THE NATIONAL INSTITUTE OF ENGINEERING

MYSORE – 8

(Autonomous Institution under VTU)

B.E in CSE

Scheme of Teaching and Blown-up Syllabus

V Semester (2022 admitted)

Department of Computer Science and Engineering

The National Institute of Engineering, Mysuru

Department of Computer Science and Engineering

Vision

The department will offer, through best-in-class faculty and infrastructure, globally acceptable education in Computer Science and produce highly competent and value-based computer engineers.

Mission

1. To evolve into an outstanding department contributing significantly to teaching, research and consultancy in computer science in an integrated manner.
2. To develop state-of-the-art infrastructure and advanced computing facility in tune with requirement of industry and national projects.
3. To promote innovation and entrepreneurship to enhance competence of graduates of computer science.

Program Outcomes (POs)

PO1: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

PO5: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

PO6: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice

PO7: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

PSO1: The ability to understand, analyze and develop software in the emerging areas for efficient use of computer –based systems of varying complexity.

PSO2: The ability to think logically and apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product.

Program Educational Objectives (PEOs)

PEO1: Acquire the necessary mathematical and scientific knowledge as well as basic managerial and financial procedures to analyze and solve real world problems within their work domain.

PEO2: Acquire the state-of-art knowledge in major areas of computing science like programming, networking, information security and algorithm development as well as technology solutions like cloud, database systems and mobile applications to enable them to succeed in pursuit of higher studies/ Industry/R&D activity.

PEO3: Have the ability and the mindset to continuously update and innovate.

PEO4: Have the necessary communication skills to be able to effectively communicate with technical experts and also non- technical end users.

The National Institute of Engineering

Scheme of Teaching & Examination (2022 Scheme)

Department: Computer Science and Engineering (BE in CS&E)

B.E. 2022 and 2023 Admitted Batch

V Semester

Sl. No	Type of Course	Course Code	Course Title	Teaching Department (TD)	Question Paper setting Board (PSB)	L	T	P	S	Duration in Hours	CIE Marks	SEE Marks	Total Marks	Credits
1	HSMS	BCS501	Software Engineering & Project Management	CS	CS	3	0	0		3	50	50	100	**3**
2	IPCC	BCS502	Computer Networks	CS	CS	3	0	2		3	50	50	100	**4**
3	PCC	BCS503	Automata Theory and Computation	CS	CS	3	2	0		3	50	50	100	**4**
4	PCCL	BCSL504	Full Stack Development Lab	CS	CS	0	0	2		3	50	50	100	**1**
5	PCC	BCS505	Full Stack Development	CS	CS	3	0	0		3	50	50	100	**3**
6	PEC	BXX516X	Professional Elective Course (Industry suggested course) - Group I	CS	CS	3	0	0		3	50	50	100	**3**
7	PROJ	BXX586	Minor Project	CS	CS	0	0	2		-	50	-	50	**1**
8	AEC	BRMK557	Research Methodology and IPR	CS	CS	2	0	0		2	50	50	100	**2**
9	MC	BESK508	Environmental Studies	Civil Engg	Civil	1	0	0		-	50	-	50	**1**
10	MC	BNSK559	National Service Scheme (NSS)	NSS Coordinator		0	0	2		–	100	–	100	**0**
		BPEK559	Physical Education (PE) (Sports & Athletics)	PED										
		BYOK559	Yoga	Yoga Teacher										
									Total		**550**	**350**	**900**	**22**

Professional Elective Course - Group I

Course Code	Course Name
BCS516A	Computer Graphics
BCS516B	Artificial Intelligence
BCS516C	Unix System Programming

Course Code: BCS501   Course:Software Engineering & Project Management
Credits: 3   L:T:P - 3:0:0
SEE: 50%   CIE: 50%
SEE Hours: 3   Max. Marks: 100

Prerequisites if any	NIL
Learning objectives	1. Learn the fundamentals of software engineering process and process models 2. Learn to use appropriate analysis and modeling techniques for building a software systems for real world problems 3. Learn to validate the software systems using testing strategies 4. Use suitable software project estimation model for developing software

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

COs	Course Outcomes	Bloom's level
CO1	Describe the fundamentals of Software Engineering Process and Process Models.	Understand
CO2	Discuss requirement engineering tasks.	Understand
CO3	Prepare quality software system using design principles.	Apply
CO4	Use software testing techniques to perform system validations.	Apply
CO5	Apply an effective software project estimation model for developing software product.	Apply

Mapping with POs and PSOs

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2
CO1	3	1	2	1	1	-	-	-	2	2	-	2		1	-
CO2	3	2	1	1	2	-	-	-	1	1	2	2		2	-
CO3	1	1	3	1	2	-	-	-	2	2	-	2		3	-
CO4	3	1	1	2	1	-	-	-	1	1	-	2		1	2
CO5	3	3	3	2	1	2	-	2	2	2	2	2		2	3

Mapping Strength: Strong-3   Medium-2   Low -1

Course Structure

No.	Module	No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
Module -1				
1.1	Introduction to Software engineering	2	-	-
1.2	The Software Process: Software Engineering, A Layered Technology, A Process Frame Work, Capability Maturity Model Integration	3	-	-
1.3	Process Models: Incremental Process Models, Evolutionary Process Models	3	-	-
Module – 2				
2.1	Agile View of Process: Agility, Agile Process, Agile Process Model	3	-	-
2.2	Requirement Engineering: Requirement Engineering Tasks, Initiating Requirement Engineering Process, Developing USE-CASE	4	-	-
Module – 3				
3.1	Building The Analysis Model: Requirement Analysis, Analysis Modeling Approach, Data Modeling concept, Scenario Based Modeling, Flow Based Modeling, and Behavioral Modeling	4	-	-
3.2	Design Engineering: Design Process and Design Quality, Design Concepts	4	-	-
3.3	Creating an Architectural Design: Software Architecture, Data Design, Architectural Styles and Patterns	3	-	-
Module-4				
4.1	Testing Strategies: A Strategic Approach to Software Testing, Test Strategies for Conventional Software, validation testing	3	-	-
4.2	Testing Tactics: Software Testing Fundamentals, Black Box & White Box Testing, Basis Path Testing, Black Box Testing	4	-	-
Module – 5				
5.1	Project Management: Project Management Spectrum, People, Product, Process, Project	3	-	-
5.2	Software Project Estimation: Decomposition Techniques, Empirical Estimation Models	3	-	-
5.3	Report writing	1	-	
Total No. of Lecture Hours		**40**	**-**	**-**
Total No. of Tutorial Hours			**0**	**-**
Total No. of Practical Hours				**-**

Text Books:
1. Software Engineering: A Practitioners Approach – Roger S. Pressman, 7th Edition, McGraw-Hill 2010

Reference Books:
1. Software Engineering: Ian Somerville, 10th Edition, Pearson Education, 2016.
2. Software Engineering Theory and Practice: Shari Lawrence Pfleeger, Joanne M. Atlee, 3rd Edition, Pearson Education, 2006.
3. Software Engineering Principles and Practice: Waman S Jawadekar, Tata McGraw Hill, 2004

Online Resources:
1. https://www.digimat.in/nptel/courses/video/106101061/L01.html
2. https://www.digimat.in/nptel/courses/video/106105182/L01.html
3. https://www.coursera.org/learn/software-processes-and-agile-practices

(2022 SCHEME)

Course Code: BCS502   **Course Name:** Computer Networks
Credits: 4   **L: T:P - 3:0:2**
SEE: 50% Marks   **CIE: 50% Marks**
SEE Hours: 3   **Max. Marks: 100**

Prerequisites if any	Basic concepts of communication, Digital electronics and computers.
Learning objectives	1. To Understand the fundamentals of Networks and study Networking Models and services at Network layer. 2. To Analyze the IPv4, IPv6 addressing mechanism and subnetting concepts. 3. Discuss the Services and functioning of protocols of Network, Transport and Application layers. 4. To Demonstrate working of networking concepts and functioning of protocols using Cisco packet tracer.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes
CO1	Understand and nalyzethe different networking models, network layer services, Performance,IPV4 and IPV6 addressing mechanism.
CO2	Describe the working of Unicast and Multicast routing protocols.
CO3	Discuss the Transport Layer services and functioning of connectionless and connection-oriented protocols.
CO4	Describe the functioning of popular application layer protocols.
CO5	Demonstrate the various networking concepts and working of protocols using Cisco packet tracer.

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2
CO1	3	3	1	2	1	1	1	1	1	1	2	2		2	2
CO2	3	3	2	2	2	1	1	1	1	1	2	2		3	2
CO3	3	3	2	1	2	1	1	1	1	1	2	2		3	2
CO4	3	3	2	1	3	1	1	2	3	1	2	2		3	3
CO5	3	3	3	2	3	2	2	2	2	1	3	2		3	3

Mapping Strength: **Strong– 3**   **Medium – 2**   **Low – 1**

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
Module – 1: Introduction to Computer Networks and Network Layer				
1.1	Networks	1	-	-
1.2	Network Types	1		
1.3	**Networks Models:** TCP/IP Protocol Suite, The OSI Model.	1		
1.4	**Network Layer:** Network layer services: Packetizing, Routing and forwarding, other services	1	-	-
1.5	**Packet switching:** Datagram approach, Virtual-Circuit approach	2	-	-
1.6	Network layer performance	1	-	-

	Module – 2: Network Layer-Part I			
2.1	IPv4 addresses: Address space, Classful addressing	1	-	-
2.2	Classless addressing	2	-	-
2.3	DHCP, NAT	1	-	-
2.4	Forwarding of IP Packets: Forwarding Based on Destination Address	1		
2.4	**Network Layer Protocols:** Internet Protocol, (IP): IPV4 Datagram format	1	-	-
2.5	Fragmentation	1	-	-
2.6	Options, Security of IPV4 datagram, ICMP Checksum	1	-	-
2.7	**Next Generation IP:** IPV6 Addressing	1	-	-
2.8	The IPV6 Protocol	1	-	-
	Module – 3: Network Layer-Part II			
3.1	**Unicast Routing:**Routing Algorithms: Distance Vector Routing,	1	-	-
3.2	Link state Routing	1		
3.3	Unicast Routing Protocols: Routing Information Protocol (RIP)	1	-	-
3.4	OSPF	1	-	-
3.5	Border Gateway Protocol (BGP): operation of External BGP (eBGP), Operation of Internal BGP (eBGP)	2	-	-
3.6	**Multicast Routing:** Introduction, Unicasting, Multicasting, broadcasting	1	-	-
3.7	MOSPF	1	-	-
	Module – 4:Transport Layer			
4.1	**Transport Layer:** Transport Layer Services: process-to-process communication, ICANN Ranges, Encapsulation and Decapsulation, Multiplexing and Demultiplexing, Flow control and Error Control	1	-	-
4.2	connectionless and connection-oriented service, Transport Layer protocols: Introduction, services, port numbers	1	-	-
4.3	User Datagram Protocol: User Datagram and UDP services	1	-	-
4.4	Transmission Control Protocol: TCP services, TCP features, Segment	1	-	-
4.5	TCP connection, Windows in TCP, Flow control (in brief)	2	-	-
4.6	Error control: checksum, acknowledgement, generating acknowledgement, Retransmission- Retransmission after RTO, retransmission after 3 duplicates, Out of order segments	1	-	-
4.7	TCP congestion control: congestion window, congestion detection, Congestion policies, fast recovery	1	-	-
	Module – 5: Application Layer			
5.1	**Application Layer:** Application-Layer Paradigms, Application Programming Interface (Socket and socket address)	2	-	-
5.2	**Standard ClientServer Protocols:** World Wide Web	1	-	-
5.3	HTTP	1		
5.4	FTP	1	-	-
5.5	Electronic Mail	1		
5.6	TELNET	1		
5.7	Secure Shell (SSH) - components, Domain Name System (DNS)	1	-	-
	Total No. of Hours	**40 Hours**		
	List of Experiments			
1	Study of networking devices like Hub, Repeater, Bridge, Switch,			1

	Router, Gateway, Access point, MODEM and NIC			
2	Write a program to implement the following Error Detection Techniques a. Cyclic Redundancy Check (CRC) b. Checksum			1
3	a)Introduction to Cisco packet tracer. b) Create basic topologies and assign IP address, subnet mask, gateway IP address and test connectivity using PING command.			1

4	Perform :
	  a) An Initial Switch Configuration.
	(Host name, Console password, vty password, Privileged EXEC mode password, Privileged EXEC mode secret, IP address on VLAN1 interface, Default gateway)
	
	  b) An Initial Router Configuration.
	(Configure the router host name, configure the passwords, configure the banner messages, verify the router configuration)
				1

5	Configure and implement DHCP service in a Local Area Network. also configure Cisco Router as a DHCP sever.			1
6	a. Implement the Static Routing and Default Routing. b. Configure WEP on a Wireless Router.			1
7	Configure Dynamic Routing using RIP.			1
8	Using TCP/IP sockets, write a client – server program to make the client send the file name and to make the server send back the contents of the requested file if present.			1
9	Configure and implement DNS service.			1
10	Defining and using Access Control Lists.			1
	Total No. of Lecture Hours	**40**	-	1
	Total No. of Tutorial Hours		**00**	-
	Total No. of Practical Hours			**10**
	Total			**50**

Textbook:

1. **BehrouzForouzan," Data Communications and Networking", Tata McGraw-Hill, 5th Edition, 2013.**

   Module 1:
   Chapter 1: 1.2,1.3
   Chapter 2:2.2,2.3
   Chapter 18: 18.2,18.3,18.4(18.4.1,18.4.2,18.4.3,18.4.4,18.4.5)

   Module 2:
   Chapter 18: 18.5(18.5.1)
   Chapter 19: 19.1.1,19.1.2,19.1.3,19.1.4, 19.2.3
   Chapter 22: 22.1,22.2

Module 3:
Chapter 20:20.2(20.2.1,20.2.2),20.3(20.3.2,20.3.3,20.3.4),
Chapter21 : 21.1 , 21.3.2

Module 4:
Chapter 23: 23.1.1,
Chapter 24: 24.1(24.1.1,24.1.2), 24.2(24.2.1,24.2.2), 24.3(24.3.1, 24.3.2, 24.3.3, 24.3.4, 24.3.6, 24.3.7, 24.3.8, 24.3.9)

Module 5:
Chapter 25: 25.1.2,25.2.1
Chapter 26: 26.1(26.1.1, 26.1.2), 26.2, 26.3(26.3.1), 26.4, 26.5(26.5.1), 26.6.

Reference Book:

1. Larry Peterson and Bruce S Davis "Computer Networks: A System Approach 5th Edition, Elsevier -2014
2. Computer Networks, Andrew S. Tanenbaum, Pearson Education, 4th Edition, 2002.
3. Data and Computer Communication, William Stallings, Pearson Education, 8th Edition, 2007

Online Resources:

1. https://archive.nptel.ac.in/courses/106/105/106105183/

Code: BCS503 **Course: Automata Theory and Computation**
Credits: 4 **L:T:P - 3:2:0**
SEE: 100 Marks **CIE: 100 Marks**
SEE Hours: 3 **Max. Marks:100**

Prerequisites if any	Any Programming language, Discrete Mathematical structures
Learning objectives	1. To give an overview of the theoretical foundations of computer science from the perspective of formal languages and illustrate finite state machines to solve problems in computing 2. To familiarize Regular grammars, context frees grammar and also to explain the hierarchy of problems arising in the computer sciences.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Discuss basic concepts of formal languages and Automata Theory	Understanding
CO2	Design Finite Automata for different Regular Expressions and Languages	Apply
CO3	Construct context free grammar for various languages	Apply
CO4	Analyze and solve problems related to normal form techniques, push down automata and Turing Machines	Analyze

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2
CO1	3	2	2	3	-	-	-	-	-	-	-	2			
CO2	3	3	3	3	2	-	-	-	3	2	2	2		3	2
CO3	3	3	3	3	2	-	-	-	3	2	2	2		2	2
CO4	3	3	3	3	2	-	2	-	3	2	2	2		2	2

Mapping Strength: Strong– 3   Medium – 2   Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
Module – 1: Introduction to Automata Theory			
1.1	Central Concepts of Automata Theory	1		
1.2	Finite Automata - Deterministic Finite Automata	2	1	
1.3	Non Deterministic Finite Automata, NFA to DFA	2		
1.4	Finite Automata with Epsilon Transitions	1		
1.5	Elimination of Epsilon Transitions	1	1	

	Module – 2: Regular Expressions and Languages			
2.1	Regular Expressions	2		
2.2	Finite Automata and Regular Expressions – DFA to Regular Expression – Kleen's closure	2	1	
2.3	Finite Automata to Regular Expression – State elimination	2		
2.4	Regular Expression to Finite automata	1	1	
2.5	Applications of Regular Expressions	1		
	Module – 3: Properties of Regular Languages, Context Free Grammars			
3.1	Proving Languages not to be regular, Closure Properties of regular languages	2		
3.2	Equivalence and Minimization of Automata	2	1	
3.3	Context Free Grammars	2	1	
3.4	Leftmost, rightmost Derivations, Parse Trees, Ambiguity in Grammars	2		
	Module – 4: Pushdown Automata			
4.1	Pushdown Automata, Languages of PDA	2	1	
4.2	Equivalence of PDA and CFG – Grammars to PDA	2		
4.3	Elimination of Epsilon, Unit Productions, Useless productions	2	1	
4.4	Chomsky Normal Form	2	1	
	Module – 5: Turing Machines			
5.1	Introduction to Turing Machines	2		
5.2	Notation , Instantaneous description and transitions of Turning Machine	2	1	
5.3	Post's Correspondence Problem	2		
5.4	Introduction to Class P and NP problems	2		
Total No. of Lecture Hours		**40**	-	-
Total No. of Tutorial Hours			**10**	**-**
Total No. of Practical Hours				**00**

Textbook:

1. Textbook 1
   John E Hopcroft, Rajeev Motwani, Jeffrey D Ullman, Introduction to Automata Theory, Languages, and Computation, 3rd Edition, Pearson Education

Reference Book:

1. Sipser, Michael. Introduction to the Theory of Computation. 3rd ed. Cengage Learning, 2012. ISBN: 9781133187790.
2. Peter Linz, An Introduction to Formal Languages and Automata, 6/e

Code: BCSL504   **Course: Full stack development LAB**
Credits: 1   **L:T:P - 0:0:2**
SEE: 50%   **CIE: 50%**
 Examination type(SEE): practical
 Hours: 2   **Max. Marks: 100**

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes
CO1	Create web pages using HTML and CSS.
CO2	Apply core constructs and event handling mechanisms of JavaScript to develop webpages.
CO3	Create dynamic web applications by implementing features of ReactJS.
CO4	Create RESTful API's using Node.js.
CO5	Apply CRUD operations (Create, Read, Update, Delete) in MongoDB using queries

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2
CO1	1	-	3	-	2	1	1	-	2	2	1	3		3	3
CO2	1	-	2	-	2	1	1	-	2	2	1	2		3	3
CO3	1	2	3	2	3	1	1	1	2	2	2	2		3	3
CO4	1	2	3	2	3	1	1	1	2	2	2	2		3	3

Sl. No	LAB EXPERIMENTS	COURSE OUTCOME
1	a. Design a html page as shown below. **BOOK DETAILS** Author: [ ] Title: [ ] Price: [ ] [Submit] [Reset] b. Write a HTML program for the demonstration of Lists. (i)Unordered List. (ii)Ordered List. (iii)Descriptive List.	CO1

2	Create the below registration form using forms in HTML **Contact Form Example** A complete **HTML Form** with all inputs, select dropdown, radio buttons, checkbox, textarea, submit and reset buttons. Name Email [Check] Age Country India Password Resume [Choose File] No file chosen Hobbies ☑ Cricket ☐ Football Gender ○ Female ○ Male City --Choose City-- ▼ Address [Submit] [Reset]	CO1
3	Build a responsive web application for shopping cart with registration, login, catalog and cart pages using CSS features.	CO1
4	Write JavaScript to validate the following fields of the Registration page. 1. First Name (Name should contains alphabets and the length should not be less than 6 characters). 2. Password (Password should not be less than 6 characters length). 3. E-mail id (should not contain any invalid and must follow the standard pattern ame@domain.com) 4. Mobile Number (Phone number should contain 10 digits only). 5. Last Name and Address (should not be Empty).	CO2

5	Develop and demonstrate JavaScript with POP-UP boxes and functions for the following problems:
	  a) Input: Click on Display Date button using onclick () function
	    Output: Display date in the textbox
	  b) Input: Obtain a number using prompt
	    Output: Factorial of n number using alert
		CO2

6	Write a JavaScript program to generate a for loop that will iterate from 0 to 15. For each iteration, it will check if the current number is odd or even, and display a message to the screen using map and filters.	CO2
7	Write a JavaScript program that modifies the DOM to change the content of an HTML element. Add event listeners to handle button clicks and dynamically change text on the page.	CO2
8	Write a JavaScript program that handles events triggered by the body, button, text box, and password field	CO2
9	Write a JavaScript program to find HTML elements using various methods in JavaScript, such as by id, tag name, class name, CSS selectors, and HTML object collections.	CO2
10	Create a React application that demonstrates the use of state and props. Implement a parent component that maintains state and passes it down to child components via props. Show how changes in state affect the rendering of the child components.	CO3
11	Develop a React program that utilizes hooks, such as useState and useEffect, within a functional component.	CO3
12	Write a React program that demonstrates the component life cycle phases mounting, updating and unmounting.	CO3
13	Write a React program that implements error handling using error boundaries.	CO3
14	Write a React program that integrates React Router into a React application.	CO3

15	Write a program that connects to MongoDB using Nodejs and performs basic query.	CO4
16.	Describe the following operations in MongoDB. **a)** switch to a new database called **companyDB.** b) Create a new collection called **employees.** c) Insert a few documents into the **employees** collection d) Query all documents in the **employees** collection e) Query documents where the age is greater than 30 f) Insert a new document into the **employees** collection g) Find a document where the name is "Alice" h) Update the age of the employee named "Bob" i) Delete the employee named "Charlie" j) Retrieve only the name and department fields for all employees k) Calculate the average age of employees in each department	CO5
17.	Demonstrate the following operations using Mongo shell script a) switch to the schoolDB database, create a teachers collection, and insert documents with fields name, subject, and experience (in years). b) Use the Mongo shell to export the students collection to a JSON file. Import the JSON file back into a new collection named studentsBackup.	CO5
18.	Create and demonstrate the following in Mongo DB a) Projection operators ($, $elematch and $slice) b) Execute query selectors (Any one comparison selectors, Any one logical selectors) c) Execute Aggregation operations ($avg, $min, $max, $push, $addToSet.)	CO5

Code: BCS505	Course: Full stack development
Credits: 3	L:T:P - 3:0:0
SEE: 50%	CIE: 50%
SEE Hours: 3	Max. Marks: 100

Prerequisites if any	Basic knowledge about computer programming.
Learning objectives	1. Create web page using HTML & CSS
	2. Develop familiarity with the JavaScript language, realize concepts commonly used in dynamic language programming, such as introspection, higher-order functions, closures, familiar with common libraries and tools that are used in web application development.
	3. To Create React Components, lifecycle of components, rendering list and portal and perform some simple tests, and error handling.
	4. To create Node.js modules, events and database access and interact with databases using MongoDB.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes
CO1	Create web pages using HTML and CSS.
CO2	Apply core constructs and event handling mechanisms of JavaScript to develop webpages.
CO3	Create dynamic web applications by implementing features of ReactJS.
CO4	Create RESTful API's using Node.js.
CO5	Apply CRUD operations (Create, Read, Update, Delete) in MongoDB using queries

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	3	-	2	1	1	-	2	2	1	3	3	3
CO2	1	-	2	-	2	1	1	-	2	2	1	2	3	3
CO3	1	2	3	2	3	1	1	1	2	2	2	2	3	3
CO4	1	2	3	2	3	1	1	1	2	2	2	2	3	3

Mapping Strength: **Strong– 3**   **Medium – 2**   **Low – 1**

Course Structure

Nos.	Modules -1:HTML &CSS	No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
1.1	Introduction to HTML, Basic syntax, Standard HTML Document Structure, Images,	1	-	
1.2	Paragraphs, Line Breaks, Heading Tags, Font Styles, Sizes, Color, Character Entity	1	-	
1.3	Links, Lists, tables, form tags, Background images, span and div tags.	2	-	-
1.4	Introduction to CSS, Applying CSS to HTML, CSS selectors, properties and values.	2	-	-
1.5	Font properties, text decoration, List property, CSS Colors and background, CSS Box Model.	1	-	-

Module – 2: JavaScript			
2.1	Introduction to JavaScript, General syntactic characteristics.	1	-	-
2.2	Primitives, operations, expressions.	1	-	-
2.3	Screen output and keyboard input, Control statements.	1	-	-
2.4	Object creation &modification, arrays, array methods, Functions.	1	-	-
2.5	map (), reduce() and filter() .	1		
2.6	JavaScript and HTML Documents: The JavaScript execution environment, The Document Object Model, Element access in JavaScript, Events and Event handling.	2	-	-
2.7	Handling events from the Body elements, Button elements, Text box and Password elements.	2	-	-
Module – 3: ReactJS			
3.1	Introduction, Templating using JSX	1	-	-
3.2	Components, State, Props and Hooks.	2	-	-
3.3	Lifecycle of Components	2	-	-
3.4	Rendering List and Portals	2	-	-
3.5	Error Handling, Routers	2	-	-
Module – 4: NodeJS			
4.1	Node.js overview, Node.js – basics and setup.	1	-	-
4.2	Node.js console, Node.js command utilities	2	-	-
4.3	Node.js modules, Node.js concepts	3	-	-
4.4	Node.js events, Node.js database access.	2		-
Module – 5: MongoDB			
5.1	MongoDB basics: Documents, collections, database query language, mongo shell.	2	-	-
5.2	MongoDB CRUD operations (create, read, projection, update, delete aggregate)	2	-	-
5.3	Reading from MongoDB, Writing from MongoDB	2	-	-
5.4	Importing JSON data into MongoDB and Exporting JSON data from MongoDB.	1		
	Total No. of Lecture Hours	40		-
	Total No. of Tutorial Hour		00	
	Total No. of Practical Hours			00

Textbook:

1. Programming the World Wide Web, Robert W. Sebesta, 4th Edition, Pearson Education, 2008.
2. Full-Stack React Projects: Learn MERN Stack Development by Building Modern Web Apps Using MongoDB, Express, React, and Node.js, 2nd Edition.

Reference Book:

1. Open-Source Web Development with Lamp, James Lee and Brent Ware, Pearson Education, 2009.

2. Internet and World Wide Web: How to Program -Harvey M. Deitel, Paul J. Deitel, 4thedition,Pearson, 2009.
3. The Web Programming Building Internet Applications- Chris Bates, 3rd Edition, Wiley India, 2006.

Online Resources:

1. MongoDB Notes for Professionals book Tutorial for Beginners in PDF by GoalKicker.com
2. https://docs.google.com/viewer?url=https://www.computer-pdf.com/pdf/0840-mongodb-notes-for- professionals-book.pdf
3. https://www.javatpoint.com/reactjs-tutorial

Course Code: BCS516B   **Course: Artificial Intelligence**
Credits: 3   **L:T:P** 3:0:0
CIE: 50 Marks   **SEE:** 50 Marks
SEE Hours: 3   **Max. Marks:** 100

Pre requisites if any	None
Learning objectives	1. Develop an understanding of the historical context of AI and its fundamental principles.
	2. Acquire proficiency in applying basic AI principles to solve problems effectively.
	3. Familiarize oneself with the methodologies of inference, perception, knowledge representation, and learning in AI.

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

COs	Course Outcomes	Bloom's level
CO1	Explain the architecture and components of intelligent agents, including their interaction with the AI environment.	Understand
CO2	Apply problem-solving agents and various search strategies to solve a given problem.	Apply
CO3	Illustrate logical reasoning and knowledge representation using propositional and first order logic.	Analyze
CO4	Demonstrate proficiency in representing knowledge and solving problems using first-order logic and Describe various ways to quantify uncertainty.	Apply

Mapping with Pos and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2
CO1	3	2	1	2	1	1	1	2	1	1	1	1		2	2
CO2	3	3	2	2	3	3	2	1	2	2	1	2		2	2
CO3	3	3	2	3	2	2	2	1	2	1	1	2		2	2
CO4	3	3	3	3	2	2	2	1	3	2	2	2		2	2

Mapping Strength: Strong–3   Medium–2   Low–1

Course Structure

Sl. no	Modules	No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
Module–1: Introduction to AI			
1.1	**Introduction:** What is AI? Foundations of AI.	2	-	-
1.2	History of Artificial Intelligence	1	-	-
1.3	The State of the Art	1	-	-
1.4	**Intelligent Agents:** Agents and environment	1	-	-
1.5	Concept of Rationality	1	-	-
1.6	The nature of environments	1	-	-
1.7	The structure of agents	1	-	-
	Module–2: Problem solving based on searching			
2.1	Problems solving Agents, Example problems	2	-	-
2.2	Searching for solutions	1	-	-
2.3	Uniformed Search strategies–Uniform cost search	1	-	-
2.4	Breadth First Search, Depth First Search	1	-	-
2.5	Depth Limited Search	1	-	-
2.6	Iterative Deepening Depth First	2	-	-
	Module–3: Heuristic Search Strategies			
3.1	Heuristic functions	1	-	-
3.2	Greedy best first search	1	-	-
3.3	A*algorithm	2	-	-
3.4	Local Search & Optimization: Hill Climbing	2	-	-
3.5	Genetic Algorithms	2	-	-
	Module–4: Logical Agents, First Order Logic			
4.1	**Logical Agents:** Knowledge–based agents	1	-	-
4.2	The Wumpus world, Logic	1	-	-
4.3	Proposition logic	1	-	-
4.4	Reasoning patterns in Propositional Logic	2	-	-
4.5	**First Order Logic:** Representation Revisited, Syntax and Semantics of First Order logic	2	-	-
4.6	Using First Order logic.	1	-	-
	Module–5: Quantifying Uncertainty			
5.1	**Inference in First Order Logic:** Propositional Versus First Order Inference	2	-	-
5.2	Unification, Forward Chaining	1	-	-
5.3	Backward Chaining, Resolution.	1	-	-
5.4	Acting under Uncertainty	1		
5.5	Probability Notation	1		
5.6	Baye's Rule and its use	2		
	Total No. of Lecture Hours	**40**	-	-
	Total No. of Tutorial Hours		**00**	-
	Total No. of Practical Hours			**00**

Textbook:
  1. Stuart J. Russell and Peter Norvig, Artificial Intelligence, 3rd Edition, Pearson, 2015

Reference Book:

  1. Elaine Rich, Kevin Knight, Artificial Intelligence, 3rd edition, Tata McGraw Hill, 2013

  2. George F Lugar, Artificial Intelligence Structure and strategies for complex, Pearson Education, 5th Edition, 2011

  3. Nils J. Nilsson, Principles of Artificial Intelligence, Elsevier, 1980

  4.   Saroj Kaushik, Artificial Intelligence, Cengage learning, 2014.

  Web links and Video Lectures (e-Resources):

  1. https://www.kdnuggets.com/2019/11/10-free-must-read-books-ai.html

  2. https://www.udacity.com/course/knowledge-based-ai-cognitive-systems--ud409

  3. https://nptel.ac.in/courses/106/105/106105077

Code: BCS586   **Course: MinorProject**
Credits: 2   **L:T:P:0:0:2**
CIE: 50 Marks   **Max.Marks: 50**

Course Outcomes:

On the successful completion of the course,the student will be able to

COs	Course Outcomes	Bloom'slevel
CO1	Conceptualize, design and implement solutions for specific problems	Apply
CO2	Apply resource management skills for projects and Communicate the solutions through presentations and technical reports	Apply

Mapping COs with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2
CO1	2	3	3	2	3	2	1	2	3	2	1	2		2	2
CO2	2	2	2	1	2	1	1	1	3	2	2	2		2	2

Mapping Strength: Strong–3   Medium–2   Low –1

Code: BRMK557   **Course: Research Methodology & IPR**
Credits: 2   **CIE: 50 Marks**
L:T:P- 2:0:0   **SEE: 50 Marks**
SEE Hours: 2   **Total Marks: 50**

Prerequisites (if any)	NIL
Learning objectives	1. To explain basics of research and its types 2. To acquire knowledge of Literature Review, Technical Reading, Attributions and Citations 3. To practice Ethics in Engineering Research 4. To gain knowledge of Intellectual Property Rights in engineering

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Understand the knowledge on basics of research and its types.	Understand
CO2	Learn the concept of Literature Review, Technical Reading, Attributions and Citations.	Understand
CO3	Learn Ethics in Engineering Research.	Understand
CO4	Analyze the application of Intellectual Property Rights in engineering.	Analyze

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2
CO1	3	2	-	-	3	3	3	3	3	3	-	3		2	2
CO2	3	2	-	-	3	3	3	3	3	3	-	3		3	3
CO3	3	2	-	-	3	3	3	3	3	3	-	3		-	-
CO4	3	3	3	3	3	3	3	3	3	3	3	3		2	2

Mapping Strength: Strong– 3   Medium – 2   Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
Module – 1			
1.1	Introduction: Meaning of Research, Objectives of Engineering Research, and Motivation in Engineering Research, Types of Engineering Research.	2	-	-
1.2	Finding and Solving a Worthwhile Problem.	1	-	-
1.3	Ethics in Engineering Research, Ethics in Engineering Research Practice, Types of Research Misconduct, Ethical Issues Related to Authorship.	2	-	-
	Module – 2			
2.1	Literature Review and Technical Reading, New and Existing Knowledge, Analysis and Synthesis of Prior Art Bibliographic Databases, Web of Science, Google and Google Scholar,	1	-	-
2.2	Effective Search: The Way Forward Introduction to Technical Reading Conceptualizing Research, Critical and Creative Reading, Taking Notes While Reading, Reading Mathematics and Algorithms, Reading a Datasheet.	2	-	-
2.3	Attributions and Citations: Giving Credit Wherever Due, Citations: Functions and Attributes, Impact of Title and Keywords on Citations, Knowledge Flow through Citation, Citing Datasets, Styles for Citations, Acknowledgments and Attributions, What Should Be Acknowledged, Acknowledgments in, Books Dissertations, Dedication or Acknowledgments.	2	-	-
	Module – 3			
3.1	Introduction To Intellectual Property: Role of IP in the Economic and Cultural Development of the Society, IP Governance, IP as a Global Indicator of Innovation, Origin of IP History of IP in India. Major Amendments in IP Laws and Acts in India.	1	-	-
3.2	**Patents:** Conditions for Obtaining a Patent Protection, To Patent or Not to Patent an Invention. Rights Associated with Patents. Enforcement of Patent Rights. Inventions Eligible for Patenting. Non-Patentable Matters. Patent Infringements. Avoid Public Disclosure of an Invention before Patenting. Process of Patenting.	2	-	-
3.3	**Process of Patenting.** Prior Art Search. Choice of Application to be Filed. Patent Application Forms. Jurisdiction of Filing Patent Application. Publication. Pre-grant Opposition. Examination. Grant of a Patent. Validity of Patent Protection. Post-grant Opposition. Commercialization of a Patent. Need for a Patent Attorney/Agent. Can a Worldwide Patent be Obtained? Do I Need First to File a Patent in India? Patent Related Forms. Fee Structure. Types of Patent Applications. Commonly Used Terms in	2	-	-

	Patenting. National Bodies Dealing with Patent Affairs. Utility Models.			
Module – 4				
4.1	**Copyrights and Related Rights**: Classes of Copyrights. Criteria for Copyright. Ownership of Copyright. Copyrights of the Author. Copyright Infringements. Copyright Infringement is a Criminal Offence. Copyright Infringement is a Cognizable Offence. Fair Use Doctrine. Copyrights and Internet. Non-Copyright Work.	1	-	-
4.2	Copyright Registration. Judicial Powers of the Registrar of Copyrights. Fee Structure. Copyright Symbol. Validity of Copyright. Copyright Profile of India. Copyright and the word 'Publish'. Transfer of Copyrights to a Publisher. Copyrights and the Word 'Adaptation'. Copyrights and the Word 'Indian Work'. Joint Authorship. Copyright Society. Copyright Board. Copyright Enforcement Advisory Council (CEAC). International Copyright Agreements, Conventions and Treaties. Interesting Copyrights Cases.	2	-	-
4.3	Trademarks: Eligibility Criteria. Who Can Apply for a Trademark. Acts and Laws. Designation of Trademark Symbols. Classification of Trademarks. Registration of a Trademark is Not Compulsory. Validity of Trademark. Types of Trademark Registered in India. Trademark Registry. Process for Trademarks Registration. Prior Art Search. Famous Case Law: Coca-Cola Company vs. Bisleri International Pvt. Ltd.	2	-	-
Module – 5				
5.1	Industrial Designs: Eligibility Criteria. Acts and Laws to Govern Industrial Designs. Design Rights. Enforcement of Design Rights. Non-Protectable Industrial Designs India. Protection Term. Procedure for Registration of Industrial Designs. Prior Art Search. Application for Registration. Duration of the Registration of a Design. Importance of Design Registration. Cancellation of the Registered Design. Application Forms. Classification of Industrial Designs. Designs Registration Trend in India. International Treaties. Famous Case Law: Apple Inc. vs. Samsung Electronics Co.	2	-	-
5.2	Geographical Indications: Acts, Laws and Rules Pertaining to GI. Ownership of GI. Rights Granted to the Holders. Registered GI in India. Identification of Registered GI. Classes of GI. Non-Registerable GI. Protection of GI. Collective or Certification Marks. Enforcement of GI Rights. Procedure for GI Registration Documents Required for GI Registration. GI Ecosystem in India.	2	-	-
5.3	**Case Studies on Patents.** Case study of Curcuma (Turmeric) Patent, Case study of Neem Patent, Case study of Basmati patent.	1	-	-
Total No. of Lecture Hours		**25**		
Total No. of Tutorial Hours			**-**	**-**
Total No. of Practical Hours				**-**

Textbooks:
1. Dr. Santosh M Nejakar, Dr. Harish Bendigeri "Research Methodology and Intellectual Property Rights", ISBN 978-93-5987-928-4, Edition: 2023-24.

Reference Books:
1. David V. Thiel "Research Methods for Engineers" Cambridge University Press, 978-1-107-03488-4
2. Intellectual Property Rights by N.K.Acharya Asia Law House 6th Edition. ISBN: 978-93-81849-30-9

Online Resources:

1. https://onlinecourses.swayam2.ac.in/ntr24_ed08/preview

B.E. Blown up Syllabus – III Year