	9
Module – 5	No. of Hours
E-Security: Introduction–Electronic Security–Attacking Methods- Security Practices– Secure Electronic Transaction (SET) - Security Tools –Network Security – Electronic Commerce Act-Virtual Private Network.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Characterizes basic business models on the web and scope of E-Commerce and its applications.
CO2	Recognize the impact of information andcommunication Technologies, especially of the internet in business operations.
CO3	Illustrate the internet security infer with the security algorithms.
CO4	Explain the concepts of EDI and types of electronic payment system.
CO5	Extend the electronic security by make use ofsecurity tools and network security

Text Books	
1.	C.S.V.Murthy, 2017, E-Commerce Concepts –Models- Strategies, Himalaya Publishing House.



Reference Text Books

1.	Gray P. Schneider, 2011, Electronic commerce, International Student Edition.
2.	Henry Chan, Raymond Lee, Tharam Dillon, Elizabeth Chang, 2011, E-Commerce, Fundamentals and Applications, Wiely Student Edition

Web links and Video lectures (e-Resources)

- https://www.tutorialspoint.com/e_commerce/
- <https://www.thecounty.ca/media/petcounty/documents/department/developing/aWhatisE-Commerce.pdf>

ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE FOR THE THEORY:

1. Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
2. Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes/ Weekly test / project work for 40 marks, scaled down to 20 marks.
4. Total marks scored (30+20 = 50 marks).
5. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50).

SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

CO-PO Mapping

PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	1	2	-	2	-	1	-
CO2	3	2	1	-	2	-	2	-
CO3	3	1	3	1	1	2	1	-
CO4	3	2	3	2	2	-	2	-
CO5	2	3	3	-	1	-	1	-

Level 1-High, Level 2-Moderate, Level 3-Low



MOOGAMBIGAI CHARITABLE AND EDUCATIONAL TRUST
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Department of Bachelors of Computer Administration

Semester - V					
Object Oriented Modeling and Design					
Category: PEC-I					
Course Code	:	B24OOM553	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	3:0:0:3	SEE	:	50 Marks
Total Hours/Semester	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To provide fundamental knowledge of object-oriented concepts and modeling techniques.
2.	To enable students to understand and apply Unified Modeling Language (UML) for system analysis and design
3.	To develop the ability to design software systems using object-oriented principles.
4.	To introduce basic design principles and commonly used design patterns for developing maintainable applications.
5.	To equip students with practical skills to model real-world systems using UML tools and case studies.

Module – 1	No. of Hours
Basics of Object-Oriented Concepts: Introduction to object-oriented paradigm. Object and class concepts. Abstraction and encapsulation. Inheritance and polymorphism. Difference between object-oriented analysis and object-oriented design. Overview of Software Development Life Cycle. Introduction to Unified Modeling Language.	9
Module – 2	No. of Hours
UML Structural Diagrams: Introduction to UML building blocks. Class diagram with attributes and methods. Relationships including association, aggregation, composition and generalization. Object diagram. Package diagram with basic concepts.	9
Module – 3	No. of Hours
UML Behavioral Diagrams: Use case diagram with actors and use cases. Use case documentation. Sequence diagram. Activity diagram. State chart diagram with basic concepts.	9
Module – 4	No. of Hours
Object-Oriented Design Principles: Introduction to object-oriented design concepts. Coupling and cohesion. Basic design principles for maintainable systems. Introduction to design patterns including Singleton, Factory and Observer patterns. Introduction to refactoring concepts.	9
Module – 5	No. of Hours
Case Study and Modeling Tools: Domain modeling concepts. Introduction to basic architectural patterns such as Layered architecture and MVC. Forward engineering and reverse engineering concepts. Introduction to UML modeling tools such as StarUML or Visual Paradigm. Case study involving modeling of a simple system such as Library Management, Banking System or Student Management System.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Explain object-oriented concepts and UML fundamentals.
CO2	Develop structural UML diagrams for simple software systems.
CO3	Construct behavioral UML diagrams representing system interactions and workflows.
CO4	Apply basic object-oriented design principles and patterns in system design.
CO5	Design and model simple software systems using UML tools.

Text Books	
1.	Michael Blaha and James Rumbaugh, “Object-Oriented Modeling and Design with UML”

Reference Text Books	
1.	Object Oriented Analysis and Design by Booch, Rumbaugh & Jacobson (The UML Trilogy)
2.	UML Distilled: A Brief Guide to the Standard Object Modeling Language by Martin Fowler
3.	Object-Oriented Analysis and Design with Applications by Grady Booch



Web links and Video lectures (e-Resources)

- <https://www.youtube.com/watch?v=QAdgBqIYoHc>

ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE FOR THE THEORY:

1. Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
2. Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes/ Weekly test / project work for 40 marks, scaled down to 20 marks.
4. Total marks scored (30+20 = 50 marks).
5. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50).

SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

CO-PO Mapping

PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	1	1	1	1	1	2
CO2	3	3	-	1	2	1	2	2
CO3	2	-	2	1	2	-	2	1
CO4	2	2	1	2	1	2	1	2
CO5	1	-	1	1	2	2	3	1

Level 1-High, Level 2-Moderate, Level 3-Low



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Department of Bachelors of Computer Administration

Semester - V					
No SQL					
Category: PEC					
Course Code	:	B24NOS554	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	3:0:0:3	SEE	:	50 Marks
Total Hours/Semester	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To explain and compare different types of NoSQL Databases.
2.	To compare and contrast RDBMS with different NoSQL databases.
3.	To demonstrate the detailed architecture and performance tune of Document-oriented NoSQL databases.
4.	To explain performance tune of Key-Value Pair NoSQL databases.
5.	To apply NOSQL development tools on different types of NoSQL Databases.

Module – 1	No. of Hours
Overview and History of NoSQL Databases. Definition of the Four Types of NoSQL Database, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Key Points.	9
Module – 2	No. of Hours
Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges NoSQL approach, Key-Value and Document Data Models, Column-Family Stores, Aggregate-Oriented Databases. Replication and sharding, MapReduce on databases. Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication	9
Module – 3	No. of Hours
NoSQL Key/Value databases using MongoDB, Document Databases, Document oriented Database Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure.	9
Module – 4	No. of Hours
Column- oriented NoSQL databases using Apache HBASE, Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE, Column-Family Data Store Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage.	9
Module – 5	No. of Hours
NoSQL Key/Value databases using Riak, Key-Value Databases, Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Shopping Cart Data, Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets. Graph NoSQL databases using Neo4, NoSQL database development tools and programming languages, Graph Databases, Graph Database. Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Explain object-oriented concepts and UML fundamentals.
CO2	Develop structural UML diagrams for simple software systems.
CO3	Construct behavioral UML diagrams representing system interactions and workflows.
CO4	Apply basic object-oriented design principles and patterns in system design.
CO5	Design and model simple software systems using UML tools.

Text Books	
1.	Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley



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	Publications, 1 st Edition, 2019.
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Web links and Video lectures (e-Resources)

- <https://www.ibm.com/cloud/learn/nosql-databases>
- <https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp>
- <https://www.geeksforgeeks.org/introduction-to-nosql/>
- <https://www.javatpoint.com/nosql-databa>

ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE FOR THE THEORY:

1. Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
2. Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes/ Weekly test / project work for 40 marks, scaled down to 20 marks.
4. Total marks scored (30+20 = 50 marks).
5. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50).

SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

CO-PO Mapping

PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	1	1	1	1	1	2
CO2	3	1	-	1	1	1	1	2
CO3	-	1	1	1	2	-	-	-
CO4	2	1	3	2	-	2	2	-
CO5	1	-	1	1	2	2	3	1

Level 1-High, Level 2-Moderate, Level 3-Low



Semester - V					
Wireless Communication					
Category: PEC-I					
Course Code	:	B24WIC555	CIE	:	50 Marks
Teaching Hours L:T:P:S	:	3:0:0:3	SEE	:	50 Marks
Total Hours/Semester	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To provide fundamental understanding of cellular concepts, frequency reuse, interference management and system capacity in wireless communication systems
2.	To explain large-scale and small-scale mobile radio propagation models and their impact on wireless system design.
3.	To introduce fading phenomena, multipath effects and statistical channel models in mobile communication.
4.	To develop knowledge of equalization and diversity techniques for improving wireless communication performance.
5.	To familiarize students with wireless network standards such as IEEE 802.11, 802.16 and modern wireless communication technologies.

Module – 1	No. of Hours
The Cellular Concept-System Design Fundamentals: Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies- Prioritizing Handoffs, Practical Handoff Considerations, Interference and system capacity — Co channel Interference and system capacity, Channel planning for Wireless Systems, Adjacent Channel interference, Power Control for Reducing interference, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring.	9
Module – 2	No. of Hours
Mobile Radio Propagation: Large-Scale Path Loss: Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating Power to Electric Field, The Three Basic Propagation Mechanisms, Reflection- Reflection from Dielectrics, Brewster Angle, Reflection from perfect conductors, Ground Reflection (Two-Ray) Model, Diffraction-Fresnel Zone Geometry, Knife-edge Diffraction Model, Multiple knife-edge Diffraction, Scattering, Outdoor Propagation Models- Longley-Ryze Model, Okumura Model, Hata Model, PCS Extension to Hata Model, Walfisch and Bertoni Model, Wideband PCS Microcell Model, Indoor Propagation Models-Partition losses (Same Floor), Partition losses between Floors, Log-distance path loss model, Ericsson Multiple Breakpoint Model, Attenuation Factor Model, Signal penetration into buildings, Ray Tracing and Site Specific Modeling.	9
Module – 3	No. of Hours
Mobile Radio Propagation: Small Scale Fading and Multipath: Small Scale Multipath propagation Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel Relationship between Bandwidth and Received power, Small-Scale Multipath Measurements-Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow fading, Statistical Models for multipath Fading Channels-Clarke's model for flat fading, spectral shape due to Doppler spread in Clarke's model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray Rayleigh Fading Model.	9
Module – 4	No. of Hours
Equalization and Diversity: Introduction, Fundamentals of Equalization, Training A Generic Adaptive Equalizer, Equalizers in a communication Receiver, Linear Equalizers, Non-linear Equalization-Decision Feedback Equalization (DFE), Maximum Likelihood Sequence Estimation (MLSE) Equalizer, Algorithms for adaptive equalization-Zero Forcing Algorithm, Least Mean Square Algorithm, Recursive least squares algorithm. Diversity Techniques-Derivation of selection Diversity improvement, Derivation of Maximal Ratio Combining improvement, Practical Space Diversity Consideration-Selection Diversity, Feedback or Scanning Diversity, Maximal Ratio Combining, Equal Gain Combining, Polarization Diversity, Frequency Diversity, Time Diversity, RAKE Receiver.	9



Module – 5	No. of Hours
Wireless Networks: Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11, IEEE 802.11 Medium Access Control, Comparison of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, Wireless PANs, Hiper Lan, WLL.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Explain object-oriented concepts and UML fundamentals.
CO2	Develop structural UML diagrams for simple software systems.
CO3	Construct behavioral UML diagrams representing system interactions and workflows.
CO4	Apply basic object-oriented design principles and patterns in system design.
CO5	Design and model simple software systems using UML tools.

Text Books	
1.	Wireless Communications, Principles, Practice — Theodore, S.Rappaport, 2 nd Edition, 2002, PHI.

Reference Text Books	
1.	Wireless Communication and Networking — William Stallings, 2003, PHI.
2.	Wireless Communication — Upen Dalal, Oxford Univ. Press

Web links and Video lectures (e-Resources)	
https://in.video.search.yahoo.com/search/video?fr=mcafee&p=wireless+communication+you+tube+videos&type=E210IN885G91969#id=1&vid=100cfaad40d93b7d0e2e04f8470c39eb&action=click	

ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE FOR THE THEORY:

1. Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
2. Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes/ Weekly test / project work for 40 marks, scaled down to 20 marks.
4. Total marks scored (30+20 = 50 marks).
5. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50).

SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.



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CO-PO Mapping

PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	1	2	2	1	-	1	1	2
CO2	1	1	1	1	1	1	1	2
CO3	3	3	2	2	-	-	1	2
CO4	1	1	3	1	2	2	2	2
CO5	3	2	1	2	2	-	2	-

Level 1-High, Level 2-Moderate, Level 3-Low



Semester - V					
Python Programming Lab					
Category: PCCL					
Course Code	:	B24PYPL506	CIE	:	50 Marks
Teaching Hours L : P : S	:	0:2:0	SEE	:	50 Marks
Total Hours/Semester	:	30	Total	:	100 Marks
Credits	:	1	SEE Duration	:	3 Hrs

Course Learning Objective is

1.	To apply core Python concepts such as operators, control statements, data structures, functions, exception handling, and object-oriented programming to develop executable programs.
2.	To design and implement classes and inheritance mechanisms, including constructors, inner classes, method overloading, method overriding, and operator overloading.
3.	To use NumPy arrays to perform array creation, sorting, broadcasting, universal functions, aggregations, and structured array operations.
4.	To apply data analysis and machine learning basics using Python libraries, including K-Nearest Neighbors and efficient data manipulation techniques.
5.	To perform data visualization and data handling tasks using Pandas and Matplotlib to create plots, charts, and data frames for analytical reporting.

Sl. No	List of Experiments - Develop PYTHON programs for
1.	Program to demonstrate membership and Identity operators
2.	Program to demonstrate Control statements.
3.	Program to demonstrate built-in and user defined functions
4.	Program to demonstrate list and its operations and functions.
5.	Program to demonstrate Set operations
6.	Program to demonstrate tuple and its operations and functions
7.	Program to demonstrate dictionaries and its operations and functions.
8.	Program to demonstrate Classes and Objects.
9.	Program to demonstrate Constructors.
10.	Program to demonstrate inner classes.
11.	Program to demonstrate Single and Multiple inheritance.
12.	Program to demonstrate Operator Overloading.
13.	Program to demonstrate Method Overloading.
14.	Program to demonstrate Method Overriding.
15.	Program to demonstrate Arrays using Numpy
16.	Program to demonstrate list and its operations and functions using Numpy.
17.	Program to demonstrate Universal functions on Numpy Arrays.
18.	Program to demonstrate Aggregations.
19.	Program to demonstrate Array Broadcasting.
20.	Program to demonstrate Exception Handling
21.	Program to demonstrate Sorting arrays, K-Nearest Neighbors.
22.	Program to demonstrate Structured Arrays.
23.	Program to demonstrate Matplotlib.
24.	Program to demonstrate Seaborn.



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Course Outcomes: At the end of the course, the students will be able to	
CO1	Realize the basic concepts of Python.
CO2	Implement application using list, tuples, and dictionaries functions and learn to build user defined functions in python.
CO3	Learn the Concept of OOPs, and implement data science in python using Pandas Module.
CO4	Acquire and apply knowledge to Numpy module and the use of Numpy module
CO5	Incorporate Visualization concepts using Matplotlib, Seaborn

ASSESSMENT DETAILS BOTH (CIE AND SEE)

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A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CONTINUOUS INTERNAL EVALUATION (CIE)

Component	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks	Eligibility
Laboratory	Lab Conduction & Record	Evaluating each expt. for 10 marks*12 expts.	20	50	40% of 50 = 20
	Laboratory Test -1: After 6 Expts	50	15		
	Laboratory Test -2: After 12 Expts	50	15		
Continuous Internal Evaluation (CIE)				50	20

SEMESTER END EXAMINATION (SEE)

- SEE marks for the practical course are 50 Marks. Practical examinations are to be conducted between the schedules mentioned in the academic calendar of the Institution.
- All laboratory experiments are to be included for practical examination.
- Evaluation of test write-up, conduction procedure, result and viva will be conducted jointly by examiners.
- Rubrics suggested for SEE, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks.
- Change of experiment is allowed only once and 15% of Marks allotted to the Conduction procedure part are to be made zero. The minimum duration of SEE is 03 hours.

CO-PO Mapping

PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	1	2	2	3	1	1	1	1
CO2	2	2	2	3	2	2	-	-
CO3	3	1	2	-	2	1	2	-
CO4	3	3	3	3	1	2	-	1
CO5	3	2	2	-	3	2	1	-

Level 1-High, Level 2-Moderate, Level 3-Low



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Semester - V					
Internet of Things Lab					
Category: PCCL					
Course Code	:	B24IOTL507	CIE	:	50 Marks
Teaching Hours L : P : S	:	0:2:0	SEE	:	50 Marks
Total Hours/Semester	:	30	Total	:	100 Marks
Credits	:	1	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To demonstrate the IoT architecture design for a given problem
2.	To apply IOT techniques for a given problem
3.	To analyze the application protocol, transport layer methods for the given business case

Sl. No	Experiments
1.	Run some python programs on Pi like: Read your name and print Hello message with name Read two numbers and print their sum, difference, product and division. Word and character count of a given string Area of a given shape (rectangle, triangle and circle) reading shape and appropriate values from standard input Print a name „n“ times, where name and n are read from standard input, using for and while loops. Handle Divided by Zero Exception. Print current time for 10 times with an interval of 10 seconds. Read a file line by line and print the word count of each line
2.	Get input from two switches and switch on corresponding LEDs
3.	Flash an LED at a given on and off time cycle, where the two times are taken from a file
4.	Switch on a relay at a given time using cron, where the relay's contact terminals are connected to a load
5.	Access an image through a Pi web cam
6.	Control a light source using web page
7.	Implement an intruder system that sends an alert to the given email
8.	Get the status of a bulb at a remote place (on the LAN) through web.
	Demonstration Experiments (For CIE) if any
	- Get an alarm from a remote area (through LAN) if smoke is detected - A team of two students must develop the mini project. However during the examination, each student must demonstrate the project individually - The team must submit a brief project report (20-25 pages) that must include the following a. Introduction b. Requirement Analysis c Software Requirement Specification d. Analysis and Design, e. Implementation f. Testing - Brief synopsis not more than two pages to be submitted by the team as per the format given. It is recommended that students to do prior art search as part of literature survey before submitting the synopsis for the Mini/Major projects

Course Outcomes: At the end of the course, the students will be able to	
CO1	Identify and analyze a real-world problem and define project requirements.
CO2	Design and develop a mini project using appropriate tools and technologies.
CO3	Apply problem-solving and programming skills to implement the solution.
CO4	Prepare project documentation and present the outcomes effectively.



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ASSESSMENT DETAILS BOTH (CIE AND SEE)

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A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CONTINUOUS INTERNAL EVALUATION (CIE)

Component	Type of Assessment	Max. Marks	Max. Marks Scaling Down to	Total Marks	Eligibility
Laboratory	Lab Conduction & Record	Evaluating each expt. for 10 marks*12 expts.	20	50	40% of 50 = 20
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	Laboratory Test -2: After 12 Expts	50	15		
Continuous Internal Evaluation (CIE)				50	20

SEMESTER END EXAMINATION (SEE)

- SEE marks for the practical course are 50 Marks. Practical examinations are to be conducted between the schedules mentioned in the academic calendar of the Institution.
- All laboratory experiments are to be included for practical examination.
- Evaluation of test write-up, conduction procedure, result and viva will be conducted jointly by examiners.
- Rubrics suggested for SEE, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks.
- Change of experiment is allowed only once and 15% of Marks allotted to the Conduction procedure part are to be made zero. The minimum duration of SEE is 03 hours.

CO-PO Mapping

PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	2	3	-	2	-
CO2	3	3	1	1	3	-	2	-
CO3	3	1	2	3	2	-	2	-
CO4	2	1	3	2	1	-	-	-

Level 1-High, Level 2-Moderate, Level 3-Low



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Semester - V					
Mini Project					
Category: MPRJ					
Course Code	:	B24MPJ508	CIE	:	50 Marks
Teaching Hours L : P : S	:	0:4:0	SEE	:	50 Marks
Total Hours/Semester	:		Total	:	100 Marks
Credits	:	2	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To apply theoretical knowledge to design and develop a small real-world application.
2.	To Enhance problem-solving and programming skills through independent or team-based project work.
3.	To develop documentation and presentation skills by preparing reports and demonstrating the project.

Mini Project Work Evaluation: During project work, the evaluation process will be divided into number of phases to assess the continuous progress (Minimum three phases).

- The project guides and project coordinator follows rubrics, which is set by the Department for evaluation and then submitted to the head of department.
- Each internal guide will verify the statement of project and literature of works and implementation details. The department will encourage students to make publications in standard conferences/journals.

Rubrics for Mini Project Evaluation CIE & SEE:

Review #	Agenda	Assessment	Review Assessment Weightage	Overall Weightage
Review 1	Project Synopsis Evaluation	Rubrics1	50	50 (Avg of R1, R2, R3)
Review 2	Mid-Term Project Evaluation	Rubrics2	50	
Review 3	Final Internal Project Evaluation	Rubrics3	50	
Final Project Viva-Voce	End-Semester Project Evaluation	50		50
Total				100



Semester - VI					
Data Analytics using Python					
Category: PLC					
Course Code	:	B24DAP601	CIE	:	50 Marks
Teaching Hours L:T:P	:	2:2:0	SEE	:	50 Marks
Total Hours/Semester	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To introduce the data analytics lifecycle and equip students with a foundational understanding of Python as a tool for data analysis.
2.	To develop proficiency in using Python data structures such as strings, lists, sets, tuples, and dictionaries for managing and processing data.
3.	To enable students to apply NumPy and Pandas libraries for numerical computation, data manipulation, statistical analysis, and handling missing data.
4.	To teach techniques for loading, storing, and transforming data from various sources, including files, databases, and web APIs, along with string manipulation and data wrangling.
5.	To equip students with the ability to visualize and summarize data through charts, plots, and grouped operations using libraries like matplotlib and pandas

Module – 1	No. of Hours
Introduction to Data Analytics: Life Cycle, Discovery, Data Preparation, Model Planning, Model Building, Communicate Results, Operationalize. Data Analytics using Python: Python for Data Analysis, Python as Glue, Solving the “Two-Language” Problem, Essential Python Libraries, Installation and Setup, Integrated Development Environments (IDEs).	9
Module – 2	No. of Hours
Python Data Structures: Strings- Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings, Lists-Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods. Sets, Tuples and Dictionaries.	9
Module – 3	No. of Hours
NumPy Basics: The NumPy ndarray, Universal Functions, Data Processing Using Arrays, File Input and Output with Arrays, Linear Algebra, Random Number Generation. Pandas: Introduction to pandas Data Structures, Essential Functionality, Summarizing and Computing Descriptive Statistics, Handling Missing Data, Hierarchical Indexing	9
Module – 4	No. of Hours
Data Loading, Storage, and File Formats: Reading and Writing Data in Text Format, Binary Data Formats, Interacting with HTML and Web APIs, Interacting with Databases, Data Wrangling: Combining and Merging Data Sets, Reshaping and Pivoting, Data Transformation, String Manipulation	9
Module – 5	No. of Hours
Plotting and Visualization: A Brief matplotlib API Primer, Figures and Subplots, Plotting Functions in pandas, Plotting Maps Data Aggregation and Group Operations: GroupBy Mechanics, Data Aggregation, Group-wise Operations and Transformations, Pivot Tables and Cross-Tabulation	9

LABORATORY

Practical Component of IPCC (10 Experiments)

Sl. No	List of experiments
1.	Write a Python program to perform linear search
2.	Write a Python program to insert an element into a sorted list
3.	Write a python program using object - oriented programming to demonstrate encapsulation, overloading and inheritance



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4.	Implement a python program to demonstrate 1) Importing Datasets 2) Cleaning the Data 3) Data frame manipulation using Numpy
5.	Implement a python program to demonstrate the following using NumPy Array manipulation, Searching, Sorting and splitting. broadcasting and Plotting NumPy arrays
6.	Implement a python program to demonstrate Data visualization with various Types of Graphs using Numpy
7.	Write a Python program to demonstrate Data Visualization using Seaborn
8.	Write a Python program that creates a mxn integer array and Prints its attributes using matplotlib
9.	Write a Python program to demonstrate the generation of linear regression models.
10.	Write a Python program to demonstrate Time series analysis with Pandas.

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

CO1	Explain the data analytics lifecycle and use Python programming as a tool for data analysis
CO2	Apply basic Python data structures such as strings, lists, sets, tuples, and dictionaries for efficient data handling and manipulation
CO3	Implement data analysis techniques using NumPy and pandas libraries for data processing, array operations, descriptive statistics, and handling missing data.
CO4	Perform data loading, storage, file handling, web API interaction, and apply data wrangling techniques such as combining, reshaping, and transforming datasets.
CO5	Create effective data visualizations using matplotlib and pandas, and perform data aggregation and group operations like pivot tables and cross-tabulation.

Text Books

1.	Python for Data Analytics, Wes McKinney, O'Reilly, ISBN: 978-1-449-31979-3
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Web links and Video lectures (e-Resources)

- https://www.youtube.com/watch?v=4SJ7bEILPJk&list=PLLy_2iUCG87CNaffzNZPVa9rW-QmOmEv

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CONTINUOUS INTERNAL EVALUATION (CIE)

CIE FOR THE THEORY:

1. Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
2. Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes/ Weekly test / project work for 40 marks, scaled down to 20 marks.
4. Total marks scored (30+20 = 50 marks).
5. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50).

SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.



3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

CO-PO Mapping

PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	3	3	1	2	-	-
CO2	2	2	3	2	1	3	-	-
CO3	3	2	2	3	3	3	-	-
CO4	2	1	2	1	1	2	-	-
CO5	2	2	1	2	2	3	-	-

Level 1-High, Level 2-Moderate, Level 3-Low



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Semester - VI					
Cloud Computing					
Category: PCC					
Course Code	:	B24CLC602	CIE	:	50 Marks
Teaching Hours L:T:P	:	3:0:0	SEE	:	50 Marks
Total Hours/Semester	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To explain the core concepts of the cloud computing paradigm such as how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
2.	To apply the fundamental concepts in data centers to understand the tradeoffs in power, efficiency and cost.
3.	To identify resource management fundamentals like resource abstraction, sharing and sandboxing and outline their role in managing infrastructure in cloud computing.
4.	To analyze various cloud programming models and apply them to solve problems on the cloud.

Module – 1	No. of Hours
Introduction: Different Computing Paradigms- Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing etc., Comparison of various Computing Technologies; Cloud Computing Basics- What is Cloud Computing? History, Characteristic Features, Advantages and Disadvantages, and Applications of Cloud Computing; Trends in Cloud Computing; Leading Cloud Platform Service Providers.	9
Module – 2	No. of Hours
Cloud Architecture: Cloud Service Models Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS), Comparison of different Service Models; Cloud Deployment Models Public Cloud; Private Cloud, Hybrid Cloud, Community Cloud; Cloud Computing Architecture Layered Architecture of Cloud. Virtualization Definition, Features of Virtualization; Types of Virtualizations Hardware Virtualization, Server Virtualization, Application Virtualization, Storage Virtualization, Operating System Virtualization; Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology Examples Xen: Paravirtualization, VMware: Full Virtualization, Microsoft HyperV.	9
Module – 3	No. of Hours
Cloud Application Programming and the Aneka Platform: Aneka Cloud Application Platform-Framework Overview, Anatomy of the Aneka Container; Building Aneka Clouds (Infrastructure Organization, Logical Organization, Private Cloud Deployment Mode, Public Cloud Deployment Mode, Hybrid Cloud Deployment Mode); Cloud Programming and Management-Aneka SDK (Application Model and Service Model); Management Tools (Infrastructure, Platform and Application management).	9
Module – 4	No. of Hours
Cloud Platforms in Industry: Amazon Web Services-Compute Services, Storage Services, Communication Services, Additional Services; Google App Engine-Architecture and Core Concepts, Application Life-Cycle, Cost Model, Observations; Microsoft Azure Azure Core Concepts (Compute, Storage, Core Infrastructure and Other Services), SQL Azure, Windows Azure Platform	9
Module – 5	No. of Hours
Cloud Applications: Scientific Applications-Healthcare (ECG Analysis in the Cloud), Biology (Protein Structure Prediction and Gene Expression Data Analysis for Cancer Diagnosis), Geoscience (Satellite Image Processing); Business and Consumer Applications-CRM and ERP, Productivity, Social Networking, Media Applications, Multiplayer Online Gaming.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Understand and differentiate various computing paradigms and explain the basics, characteristics, advantages, and trends of Cloud Computing.
CO2	Analyze cloud service models, deployment models, cloud architecture, and comprehend the role and types of virtualizations in cloud environments.



CO3	Demonstrate the ability to build and manage cloud applications using the Aneka platform and apply cloud programming concepts effectively.
CO4	Explore and evaluate major cloud service providers such as AWS, Google App Engine, and Microsoft Azure, including their core services and architectures.
CO5	Identify and assess the role of cloud computing in scientific, business, and consumer applications across various domains.

Text Books

1.	Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi: "Mastering Cloud Computing Foundations and Applications Programming", Elsevier, 2013.
2.	K Chandrasekaran "Essentials of Cloud Computing" , CRC Press, 2015

Web links and Video lectures (e-Resources)

- NPTEL: <https://youtu.be/ZHCtVZ6cjdg>
- <https://explore.skillbuilder.aws/learn/courses/134/aws-cloud-practitioner-essentials>

ASSESSMENT DETAILS BOTH (CIE AND SEE)

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CONTINUOUS INTERNAL EVALUATION (CIE)

CIE FOR THE THEORY:

- Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
- Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
- Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes/ Weekly test / project work for 40 marks, scaled down to 20 marks.
- Total marks scored (30+20 = 50 marks).
- The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50).

SEMESTER END EXAMINATION (SEE)

- The question paper shall be set for 100 marks and duration of SEE is 3 hours.
- The question paper will have two parts: Part-A and Part-B.
- Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
- Part-B** contains total 10 questions.
- Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
- Students should answer five full questions, selecting one full question from each module.
- Question papers to be set as per the Blooms Taxonomy levels.

CO-PO Mapping

PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	3	1	1	3	-	-
CO2	3	1	2	3	3	1	-	-
CO3	3	2	2	2	1	3	-	-
CO4	3	2	3	1	1	1	-	-
CO5	1	1	2	1	1	2	-	-

Level 1-High, Level 2-Moderate, Level 3-Low



Semester - VI					
Cryptography and Network Security					
Category: PCC					
Course Code	:	B24CNS631	CIE	:	50 Marks
Teaching Hours L:T:P	:	3:0:0	SEE	:	50 Marks
Total Hours/Semester	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To understand the fundamentals of classical and modern cryptographic techniques
2.	To analyze symmetric encryption methods including block and stream ciphers.
3.	To explain pseudorandom number generation and its role in stream ciphers.
4.	To understand public-key cryptography, RSA, and cryptographic hash functions.
5.	To apply cryptographic techniques to real-world security protocols and applications.

Module – 1	No. of Hours
Classical Encryption Techniques: Symmetric Cipher Model - Substitution Techniques: Caesar Cipher - Monoalphabetic Ciphers - Play fair Cipher - Hill Cipher - Polyalphabetic Ciphers - one-Time Pad. Transposition Techniques - Steganography.	9
Module – 2	No. of Hours
Block Ciphers and the Data Encryption Standard: Traditional Block Cipher Structure: Stream Ciphers and Block Ciphers - The Feistel Cipher. Advanced Encryption Standard: AES Structure - AES Transformation Functions – An AES Example.	9
Module – 3	No. of Hours
Pseudorandom Number Generation and Stream Ciphers: Principles of Pseudorandom Number Generation - Pseudorandom Number Generators - Pseudorandom Number Generation Using a Block Cipher - Stream Ciphers.	9
Module – 4	No. of Hours
Public-Key Cryptography and RSA: Principles of Public-Key Cryptosystems - The RSA Algorithm. Cryptographic Hash Functions: Applications of Cryptographic Hash Functions - Two Simple Hash Functions - Hash Functions Based on Cipher Block Chaining.	9
Module – 5	No. of Hours
Transport-Level Security: Transport Level Security - HTTPS - Secure Shell (SSH). Email Security: Pretty good privacy.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Explain classical encryption techniques including substitution, transposition ciphers, and steganography.
CO2	Analyze block cipher structures and working principles of DES and AES algorithms.
CO3	Describe principles of pseudorandom number generation and the operation of stream ciphers
CO4	Explain public-key cryptography concepts, RSA algorithm, and cryptographic hash functions.
CO5	Apply cryptographic mechanisms to secure communication protocols such as TLS, HTTPS, SSH, and email security.

Text Books	
1.	William Stallings, Cryptography and Network Security - Principles and Practice, Pearson Education, 6th Edition, Unit - I : 2 (2.1 – 2.3, 2.5) Unit - II : 3 (3.1) and 5 (5.2, 5.3, 5.5) Unit - III : 7 (7.1 – 7.4) Unit - IV : 9 (9.1, 9.2) and 11 (11.1, 11.2, 11.4) Unit - V : 17 (17.3 – 17.5) and 19 (19.1)



Reference Text Books

1.	William Stallings , “Network Security Essentials Applications and Standards”, 2 nd edition, Pearson Education, 2003
2.	Behrouz A. Forouzan, Cryptography and Network Security, Tata McGraw Hill 2007.

Web links and Video lectures (e-Resources)

- <https://www.tutorialspoint.com/cryptography/index.htm>
- <https://www.geeksforgeeks.org/cryptography-and-its-types/>

ASSESSMENT DETAILS BOTH (CIE AND SEE)

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CONTINUOUS INTERNAL EVALUATION (CIE)

CIE FOR THE THEORY:

- Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
- Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
- Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes/ Weekly test / project work for 40 marks, scaled down to 20 marks.
- Total marks scored (30+20 = 50 marks).
- The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50).

SEMESTER END EXAMINATION (SEE)

- The question paper shall be set for 100 marks and duration of SEE is 3 hours.
- The question paper will have two parts: Part-A and Part-B.
- Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
- Part-B** contains total 10 questions.
- Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
- Students should answer five full questions, selecting one full question from each module.
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CO-PO Mapping

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CO3	3	2	2	3	2	2	-	-
CO4	2	3	3	2	3	2	-	-
CO5	2	3	2	3	2	2	-	-

Level 1-High, Level 2-Moderate, Level 3-Low



Semester - VI					
Digital Image Processing					
Category: PCC					
Course Code	:	B24DIP632	CIE	:	50 Marks
Teaching Hours L:T:P	:	3:0:0	SEE	:	50 Marks
Total Hours/Semester	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To provide the student with the fundamentals of digital image processing
2.	To give the students a taste of the applications of the theories taught in the subject. This will be achieved through the project and some selected lab sessions.
3.	To introduce the students to some advanced topics in digital image processing.
4.	To give the students a useful skill base that would allow them to carry out further study should they be interested and to work in the field

Module – 1	No. of Hours
Digital image fundamentals & Image Transforms: Digital Image fundamentals, Sampling and quantization, Relationship between pixels. Image Transforms: 2-D FFT, Properties. Walsh transforms, Hadamard Transform, Discrete cosine Transform, Discrete Wavelet Transform	9
Module – 2	No. of Hours
Image enhancement (spatial domain): Introduction, Image Enhancement in Spatial Domain, Enhancement Through Point Operation, Types of Point Operation, Histogram Manipulation, gray level Transformation, local or neighborhood operation, median filter, spatial domain high- pass filtering. Image enhancement (Frequency domain): Filtering in Frequency Domain, Obtaining Frequency Domain Filters from Spatial Filters, Generating Filters Directly in the Frequency Domain, Low Pass (smoothing) and High Pass (sharpening) filters in Frequency Domain	9
Module – 3	No. of Hours
Image Restoration: Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration	9
Module – 4	No. of Hours
Image segmentation: Detection of discontinuities. Edge linking and boundary detection, Thresholding, Region oriented segmentation Morphological Image Processing: Dilation and Erosion, Dilation, Structuring Element Decomposition, Erosion, Combining Dilation and Erosion, Opening and Closing, the Hit or Miss Transformation	9
Module – 5	No. of Hours
Image Compression: Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Huffman and Arithmetic Coding, Error Free Compression, Lossy Compression, Lossy and Lossless Predictive Coding, Transform Based Compression, JPEG 2000 Standards.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Have an appreciation of the fundamentals of Digital Image Processing including the topics of filtering, transforms and morphology, and image analysis and compression
CO2	Be able to implement basic image processing algorithms in MATLAB
CO3	Have the skill base necessary to further explore advanced topics of Digital Image Processing.
CO4	Be in a position to make a positive professional contribution in the field of Digital Image Processing.

Text Books	
1.	Digital Image Processing- Rafeal C. Gonzalez, Richard E. Woods, 3 rd Edition, Pearson, 2008
2.	Digital Image Processing- S Jayaraman, S. Essakkirajan, T. Veerakumar-TMH,2010

Reference Text Books	
1.	Digital Image Processing and analysis-human and computer vision application with using CVIP Tools – Scotte Umbaugh, 2 nd Ed, CRC Press, 2011
2.	Introduction to Digital Image Processing with Matlab, Alasdair McAndrew, Thomson Course Technology



Web links and Video lectures (e-Resources)

- <https://youtu.be/1I6kfkY4GyQ>

ASSESSMENT DETAILS BOTH (CIE AND SEE)

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CONTINUOUS INTERNAL EVALUATION (CIE)

CIE FOR THE THEORY:

1. Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
2. Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes/ Weekly test / project work for 40 marks, scaled down to 20 marks.
4. Total marks scored (30+20 = 50 marks).
5. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50).

SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
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CO-PO Mapping

PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	1	1	1	—	—	—
CO2	2	3	3	2	3	—	—	—
CO3	2	2	2	2	2	—	—	—
CO4	2	2	3	2	2	—	—	—
CO5	3	2	1	1	1	—	—	—

Level 1-High, Level 2-Moderate, Level 3-Low



MOOGAMBIGAI CHARITABLE AND EDUCATIONAL TRUST
Rajarajeswari College of Engineering
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Department of Bachelors of Computer Administration

Semester - VI					
Mobile Application Development					
Category: PCC					
Course Code	:	B24MAD633	CIE	:	50 Marks
Teaching Hours L:T:P	:	3:0:0	SEE	:	50 Marks
Total Hours/Semester	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To understand the fundamentals of mobile communication systems and smart phone technologies.
2.	To learn the architecture and development environment of Android applications.
3.	To understand Android components, layouts, graphics, and multimedia features.
4.	To design and implement mobile applications using Android SDK and related tools.
5.	To deploy and publish mobile applications in mobile marketplaces.

Module – 1	No. of Hours
Introduction to mobile communication and computing: Introduction to mobile computing, Novel applications, limitations and GSM architecture, Mobile services, System architecture, Radio interface, protocols, Handover and security. Smart phone operating systems and smart phones applications.	9
Module – 2	No. of Hours
Fundamentals of Android Development: Introduction to Android., The Android 4.1 Jelly Bean SDK, Understanding the Android Software Stack, Installing the Android SDK, Creating Android Virtual Devices, Creating the First Android Project, Using the Text View Control, Using the Android Emulator.	9
Module – 3	No. of Hours
The Intent of Android Development: Four kinds of Android Components: Activity, Service, Broadcast Receiver and Content Provider. Building Blocks for Android Application Design, Laying Out Controls in Containers. Graphics and Animation: Drawing graphics in Android, Creating Animation with Android's Graphics API.	9
Module – 4	No. of Hours
Creating the Activity: working with views: Exploring common views, using a list view, creating custom views, understanding layout. Using Selection Widgets and Debugging Displaying and Fetching Information Using Dialogs and Fragments. Multimedia: Playing Audio, Playing Video and Capturing Media. Advanced Android Programming: Internet, Entertainment, and Services.	9
Module – 5	No. of Hours
Displaying web pages and maps: communicating with SMS and emails. Creating and using content providers: Creating and consuming services, publishing android applications	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Describe the requirements for mobile applications
CO2	Explain the challenges in mobile application design and development
CO3	Develop design for mobile applications for specific requirements
CO4	Implement the design using Android SDK, Objective C and iOS
CO5	Deploy mobile applications in Android and iPone marketplace for distribution

Text Books	
1.	Mobile Computing: (technologies and Applications N. N. Jani S chand
2.	Android programming B.M.Hirwani Pearson publications 2013
3.	Android in Action W. Frank Ableson, RobiSen and C. E. Ortiz DreamTech Publisher 3 rd Edition-2012

Reference Text Books	
1.	Android Application development James C. Sheusi Cengage learning 2017

Web links and Video lectures (e-Resources)



- <https://youtu.be/1I6kfkY4GyQ>

ASSESSMENT DETAILS BOTH (CIE AND SEE)

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CONTINUOUS INTERNAL EVALUATION (CIE)

CIE FOR THE THEORY:

1. Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
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3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes/ Weekly test / project work for 40 marks, scaled down to 20 marks.
4. Total marks scored (30+20 = 50 marks).
5. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50).

SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
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PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	–	1	1	–	–	–	–	–
CO2	2	3	2	1	2	1	–	–	–	–	–
CO3	2	2	3	2	3	1	–	–	–	–	–
CO4	2	2	3	2	3	1	–	–	–	–	–
CO5	2	2	3	1	3	2	–	–	–	–	–

Level 1-High, Level 2-Moderate, Level 3-Low



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Department of Bachelors of Computer Administration

Semester - VI					
Full Stack Development					
Category: PCC					
Course Code	:	B24FSD634	CIE	:	50 Marks
Teaching Hours L:T:P	:	3:0:0	SEE	:	50 Marks
Total Hours/Semester	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To understand the essential javascript concepts for web development.
2.	To style Web applications using bootstrap.
3.	To utilize React JS to build front end User Interface.
4.	To understand the usage of API's to create web applications using Express JS
5.	To store and model data in a NOSQL database

Module – 1	No. of Hours
Introduction: Basic JavaScript Instructions, Statements, Comments, Variables, Data Types, Arrays, Strings, Functions, Methods & Objects, Decisions & Loops	9
Module – 2	No. of Hours
Document Object Model: DOM Manipulation, Selecting Elements, Working with DOM Nodes, Updating Element Content & Attributes, Events, Different Types of Events, How to Bind an Event to an Element, Event Delegation, Event Listeners.	9
Module – 3	No. of Hours
Introduction to MERN: MERN components, Server less Hello world. React Components: Issue Tracker, React Classes, Composing Components, Passing Data Using Properties, Passing Data Using Children, Dynamic Composition.	9
Module – 4	No. of Hours
React State: Initial State, Async State Initialization, Updating State, Lifting State Up, Event Handling, Stateless Components, Designing Components, State vs. Props, Component Hierarchy, Communication, Stateless Components. Express, REST API, GraphQL, Field Specification, Graph Based, Single Endpoint, Strongly Typed, Introspection, Libraries, The About API GraphQL Schema File, The List API, List API Integration, Custom Scalar types, The Create API, Create API Integration, Query Variables, Input Validations, Displaying Errors.	9
Module – 5	No. of Hours
MongoDB: Basics, Documents, Collections, Databases, Query Language, Installation, The Mongo Shell, MongoDB CRUD Operations, Create, Read, Projection, Update, Delete, Aggregate, MongoDB Node.js Driver, Schema Initialization, Reading from MongoDB, Writing to MongoDB. Modularization and Webpack ,Back-End Modules Front-End Modules and Webpack Transform and Bundle, Libraries Bundle ,Hot Module Replacement, Debugging Define Plugin: Build Configuration, Production Optimization	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Apply Javascript to build dynamic and interactive Web project
CO2	Implement user interface components for JavaScript-based Web using React.JS
CO3	Apply Express/Node to build web applications on the server side.
CO4	Develop data model in an open source nosql database.
CO5	Demonstrate modularization and packing of the front-end modules.

Text Books	
1.	Jon Duckett, "JavaScript & jQuery: Interactive Front-End Web Development", Wiley, 2014.
2.	Vasan Subramanian, Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node. Apress, 2019



Web links and Video lectures (e-Resources)

- <https://github.com/vasansr/pro-mern-stack>
- <https://nptel.ac.in/courses/106106156>
- <https://archive.nptel.ac.in/courses/106/105/106105084/>

ASSESSMENT DETAILS BOTH (CIE AND SEE)

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CONTINUOUS INTERNAL EVALUATION (CIE)

CIE FOR THE THEORY:

1. Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
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SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
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Level 1-High, Level 2-Moderate, Level 3-Low



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Semester - VI					
Data Mining and Warehousing					
Category: PCC					
Course Code	:	B24DMW641	CIE	:	50 Marks
Teaching Hours L:T:P	:	3:0:0	SEE	:	50 Marks
Total Hours/Semester	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To understand the concepts, architecture, and modeling techniques of Data Warehousing and OLAP systems .
2.	To explain the fundamentals of Data Mining , KDD process, techniques, applications, and challenges.
3.	To analyze and apply Association Rule Mining algorithms for discovering frequent patterns and relationships in data.
4.	To understand and compare various Clustering Techniques for partitioning and grouping large datasets.
5.	To design and evaluate Decision Tree models and apply Rough Set Theory for knowledge discovery and data analysis.

Module – 1	No. of Hours
Data Warehousing: Introduction – Data Warehouse Architecture – Dimensional Modelling – Categorisation of Hierarchies – Aggregate Function – Summarisability – Fact Dimension Relationship - OLAP operations – Lattice of Cuboids – OLAP Server – ROLAP – MOLAP.	9
Module – 2	No. of Hours
Data Mining: Introduction - What is Data Mining? – Data Mining: Definitions – KDD vs. Data Mining – DBMS vs. DM – Other Related Areas – DM Techniques - Other Mining Problems – Issues and Challenges in DM – DM Application Areas – DM Applications –Case Studies – Conclusion	9
Module – 3	No. of Hours
Association Rules: Introduction – What is an Association Rule? – Methods to Discover Association Rules – Apriori Algorithm – Partition Algorithm – Pincer – Search Algorithm – Dynamic Itemset Counting Algorithm – FP- tree Growth Algorithm – Éclat and dEclat – Rapid Association Rule Mining – Discussion on Different Algorithms – Incremental Algorithm – Border Algorithm – Generalized Association Rule – Association Rules with Item Constraints - Summary.	9
Module – 4	No. of Hours
Clustering Techniques : Introduction - Clustering Paradigms – Partitioning Algorithms – k – Medoid Algorithms – CLARA – CLARANS –Hierarchical Clustering – DBSCAN –BIRCH – CURE – Categorical Clustering Algorithms – STIRR – ROCK – CACTUS – Conclusion .	9
Module – 5	No. of Hours
Decision Trees: Introduction - What is a Decision Tree? – Tree Construction Principle – Best Split – Splitting Indices – Splitting Criteria – Decision Tree Construction Algorithms – CART – ID3 – C4.5 – CHAID – Summary Rough Set Theory : Introduction – Definitions – Example – Reduct- Propositional Reasoning and PIAP to Compute Reducts	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Recall some basic Database management principles and understand the concept of Data Mining and Data warehousing
CO2	Explain Data Mining Techniques Summarize the issues and Challenges in Data Mining
CO3	Describe Association rule mining technique and apply it to mine rules from some data sets
CO4	Illustrate Clustering algorithms and apply it to solve some problems
CO5	Describe Decision tree algorithms and Recall Rough set theory principles

Text Books	
1.	Arun K Pujari, 2017 Data Mining Techniques, 4th Edition , Universities Press Private Limited, Hyderabad
	Module Chapter/Section
	I 2 (2.1- 2.12)
	II 3 (3.1- 3.12)



III	4 (4.1 – 4.16)
IV	5 (5.1 – 5.15)
V	6 (6.1 – 6.12) & 7 (7.1 – 7.5)

Reference Text Books

1.	G.K. Gupta, 2014 , Introduction to Data Mining with Case studies, 3 rd Edition , PHI Learning Private Limited, Delhi
2.	Jiawei Han , Micheline Kamber , Jian Pei , 2012, Data Mining Concepts and Techniques , 3 rd Edition, Morgan Kaufmann Publishers, An Imprint of Elsevier , New Delhi.
3.	Ian H.Witten , Eibe Frank, Mark A. Hall, Christopher J. Pal ,2016, Data Mining Practical Machine Learning Tools and Techniques, 4 th Edition, Morgan Kaufmann Publishers, Imprint of Elsevier , New Delhi.

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1. Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
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SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
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3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
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CO4	3	3	2	2	3	2	-	-
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Level 1-High, Level 2-Moderate, Level 3-Low



MOOGAMBIGAI CHARITABLE AND EDUCATIONAL TRUST
Rajarajeswari College of Engineering
 (An Autonomous Institution under Visvesvaraya Technological University, Belagavi)
Department of Bachelors of Computer Administration

Semester - VI					
Software Testing					
Category: PCC					
Course Code	:	B24SOT642	CIE	:	50 Marks
Teaching Hours L:T:P	:	3:0:0	SEE	:	50 Marks
Total Hours/Semester	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To understand fundamental principles of software testing, defect management, quality concepts, and test adequacy criteria
2.	To analyze different testing perspectives, error taxonomies, and apply testing techniques to classical software problems.
3.	To apply black-box testing techniques such as boundary value analysis, equivalence class testing, decision tables, and random testing.
4.	To implement white-box testing methods including path testing, data flow testing, basis path testing, and integration testing strategies.
5.	To design fault-based testing approaches, mutation analysis, test planning, risk management, and quality assurance documentation.

Module – 1	No. of Hours
Basics of Software Testing: Basic Principles, Test case selection and Adequacy Humans, Errors and Testing, Software Quality; Requirements, Behavior and Correctness, Correctness Vs Reliability; Testing and Debugging; Test Metrics; Software and Hardware Testing; Testing and Verification; Defect Management; Execution History; Test Generation Strategies; Static Testing; Test Generation from Predicates. Sensitivity, Redundancy, Restriction, Partition, Visibility and Feedback, Test Specification and cases, Adequacy Criteria, Comparing Criteria.	9
Module – 2	No. of Hours
A perspective on Testing: Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Level of testing, Examples: Generalized pseudo code, The triangle problem, the Next Date function, The commission problem, The SATM (Simple Automation Teller Machine) problem, The currency converter, Saturn windshield wiper	9
Module – 3	No. of Hours
Boundary value testing, Equivalence class testing, Decision table-based testing Boundary value analysis, Robustness testing, Worst-case testing, special value testing, Examples, Random testing, Equivalence classes, Equivalence test cases for triangle problem, Next Date function and commission problem, Guidelines and observations, Decision tables, Test cases for triangle problem	9
Module – 4	No. of Hours
Path Testing, Data flow testing, Levels of Testing, Integration Testing DD Paths, Test coverage metrics, Basis path testing, guidelines and observations, Definition Use testing, Slice based testing, Guidelines and observations. Traditional view of testing levels, Alternative life cycle models, the SATM systems, separating integration and system testing, Guidelines and observations.	9
Module – 5	No. of Hours
Fault Based Testing, Planning and Monitoring the Process, Documenting Analysis and Test Assumptions in fault-based testing, Mutation Analysis, Fault-based Adequacy Criteria; Variations on mutation Analysis; From Test case specification to Test Cases, Scaffolding, Generic vs. specific Scaffolding, Test Oracles, Self checks as oracles, Capture and Replay. Quality and Process, Test and Analysis strategies and plans, Risk Planning, Monitoring the Process, Improving the process, The quality team, Organizing documents, Test strategy document, Analysis and test plan, Test design specifications documents, Test and analysis reports.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Acquire knowledge of basic principles and knowledge of software testing and debugging and test cases.
CO2	Will be able to understand the perceptions on testing like levels of testing, generalized pseudo code and with related examples.
CO3	To study the various types of testing.



CO4	Differentiate between functional testing and structural testing.
CO5	Analyze the performance of fault based testing, planning and Monitoring the process, Documentation testing.

Text Books

1.	AdithyaP.Mathur “ Foundations of Software Testing – Fundamental Algorithms and Techniques”, Pearson Education India, 2011
2.	Mauro Pezze, Michael Young, Software testing and Analysis- Process, Principles and Techniques, Wiley India, 2012
3.	Paul C Jorgensen, “Software Testing A Craftsman's Approach”, Auerbach publications, 3 rd edition, 2011.

Reference Text Books

1.	KshirasagaraNaik, PriyadarshiTripathy: Software Testing and Quality Assurance, Wiley India 2012
2.	M.G.Limaye: Software Testing-Principles, Techniques and Tools – McGraw Hill, 2009

ASSESSMENT DETAILS BOTH (CIE AND SEE)

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

CONTINUOUS INTERNAL EVALUATION (CIE)

CIE FOR THE THEORY:

1. Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
2. Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes/ Weekly test / project work for 40 marks, scaled down to 20 marks.
4. Total marks scored (30+20 = 50 marks).
5. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50).

SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

CO-PO Mapping

PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	1	2	2	2	1	-	-
CO2	1	2	1	3	2	1	-	-
CO3	2	2	2	2	1	1	-	-
CO4	1	3	1	2	1	2	-	-
CO5	3	1	1	1	1	-	-	-

Level 1-High, Level 2-Moderate, Level 3-Low



Semester - VI					
Ethical Hacking					
Category: PCC					
Course Code	:	B24ETH643	CIE	:	50 Marks
Teaching Hours L:T:P	:	3:0:0	SEE	:	50 Marks
Total Hours/Semester	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objective is	
1.	To learn aspects of security, importance of data gathering, foot printing and system hacking
2.	To learn tools and techniques to carry out a penetration testing
3.	To how intruders escalate privileges?
4.	To explain Intrusion Detection, Policy Creation, Social Engineering, DDoS Attacks, Buffer Overflows and Virus Creation.
5.	To compare different types of hacking tools.

Module – 1	No. of Hours
Casing the Establishment: What is foot printing, Internet Foot printing, Scanning, Enumeration, basic banner grabbing, Enumerating Common Network services. Case study: Network Security Monitoring.	9
Module – 2	No. of Hours
Securing permission: Securing file and folder permission, Using the encrypting file system, Securing registry permissions. Securing service: Managing service permission, Default services in windows 2000 and windows XP. Unix: The Quest for Root, Remote Access vs Local access, Remote access, Local access, After hacking root.	9
Module – 3	No. of Hours
Dial-up, PBX, Voicemail and VPN hacking, Preparing to dial up, War-Dialing, BruteForce Scripting PBX hacking, Voice mail hacking, VPN hacking, Network Devices: Discovery Autonomous System Lookup, Public Newsgroups, Service Detection, Network Vulnerability, Detecting Layer 2 Media	9
Module – 4	No. of Hours
Wireless Hacking: Wireless Foot printing, Wireless Scanning and Enumeration, Gaining Access, Tools that exploiting WEP Weakness, Denial of Services Attacks, Firewalls: Firewalls landscape, Firewall Identification-Scanning Through firewalls, packet Filtering, Application Proxy Vulnerabilities, Denial of Service Attacks, Motivation of Dos Attackers, Types of DoS attacks, Generic Dos Attacks, UNIX and Windows DoS.	9
Module – 5	No. of Hours
Remote Control Insecurities, Discovering Remote Control Software, Connection, Weakness.VNC, Microsoft Terminal Server and Citrix ICA, Advanced Techniques Session Hijacking, Back Doors, Trojans, Cryptography, Subverting the systems Environment, Social Engineering, Web Hacking, Web server hacking web application hacking, Hacking the internet Use, Malicious Mobile code, SSL fraud, E-mail Hacking, IRC hacking, Global countermeasures to Internet User Hacking.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Explain foot-printing, scanning, enumeration techniques, and network security monitoring concepts.
CO2	Apply security configurations for file systems, services, registry, and analyze privilege escalation in Windows and Unix systems.
CO3	Analyze vulnerabilities in dial-up, PBX, voicemail, VPN, and network devices using discovery and service detection techniques.
CO4	Evaluate wireless security threats, firewall mechanisms, and different types of Denial of Service (DoS) attacks.
CO5	Assess remote control insecurities, session hijacking, web and email attacks, cryptographic issues, and global countermeasures for Internet security.

Text Books	
1.	Stuart McClure, Joel Scambray and Goerge Kurtz, Hacking Exposed 7: Network Security Secrets & Solutions, Tata Mc Graw Hill Publishers, 2010



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2.	Bensmith, and Brian Komer, Microsoft Windows Security Resource Kit, Prentice Hall of India, 2010.
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1.	Stuart McClure, Joel Scambray and Goerge Kurtz, "Hacking Exposed Network Security Secrets & Solutions", 5 th Edition, Tata Mc Graw Hill Publishers, 2010
2.	Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, "Gray Hat Hacking The Ethical Hackers Handbook", 3 rd Edition, McGraw-Hill Osborne Media paperback(January 27, 2011)

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Semester - VI					
Introduction to Data Science					
Category: PCC					
Course Code	:	B24IDS644	CIE	:	50 Marks
Teaching Hours L:T:P	:	3:0:0	SEE	:	50 Marks
Total Hours/Semester	:	45	Total	:	100 Marks
Credits	:	3	SEE Duration	:	3 Hrs

Course Learning Objectives	
1.	To provide a foundation in data Science terminologies
2.	To familiarize data science process and steps
3.	To Demonstrate the data visualization tools
4.	To analyze the data science applicability in real time applications.

Module – 1	No. of Hours
Preparing and Gathering Data and Knowledge: Philosophies of data science – Data science in a big data world – Benefits and uses of data science and big data – facts of data: Structured data, Unstructured data, Natural Language, Machine generated data, Audio, Image and video streaming data – The Big data Eco system: Distributed file system, Distributed Programming framework, Data Integration frame work, Machine learning Framework, NoSQL Databases, Scheduling tools, Benchmarking Tools, System Deployment, Service programming and Security.	9
Module – 2	No. of Hours
The Data Science Process: Overview of the data science process- defining research goals and creating project charter, retrieving data, cleansing, integrating and transforming data, exploratory data analysis, Build the models, presenting findings and building application on top of them.	9
Module – 3	No. of Hours
Machine Learning: Application for machine learning in data science- Tools used in machine learning- Modeling Process – Training model – Validating model – Predicting new observations – Types of machine learning Algorithm: Supervised learning algorithms, Unsupervised learning algorithms.	9
Module – 4	No. of Hours
Visualization: Introduction to data visualization – Data visualization options – Filters – MapReduce – Dashboard development tools.	9
Module – 5	No. of Hours
Case Studies: Distributing data storage and processing with frameworks – Case study: e.g, Assessing risk when lending money.	9

Course Outcomes: At the end of the course, the students will be able to	
CO1	Describe the data science terminologies
CO2	Apply the Data Science process on real time scenario.
CO3	Analyze data visualization tools
CO4	Apply Data storage and processing with frameworks.

Text Books	
1.	Introducing Data Science, Davy Cielen, Arno D. B. Meysman and Mohamed Ali, Manning Publications, 2016.

Reference Text Books	
1.	Doing Data Science, Straight Talk from the Frontline, Cathy O’Neil, Rachel Schutt, O’ Reilly, 1 st edition, 2013.
2.	Think Like a Data Scientist, Brian Godsey, Manning Publications, 2017.

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