BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi)

Avalahalli, Yelahanka, Bengaluru 560064

Bachelor of Engineering

Department of Computer Science and Engineering

V and VI Semester Scheme and Syllabus
2021 Scheme - Autonomous

Approved in the BoS meeting held on 22.05.2023

Vision and Mission of the Department

Vision:

To develop technical professionals acquainted with recent trends and technologies of computer science to serve as valuable resource for the nation/society.

Mission:

Facilitating and exposing the students to various learning opportunities through dedicated academic teaching, guidance and monitoring.

Program Educational Objectives (PEOs)

PEO'S	
PEO1	Lead a successful career by designing, analysing and solving various problems in the field of Computer Science & Engineering.
PEO2	Pursue higher studies for enduring edification.
PEO3	Exhibit professional and team building attitude along with effective communication.
PEO4	Identify and provide solutions for sustainable environmental development.

Program Specific Outcomes (PSOs)

PSO'S	
PSO-1	Analyze the problem and identify computing requirements appropriate to its solution.
PSO-2	Apply design and development principles in the construction of software systems of varying complexity.

Scheme of V Semester

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(Autonomous Institute affiliated to VTU)

Scheme of Teaching and Examination: Effective from AY 2021– 22 Choice Based Credit System (CBCS)

UG PROGRAM: Department of Computer Science and Engineering | **Semester: V**

Sl. No	Course Category	Course Code	Course Title	Teaching Dept.	Teaching Hours /Week				Credits	Examination			
					L	T	P	PW		Duration	CIE Marks	SEE Marks	Total Marks
1	HS	21HSS51	Management and Entrepreneurship	CSE	3	0	0	0	3	3	50	50	100
2	AEC	21AEC52	Cyber and Intellectual Property Law (Common to all)	CSE	1	0	0	0	1	1	50	50	100
3	INT	21INT53	Innovation / Entrepreneurship / Societal Internship	CSE	0	0	0	6	3	-	100	-	100
4	PE	21CS54X	Professional Elective - I	CSE	3	0	0	0	3	3	50	50	100
5	PC	21CS55	Database Management System	CSE	3	0	0	0	3	3	50	50	100
6	PC	21CS56	Operating Systems	CSE	2	1	0	0	3	3	50	50	100
7	PC	21CS57	Data Communication and Networks	CSE	3	0	0	0	3	3	50	50	100
8	PC	21CSL58A	Database Management System Laboratory	CSE	0	0	2	0	1	3	50	50	100
9	PC	21CSL58B	Operating Systems Laboratory	CSE	0	0	2	0	1	3	50	50	100
10	PC	21CSL58C	Data Communication and Networks Laboratory	CSE	0	0	2	0	1	3	50	50	100
TOTAL					**15**	**1**	**6**	**6**	**22**	-----	**550**	**450**	**1000**

Professional Elective - Group I

Course Code	Course Title
21CS541	Blockchain Technology
21CS542	Advanced Software Engineering
21CS543	Internet of Things
21CS544	Image Processing & Computer Vision
21CS545	Natural Language Processing

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Yelahanka, Bengaluru-560064

Date: 14.06.2023

CIE and SEE Pattern for 2021 Scheme
(Applicable from the AY 2021-22 onwards)

Important Note:

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Examinations (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for SEE minimum passing mark is 35% of the maximum marks (18 marks out of 50). The student is declared as a pass in the course if he / she 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.

4 CREDIT and 3 CREDIT COURSES

I. CONTINUOUS INTERNAL EVALUATION (CIE): 50 MARKS

- Internal Assessment (IA) Tests: 3 IAs to be conducted for 40 Marks (90 minutes each). Total of 3 tests will be 120 and the same can be scale down to **60 marks.**
- Alternate Assignment Tool (AAT): 2 AATs each of 10 marks, total **20 marks.**
- Assignments: 2 assignments of each 10 marks, total **20 marks**.
- CIE marks = 60 + 20 + 20 = 100 and same can be scale down to **50 marks.**
- Student has to score minimum of 20 marks (40%).

II. SEMESTER END EXAMINATIONS (SEE): 50 MARKS

SEE is conducted for 100 Marks (3 hours).

Question Paper Pattern:

Part - A: Comprises 20 objective type questions carrying 1 Mark each with a total 20 Marks.

Part - B: There will be **5 modules**. Each module will have **TWO questions carrying 16 marks** each. There will be a maximum of three sub section for each question. **Student has to answer any ONE full question from each module.**

SEE Marks = 20 + 80 = 100 marks and can be scale down to 50 marks.

2 CREDIT COURSES

I. CONTINUOUS INTERNAL EVALUATION (CIE): 50 MARKS

- Internal Assessment (IA) Tests: 3 IAs of MCQ type to be conducted for 40 Marks (60 minutes each). Total of 3 tests will be 120 and the same can be scale down to **60 marks.**
- Alternate Assignment Tool (AAT): 2 AATs each of 10 marks, total **20 marks**.
- Assignments: 2 assignments of each 10marks, total **20 marks.**
- CIE marks = 60 + 20 + 20 = 100 and same can be scale down to **50 marks.**
- Student has to score minimum of 20 marks (40%).

II. SEMESTER END EXAMINATIONS (SEE): 50 MARKS

SEE is conducted for 100 Marks (2 hours).

Question Paper Pattern:

- The pattern of the question paper is MCQ.
- SEE question paper will be set for 100 questions each of 01 marks. The same is scale down to 50 marks.

1 CREDIT COURSES

I. CONTINUOUS INTERNAL EVALUATION (CIE): 50 MARKS

- Internal Assessment (IA) Tests: 3 IAs of MCQ type to be conducted for 40 Marks (60 minutes each). Total of 3 tests will be 120 and the same can be scale down to **60 marks.**
- Alternate Assignment Tool (AAT): 2 AATs each of 10 marks, total **20 marks.**
- Assignments: 2 assignments of each 10marks, total **20 marks.**
- CIE marks = 60 + 20 + 20 = 100 and same can be scale down to **50 marks.**
- Student has to score minimum of 20 marks (40%).

II. SEMESTER END EXAMINATIONS (SEE): 50 MARKS

SEE is conducted for 50 Marks (1 hours).

Question Paper Pattern:

- The pattern of the question paper is MCQ.
- SEE question paper will be set for 50 questions each of 01marks. The same is scale down to 50 marks.

1 CREDIT LABORATORY COURSES

I. CONTINUOUS INTERNAL EVALUATION (CIE): 50 MARKS

- Cumulative Assessment (CA) of each experiment is 20 Marks (Conduction 10 marks + Records 5 marks +Viva 5marks). The average of all the experiments to be taken for **20 marks.**
- Open Ended Experiments (OE) **10 marks.**
- 2 IAs Test to be conducted for 100 marks. General rubrics suggested for SEE are: Writeup 20 marks, Conduction of the experiments, calculations, graphs, results, etc.,: 60 marks and Viva: 20 marks. The average of 2 IA marks is scale down to **20 marks**.
- CIE marks =20 (CA) +10 (OE) + 20 (IA test) = 50 marks.
- Student has to score minimum of 20 marks (40%).

II. SEMESTER END EXAMINATIONS (SEE): 50 MARKS

SEE is conducted for 100 Marks and scale down to 50 Marks.

Examinations to be conducted jointly by Two examiners. All the experiments are to be included for practical examination. General rubrics suggested for SEE are: Writeup 20 marks, Conduction of the experiments, calculations, graphs, results, etc.,: 60 marks and Viva: 20 marks.

CoE 16/06/2023 Dean AA 16/06/2023 Principal 19/6/23

V Semester Syllabus

B.E. COMPUTER SCIENCE AND ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

Management and Entrepreneurship (3:0:0) 3

(Effective from the academic year 2021-22)

Course Code	21HSS51	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3

Course objectives:

This course will enable students to:

1. Define the strategic, tactical, and operational roles and functions of management.
2. Use critical thinking to formulate and execute managerial entrepreneurial strategies, plans, and procedures.
3. Understand the Ideation Process, creation of Business Model, Feasibility Study and sources of funding

Module – 1

Management: Significance and Scope of Management, Importance of the management and entrepreneurship in Economic growth of Nation, Impact of the entrepreneurship on Societal Problems for Sustainable Solutions. Management in the perspective of National Economy, Career, Innovations and trends. Definition, Management functions, Levels of management, Roles of manager, Managerial skills, Management & Administration.

Planning: Importance, Types, Steps and Limitations of Planning; Decision Making types and Steps in Decision Making.

(8 Hours)

Module – 2

Organizing and Staffing: Organization-Meaning, Characteristics, Process of Organizing, Principles of Organizing, Span of Management, Departmentalization.

Committees: Meaning, Types of Committees; Centralization Vs Decentralization of Authority, Responsibility. Staffing: Importance, Recruitment and Selection Process.

Directing and Controlling: Meaning and Requirements of Effective Direction.

Motivation: Nature of Motivation, **Motivation Theories** (Maslow's Need-Hierarchy Theory and Herzberg's Two Factor Theory). **Communication:** Meaning, Importance and Purposes of Communication. **Leadership:** Meaning, Characteristics, Behavioral Approach of Leadership. **Coordination:** Meaning, Types, Techniques of Coordination; **Controlling:** Meaning, Need for Control System, Benefits of Control, Essentials of Effective Control System, and Steps in Control Process.

(8 Hours)

Module – 3

Entrepreneurship: Definition of Entrepreneur, Importance of Entrepreneurship, concepts of Entrepreneurship, Characteristics of successful Entrepreneur, Classification of Entrepreneurs, Myths of Entrepreneurship, Entrepreneurial Development models, Entrepreneurial development cycle, Problems faced by Entrepreneurs and capacity building for Entrepreneurship. Theories of Entrepreneurship.

(8 Hours)

Module – 4

Entrepreneurial Project Development: Idea Generation and Feasibility Analysis- Idea Generation; Creativity and Innovation; Identification of Business Opportunities; Market Entry Strategies; Marketing Feasibility; Financial Feasibilities; Political Feasibilities; Economic Feasibility; Social and Legal Feasibilities; Technical Feasibilities; Managerial Feasibility, Location and Other Utilities Feasibilities.
(Case study/Activity to demonstrate entrepreneurial abilities)

(8 Hours)

Module – 5

Social Responsibilities of Business: Meaning of social responsibility, social responsibilities of business towards different groups, social audit, business ethics and corporate governance.

Self-study topics:

1. Sources of funding, Working capital management and Taxation benefits.
2. Market evaluations and turnaround strategies.
3. Policies governing SME's
4. Perform market survey on sectors promoted by the government and submit the report for the same.

   Summary: The student will explore entrepreneurial opportunities and gather all relevant data for starting a venture.

(8 Hours)

Course outcomes:

The students will be able to:

CO1: Comprehend the fundamental concepts of Management and Entrepreneurship and opportunities in order to setup a business

CO2: Categorise the functions of Managers, Entrepreneurs and their social responsibilities CO3: Analyse the business environment components in developing a business plan.

CO4: Individually and in teams identify, conceptualize, and develop solutions for successful entrepreneurial management.

Textbooks:

1. P. C. Tripathi., P. N. Reddy., "Principles of Management." 6th Edition, McGraw-Hill Education, 2017.
2. Dr. Vasant Desai. "Dynamics of Entrepreneurial Development and Management", 6th Edition, Himalayan Publishing House, 2019.

References:

1. Poornima. M. Charantimath., "Entrepreneurship Development Small Business Enterprises", Pearson Education, 2008.
2. Robert. D. Hisrich., Mathew. J., Manimala., Michael. P. Peters., Dean. A., Shepherd, "Entrepreneurship", 8th Edition, Tata McGraw Hill Publishing Co. ltd, 2012.
3. Harold Koontz, Heinz Weihrich., "Essentials of Management: An International, Innovation and Leadership perspective", 10th Edition, McGraw Hill Education, 2016.

B.E. COMPUTER SCIENCE AND ENGINEERING

Choice Based Credit System (CBCS)

Semester – V

Cyber and Intellectual Property Law (0:2:0)1

(Common to all Branches)

(Effective from the academic year 2021-22)

Course Code	21AEC52	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:2:0	SEE Marks	50
Total Number of Contact Hours	15	Exam Hours	1

Course Objectives:

This course will enable students to:

1. Understand the concept of IP, copyright, patent and its protection.
2. Explain the scope of trademarks, industrial and IC layout design.
3. Enhance their knowledge on IP management and related agreements.
4. Understand overview of Cyber law and cyber policies.
5. Identify different types of cybercrime and security measures.

Module – 1

Introduction to IP: Various forms of IP, Intellectual property verses physical property, importance of intellectual property.

Copyright: Different classes of copyright work, ownership of copyright, term of copyright, infringement of copyright.

Patent: Fundamentals of patent, condition for grant of patent, inventions those are not patentable, right of patentee, transfer of patent right, Infringement of patent right, challenges in patents. Case study on prior art search and patent drafting.

(03 Hours)

Module – 2

Trademarks: Introduction to trademark, developing trademark, term of trademark, collective marks, certification trademarks, Infringement of trademark.

IC Layout Design Introduction to Semi-Conductor Integrated Circuits Layout, The Semi-Conductor Integrated Circuits Layout Design (SICLD) Act, 2000.

Industrial Design: Design registration, Industrial design act 2000.

Case study on infringement of Industrial Design

(03 Hours)

Module – 3

Creating IP: Need for creating IP, Process of development of IP and knowledge.

TRIPS (Trade-Related aspects of IPR): Need and objectives, Agreement on trip, scheme of agreements. WIPO: Objectives, functions, memberships

Treaties: Patent cooperation Treaty(PCT)**:** filing patent under PCT, Different stages and procedure in PCT filing. Paris Convention Treaty**:** filing patent under Paris convention treaty, Different procedure stages

IP Management: Defining IP management, need and importance of IP management, Undertaking IP intelligence, acquisition of IP, managing IP portfolio, commercialization of IP, protecting IP. Case studies on PCT filing.

(03 Hours)

Module – 4
Cyber Law: introduction to Indian cyber law, need for cyber law, jurisprudence of cyber law, importance of cyber law. **IT Act:** Objective and scope of The Indian Information Technology Act 2000. **Cyber Crimes**: What constitute cyber crime, Important cybercrimes.

C**yber policies:** Need for an information security policy, information security standard-ISO, introduction to various security policies. Case study on cyber crime. **(03 Hours)**
Module – 5
Phishing; Sspear phishing, protecting from phishing attack, cyber stalking, how to prevent cyber stalking. **Hacking**: types, Protection of computers from intrusion and types, different types of hackers and their operation. **Data theft**: IT act related to data theft, Spam E-mail, IT act related to spam mail, Software piracy, types, legal penalties, Identity theft, prevention practice **Electronic and digital signature:** Role of electronic signature, types of electronic signature, guidelines for electronic signature. Creation of digital signature, digital signature in India. **(03 Hours)**
Course Outcomes: The students will be able to: CO1: Describe the concept of copyright and patent and its protection. CO2: Explain the scope of trademarks, industrial and IC layout design. CO3 Describe Intellectual property management and related agreements. CO4: Understand overview of Cyber law and cyber policies. CO5: Discuss different types of cybercrime and security measures.

Text Books	
[1]	V Appukutty, Cyber Crime & Law, Coral Publishers, 2022
[2]	Surya Prakash Tripati, Ritendra Goel, Praveen Kumar Shukla, Introduction to information Security and Cyber Laws, Dream Tech Press,2021
[3]	Neeraj Pandey, Khushdeep Dharni, Intellectual Property Rights, PHI Learning, 2014
References	
[1]	Prabhuddha Ganguli, Intellectual Property Rights, Tata Mc-Graw –Hill, 2017
[2]	S R Myneni, Patent Right Creation and Registration, Asia Law House, 2017
[3]	Marjie T. Britz, Computer Forensics and Cyber Crime: An Introduction, Pearson, 3rd Edition, 2004.
[4]	Bill Nelson, Amelia Phillips, Christopher Steuart, Guide to Computer Forensics and Investigations, Cengage Learning, 4th Edition, 2010.

B.E. COMPUTER SCIENCE AND ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Innovation / Entrepreneurship/ Societal Internship (0:0:0:3) 3

(Common to all Branches)

(Effective from the academic year 2021-22)

Course Code	21INT53	CIE Marks	100
Teaching Hours/Week (L:T:P:PW)	0:0:0:6	SEE Marks	--
Total Number of Contact Hours	4 weeks	Exam Hours	--

Schedule:

Scheduled during the intervening period of IV and V semester

Course Outcomes: students will be able to

1. Acquire academic/ career/ personal overall skill/ knowledge development.
2. Perceive ample opportunities for professional growth and achievement with relevance to society and environment.
3. Expose to real job world environment and gain practical knowledge with experience.
4. Build leadership qualities, teamwork, collaborations, cooperation, and facility in using virtual workspace.
5. Intensify creativity, artistry, curiosity, imagination, innovation,, incubation, entrepreneurial skills and personal expression.
6. Write report on the work/ project carried out with presentation.

During the intervening period of IV and V semesters, students shall be ready for industrial experience. Therefore, they shall choose to undergo Internship involving Innovation / Entrepreneurship/Societal related activities. Students may choose to work on innovation or entrepreneurial activities or both resulting in start-up or undergo internship with industry/ NGO's/ Government organizations/ Micro/ Small/ Medium enterprises to make themselves ready for the industry. In case students want to undergo internship at his/her family business, he /she shall will be permitted provided, a declaration by a parent is submitted directly to the Principal of the institution. **Innovation**

Innovation refers to a new or improved product or process or a combination thereof that differs marginally or significantly from the unit's previous product. An innovation center is a place where students are encouraged to implement the innovative ideas formed through imagination, brainstorming sessions, design thinking and associated activities to bring them to reality. It is a place, where creative minds are shaped.

Entrepreneurship

Entrepreneurship refers to setting up a new business or businesses, taking on financial risks in the hope of profit. It involves investment to undertake production along with arranging inputs like land, labour material and capital, introducing new techniques and products, identifying new sources for the enterprise, etc.

Incubation Center

An organized unit designed for innovation as well as to accelerate the growth and success of new entrepreneurial companies through mentorship and an array of business support resources and services that could include physical space, capital, coaching, common services, and networking connections.

Startup

An entity that develops a business model based on either product innovation or service innovation and makes it scalable, replicable and self-reliant.

Societal (Social) related activities

Short term internship at villages, slums or urban areas can be under social internship. The internship will be more fruitful, if students work in teams. The teams can select one or more fields to do their best in the field of agriculture, watershed management, wastelands development, non- conventional energy, low cost housing, sanitation, nutrition and personal hygiene, schemes for skill development, income generation, blood bank, government scheme such as Swachch Bharat, Accessible India, Digital India, Beti Bachao and Beti Padhao, Environment and Energy Conservation and Education, legal aid, consumer protection and allied field including Indian Red Cross Society, National Cadet Corps, Bharat Scouts and Guides.

Places for Innovation/Entrepreneurial Activities

Students shall carryout Innovation or Entrepreneurial activities or both at the Incubation Center and Entrepreneurship Cell of the parent institution or elsewhere such as ATAL Incubation Centers [A flagship of Atal Innovation Mission (AIM), NITI Aayog for promoting the culture of innovation and entrepreneurship in India], institutes of national importance, public sector units, IT companies, government organizations, and non-governmental organizations, industries including MSME, etc. Institutes, should deter students to opt for internships at places established for commercial benefits.

CO-PO Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2						2			
CO2						2					2	
CO3			2	2			3	2				
CO4									3	3	2	2
CO5					2				3			2
CO6									2	3		
Average	3	2	2	2	2	2	3	2	3	3	2	2

Rubrics for Internal Evaluation (Total Marks: 100)

Indicator	Poor	Average	Good	Excellent
Acquired skills or knowledge (10 Marks) (CO1)	Not gained any skill / knowledge **or** Attended a few sessions. **0-1 Marks**	Partial skill/Knowledge gained. Only Block Diagram/ Notes/Description **2-4 Marks**	Average skill/knowledge gained. Lack of Technical/ Knowledge. **5-7 Marks**	Complete skill/ knowledge gained. All Skills Acquired. **8-10 Marks**
Presentation (10 Marks) **(CO5)**	Absence for presentation **or** Presented after the due date. **0-1 marks**	Information is lacking/unclear & communicated in such a way that the audience can not understand the purpose of the evidence of work and internship	Information is not presented in a clear manner and many details are missing related to the evidence work and internship experiences.	Information is presented in such a way that the audience can understand the purpose of the evidence of work and internship experiences.

			experiences. **2-4 Marks**	**5-7 Marks**	**8-10 Marks**
	Weekly report (10 Marks) (CO6)	Weekly report not submitted **or** Few days report was submitted. **0-1 Marks**	One Weekly report submitted. **2-4 Marks**	Two weekly reports submitted. **5-7 Marks**	All three weekly reports submitted **8-10 Marks**
	Practical Knowledge (10 Marks) (CO3)	Not gained any practical knowledge **or** Able to define basic concepts. **0-1 Marks**	Partial practical Knowledge gained. Less hands-on experience. **2-4 Marks**	Average practical knowledge gained. Only few models are exhibited. **5-7 Marks**	Complete practical knowledge gained. **8-10 Marks**
	Societal and environment al relevance (10 Marks) (CO2)	No relevance to society or environment (At-least one relevance) **0-1 Marks**	Partial relevance to society or environment. **2-4 Marks**	Average relevance to society or environment. **5-7 Marks**	Directly Relevant to society or environment. **8-10 Marks**
	Viva (10 Marks) (CO4)	Does not know any information **or** Fair leadership quality/ teamwork/ cooperation. **0-1 Marks**	Provides irrelevant information for all questions. Good leadership quality/ teamwork/ cooperation. **2-4 Marks**	Provides incomplete information for all questions. Better leadership quality/ teamwork/ cooperation. **5-7 Marks**	Provides complete information for all questions. Outstanding leadership quality/ teamwork/ cooperation. **8-10 Marks**
	Report (40 Marks) (CO6)	Does not submit the report. **0 Marks**	Report submitted does not fulfill the prescribed format/submission after one weeks of the deadline. **1-24 Marks**	Report submitted partially fulfills the prescribed format/ submission after one weeks of the deadline. **25-32 Marks**	Report submitted fulfills the prescribed format / submission in par with the deadline. **33-40 Marks**

CIE and SEE Details for Scheme 2021

Course	**CIE (Minimum Passing Marks 40% of Max Marks)**		**SEE (Minimum Passing Marks 35% of Max Marks)**	
	Max Marks	**Min Passing marks**	**Max Marks**	**Min Passing marks**
Innovation / Entrepreneurship/ Societal Internship	**100**	**40**	**-**	**-**

Database Management System (3:0:0) 3
Common to CSE/ISE
(Effective from the academic year 2021-22)

Course Code	21CS55	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3

Course Objectives:

This course will enable the students to:

1. Provide a strong foundation in database concepts, technology and practice.
2. Practice SQL programming through a variety of database problems.
3. Demonstrate the use of concurrency and transactions in database.
4. Develop Database applications for real world problems.

Preamble: Database Design course is intended to deliver students the elementary concepts of a database management system and equips them to design and implement a database application built over those concepts. It also introduces advanced level areas like transaction processing, concurrency control and recovery management. The current trend, unstructured data - NoSQL is unveiled too.

Module – 1

Introduction to Databases: Introduction, Characteristics of database approach, Advantages of using the DBMS approach, History of database applications. **Overview of Database Languages and Architectures**: Data Models, Schemas, and Instances. Three schema architecture and data independence, database languages, and interfaces, The Database System environment. **Conceptual Data Modelling using Entities and Relationships:** Entity types, Entity sets, attributes, roles, and structural constraints, Weak entity types, **ER** diagrams, examples, Specialization and Generalization.
Textbook 1:Ch 1.1 to 1.8, 2.1 to 2.6, 3.1 to 3.10 RBT: L1, L2, L3

(8 Hours)

Module – 2

Relational Model: Relational Model Concepts, Relational Model Constraints and relational database schemas, Update operations, Relational Algebra: Unary and Binary relational operations, additional relational operations (aggregate, grouping, etc.) Examples of Queries in relational algebra. Mapping Conceptual Design into a Logical Design: Relational Database Design using ER-to-Relational mapping.
SQL: SQL data definition and data types, specifying constraints in SQL, retrieval queries in SQL, INSERT, DELETE, and UPDATE statements in SQL, Additional features of SQL.
Textbook 1: Ch4.1 to 4.5, 5.1 to 5.3, 6.1 to 6.5, 8.1; Textbook 2: 3.5 RBT: L1, L2, L3

(8 Hours)

Module – 3

SQL: Advances Queries: More complex SQL retrieval queries, Specifying constraints as assertions and action triggers, Views in SQL, Schema change statements in SQL. Database Application Development: Accessing databases from applications, An introduction to JDBC, JDBC classes and interfaces, SQLJ, Stored procedures, Case study:
The internet Bookshop. **Internet Applications**: The three-Tier application architecture, The presentation layer, The Middle Tier

Textbook 1: Ch7.1 to 7.4; Textbook 2: 6.1 to 6.6, 7.5 to 7.7. RBT: L1, L2, L3

(8 Hours)

Module – 4

Normalization: Database Design Theory – Introduction to Normalization using Functional and Multivalued Dependencies: Informal design guidelines for relation schema, Functional Dependencies, Normal Forms based on Primary Keys, Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form. **Normalization Algorithms:** Inference Rules, Equivalence, and Minimal Cover, Properties of Relational Decompositions, Algorithms for Relational Database Schema Design, Nulls, Dangling tuples, and alternate Relational Designs, Further discussion of Multivalued dependencies and 4NF, Other dependencies and Normal Forms
Textbook 1: Ch14.1 to 14.7, 15.1 to 15.6 RBT: L1, L2, L3

(8 Hours)

Module – 5

Transaction Processing: Introduction to Transaction Processing, Transaction and System concepts, Desirable properties of Transactions, Characterizing schedules based on recoverability, Characterizing schedules based on Serializability, Transaction support in SQL. **Concurrency Control in Databases**: Two-phase locking techniques for Concurrency control, Concurrency control based on Timestamp ordering, Multiversion Concurrency control techniques, Validation Concurrency control techniques, Granularity of Data items and Multiple Granularity Locking. **Introduction to Database Recovery Protocols**: Recovery Concepts, NO-UNDO/REDO recovery based on Deferred update, Recovery techniques based on immediate update, Shadow paging, Database backup and recovery from catastrophic failures
Textbook 1: 20.1 to 20.6, 21.1 to 21.7, 22.1 to 22.4, 22.7. RBT: L1, L2, L (8 Hours)

Course outcomes:

The students will be able to:

CO1: Make use of DBMS Languages to write the Queries.**(K2)**

CO2: Apply the concepts of ER modelling and relational algebra for solving a problem.**(K3)**

CO3: Analyze data requirements and design a database using RDBMS concepts.**(K4)**

CO4: Appraise the need for normalization, and transaction management in fully developed DBMS. **(K5)**

CO5: Develop an Database Application using any database tool **(K6)**

Textbooks:

1. Fundamentals of Database Systems, Ramez Elmasri and Shamkant B. Navathe, 7th Edition, 2017, Pearson.
2. Database management systems, Ramakrishnan, and Gehrke, 3rd Edition, 2014, McGraw Hill Silberschatz Korth and Sudharshan, Database System Concepts, 6th Edition, Mc-GrawHill, 2013.
3. 4. Coronel, Morris, and Rob, Database Principles Fundamentals of Design, Implementation and Management, Cengage Learning 2012.

B.E COMPUTER SCIENCE and ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Operating Systems (3:0:0) 3

(Effective from the academic year 2021 -22)

Course Code	21CS56	CIE Marks	50
Teaching Hours/Week (L: T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3 Hours

Course Objectives:

This course will enable students to:

1. Recognize the importance of the operating systems.
2. Recognize how the applications interact with the operating system as the later working as intermediary program between the machine and the application.
3. Understand how operating systems managing resources such as processors, memory and I/O.

Preamble

Operating systems are the fundamental part of every computing device to run any type of software. The increasing use of computing devices in all areas of life (leisure, work), lead to a variety of operating systems. Yet all operating systems share common principles. These principles are important for computer science students in their understanding of programming languages and software built on top of operating systems.

This course will be discussing about address spaces, system call interface, process/threads, inter process communication, deadlock, scheduling, main memory, virtual memory and file systems.

Module – 1

Introduction: Significance and Scope of the course, Importance of the course in societal, political and economic growth of the nation, Impact of the course on societal and ethical issues and career perspective.

Operating systems, System structures: What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and Security; Distributed system; Kernel Data Structures Computing Environments Open-Source Operating Systems.

General Overview Of The System General Review of the System-History-System structure-User Perspective-Operating System Services- Assumptions About Hardware. **(8 Hours)**

Module – 2

Introduction to the Kernel-Architecture System Concepts-Data Structures- System Administration.

Process Scheduling: Basic concepts; Scheduling Criteria; Scheduling Algorithms.

Process Synchronization: The critical section problem; Peterson's solution; Synchronization

(8 Hours)

Module – 3

The Structure Of Process: States-Transitions-System Memory-Context of a Process-Saving the Context-Manipulation of a Process Address Space-Sleep

Process Control: Process Creation-signals-Process Termination-Awaiting-Invoking other Programs-The shell-system Boot and the INIT Process.

(8 Hours)

Module – 4

Deadlocks: Deadlocks; System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock.

Memory Management: Memory management strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation.

(8 Hours)

Module – 5

File system: File concept; Access methods; Directory and Disk structure; File system mounting; File sharing; Protection System Calls for the File System-Open-Read-Write-Lseek-Close-Create-Special files Creation -Change Directory and Change Root-Change Owner and Change Mode-Stat-Fstat-Pipes-Dup-Mount-Unmount-Link-Unlink-File System Abstraction-Maintenance.

Recap/Summary of the Course **(8 Hours)**

Course Outcomes:

The students will be able to:

CO1: Describe the structure of OS and basic architectural components involved in OS.

CO2: Illustrate the various device and resource management techniques for timesharing and distributed systems

CO3: Analyze various techniques involved in Process management.

CO4: Demonstrate the Mutual exclusion, Deadlock detection and file system concepts. CO5: Implement various operating system services used in UNIX.

Textbooks:

1. Silberschatz, Galvin, Gagne, Operating System Concepts, John Wiley, 8th Edition, 2009.

2. Maurice J. Bach, "The Design of the Unix Operating System", Pearson Education,2002.

References:

1. William Stallings, Operating Systems: Internals and Design Principles -, Prentice Hall, 7th Edition 2012.

2. Behrouz A. Forouzan, Richard F. Gilberg. Thomson, UNIX and shell Programming -, Thomson Learning, 2003.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Data Communication and Networks (3:0:0) 3

(Effective from the academic year 2021 -22)

Course Code	21CS57	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3 Hours

Course Objectives:

This course will enable students to:

1. Build an understanding of the fundamental concepts of data communication and computer networking.
2. Analyze error detection and correction techniques along with mechanisms for Media Access control
3. Examine internet protocols and compare different routing algorithms.
4. Distinguish between connection oriented and connectionless services with respect to TCP and UDP protocols.
5. Explore the working of different application layer protocols and services.

Preamble:

This course provides an outline of network functions by introducing data communication and network concepts such as characteristics, functions, benefits, metrics, and attributes that describe network features and performance.

Module – 1

Data Communications: Data Communications Networks, Network Types, Networks Models: Protocol Layering, TCP/IP Protocol suite, The OSI model, **Physical Layer**: Data and Signals, Digital Signals, Transmission Impairment, Data Rate limits, Performance, Digital Transmission: Digital to digital conversion (Only Line coding: Polar, Bipolar and Manchester coding), Analog to digital conversion (only PCM), Analog Transmission: Digital to analog conversion, Switching: Introduction, Circuit Switched Networks and Packet switching.

(8 Hours)

Module – 2

Data Link Layer: Error Detection and Correction: Introduction, Block coding, Cyclic codes, Checksum, Forward error correction, Data link control: DLC services, Data link layer protocols, Stop and Wait**,** Go-Back-N, Selective repeat, Point to Point protocol (Framing, Transition phases only).

Media Access control: Random Access, Controlled Access and Channelization, Ethernet: IEEE 802.3

(8 Hours)

Module – 3

Network layer : IPV4 Addresses, Internet Protocols :IPv4 and IPv6, Routing Algorithms: The Link-State (LS) Routing Algorithm, The Distance-Vector (DV) Routing Algorithm, Hierarchical Routing, Routing in the Internet, Intra-AS Routing in the Internet: RIP, Intra-AS Routing in the Internet: OSPF, Inter/AS Routing: BGP.

(8 Hours)

Module – 4

Transport Layer: Introduction to Transport layer services, Connectionless Transport: UDP, UDP Segment Structure, UDP Checksum, Connection-Oriented Transport TCP: TCP Segment Structure, Round- Trip Time Estimation and Timeout, TCP Connection Management, Principles of Congestion Control: The Causes and the Costs of Congestion, Approaches to Congestion Control, Network-assisted congestion-control example, ATM ABR Congestion control.

(8 Hours)

Module – 5

Application Layer: Principles of Network Applications: Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the Internet, Application-Layer Protocols. The Web and HTTP: Overview of HTTP, Non-persistent and Persistent Connections, HTTP Message Format, File Transfer: FTP Commands & Replies, Electronic Mail in the Internet: SMTP, Mail Message Format, Mail Access Protocols, DNS; The Internet's Directory Service: Services Provided by DNS, Overview of How DNS Works, DNS Records and Messages, Peer-to-Peer Applications: P2P File Distribution.

Recap/Summary of the Course **(8 Hours)**

Course Outcomes:

The students will be able to:

CO1 Explain the fundamentals of data communication and apply the techniques to solve the given problem of frequency, signals, capacity of the channel and compute the performance of networks based on the metrics specified.

CO2 Explore Access control mechanisms and Examine the relationship between bandwidth utilization, reliability and error control using appropriate techniques.

CO3 Discuss the working of routers, Internet protocol and Analyze unicast broadcast and multicasts protocols and design the new algorithm for the given problem.

CO4 Analyze the various services offered by the transport layer and investigate the reliability, flow control and congestion control techniques for the given problems.

CO5 Identify the principles used in design of the application, discuss the application layer protocols and different techniques to improve the application performance and justify solution / architecture for the given case study /problems.

CO6 Investigate the given problem using the relevant modern tool and interpret the data , compose the report based on literature survey, results obtained and demonstrate integrity of the report with 90% uniqueness using any recommended software.

Textbooks:

1. Behrouz A. Forouzan, Data Communications and Networking 5E, 5th Edition, Tata McGraw-Hill, 2013.
2. James F Kurose and Keith W Ross, Computer Networking, A Top-Down Approach, Sixth edition, Pearson,2017.

References:

1. Alberto Leon-Garcia and Indra Widjaja: Communication Networks - Fundamental Concepts and Key architectures, 2nd Edition Tata McGraw-Hill, 2004.
2. William Stallings: Data and Computer Communication, 8th Edition, Pearson Education, 2007.
3. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2007.
4. Nader F. Mir: Computer and Communication Networks, Pearson Education, 2007.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Database Management System Laboratory (0:0:2) 1

(Effective from the academic year 2021 -22)

Course Code	21CSL58A	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	50
Total Number of Contact Hours	24	Exam Hours	3 Hours

Course Objectives:

This course will enable the students to

1. Foundation of knowledge in database concepts, technology and practice to groom the students into well informed database application developers.
2. Strong practice in SQL programming through a variety of database problems.
3. Develop Database applications using front end tools and Database as backend.

Laboratory Exercises:

PART A

Exercise 1:

Consider the following schema for a Library Database:
BOOK (Book_id, Title, Publisher_Name, Pub_Year)
BOOK_AUTHORS (Book_id, Author_Name)
PUBLISHER (Name, Address, Phone)
BOOK_COPIES (Book_id, Programme_id, No_of_Copies)
BOOK_LENDING (Book_id, Programme_id, Card_No, Date_Out, Due_Date)
LIBRARY_PROGRAMME (Programme_id, Programme_Name, Address)

Write SQL queries to

1. Retrieve details of all books in the library – id, title, name of publisher, authors, number of copies in each Programme, etc.
2. Get the particulars of borrowers who have borrowed more than 3 books, but from Jan 2017 to Jun 2017.
3. Delete a book in BOOK table. Update the contents of other tables to reflect this data manipulation operation.
4. Partition the BOOK table based on year of publication. Demonstrate its working with a simple query.
5. Create a view of all books and its number of copies that are currently available in the Library.

Exercise 2:

Consider the following schema for Order Database:
SALESMAN(Salesman_id, Name, City, Commission)
CUSTOMER(Customer_id, Cust_Name, City, Grade, Salesman_id)
ORDERS(Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id)

Write SQL queries to

1. Count the customers with grades above Bangalore's average.
2. Find the name and numbers of all salesmen who had more than one customer.

3. List the entire salesman and indicate those who have and do not have customers in their cities (Use UNION operation.)
4. Create a view that finds the salesman who has the customer with the highest order of a day.
5. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted.

Exercise 3:

Consider the schema for Movie Database:
ACTOR(Act_id, Act_Name, Act_Gender) DIRECTOR(Dir_id, Dir_Name, Dir_Phone) MOVIES(Mov_id, Mov_Title, Mov_Year, Mov_Lang, Dir_id) MOVIE_CAST(Act_id, Mov_id, Role)
RATING(Mov_id, Rev_Stars)

Write SQL queries to
1. List the titles of all movies directed by 'Hitchcock'.
2. Find the movie names where one or more actors acted in two or more movies.
3. List all actors who acted in a movie before 2000 and in a movie after 2015 (use JOIN operation).
4. Find the title of movies and number of stars for each movie that has at least one rating and find the highest number of stars that movie received. Sort the result by movie title.
5. Update rating of all movies directed by 'Steven Spielberg' to 5.

Exercise 4:

Consider the schema for College Database:
STUDENT(USN, SName, Address, Phone, Gender)
SEMSEC(SSID, Sem, Sec)
CLASS(USN, SSID)
COURSE(Subcode, Title, Sem, Credits)
IAMARKS(USN, Subcode, SSID, Test1, Test2, Test3, FinalIA)

Write SQL queries to
1. List all the student details studying in fourth semester 'C' section.
2. Compute the total number of male and female students in each semester and in each section.
3. Create a view of Test1 marks of student USN '1BI15CS101' in all Courses.
4. Calculate the FinalIA (average of best two test marks) and update the corresponding table for all students.
5. Categorize students based on the following criterion: If FinalIA = 17 to 20 then CAT = 'Outstanding'
If FinalIA = 12 to 16 then CAT = 'Average'
If FinalIA< 12 then CAT = 'Weak'
Give these details only for 8th semester A, B, and C section students.

Exercise 5:

Consider the schema for Company Database:
EMPLOYEE(SSN, Name, Address, Sex, Salary, SuperSSN, DNo)
DEPARTMENT(DNo, DName, MgrSSN, MgrStartDate)
DLOCATION(DNo,DLoc)
PROJECT(PNo, PName, PLocation, DNo)
WORKS_ON(SSN, PNo, Hours)

Write SQL queries to

1. Make a list of all project numbers for projects that involve an employee whose last name is 'Scott', either as a worker or as a manager of the department that controls the project.
2. Show the resulting salaries if every employee working on the 'IoT' project is given a 10 percent raise.
3. Find the sum of the salaries of all employees of the 'Accounts' department, as well as the maximum salary, the minimum salary, and the average salary in this department.
4. Retrieve the name of each employee who works on all the projects controlled by department number 5 (use NOT EXISTS operator).
5. For each department that has more than five employees, retrieve the department number and the number of its employees who are making more than Rs. 6,00,000.

PART B: Mini Project

Note:

Use Java, C#, PHP, Python, or any other similar front-end tool. All applications must be demonstrated on desktop/laptop as a stand-alone or web-based application (Mobile apps on Android/IOS are not permitted.)

For any problem selected make sure that the application should have five or more tables. Indicative areas include: Health care.

Course Outcomes:

The students will be able to

CO1: Apply the Conceptual Design Model and Database Hierarchical Structure to construct the real world requirement.

CO2: Implement different working concepts of DBMS using SQL Queries.

CO3: Develop a Database application using any Modern tool and generate the reports for the same.

- Conduction of Practical Examination:
  1. All lab Exercises from part A are to be included for practical examination.
  2. Mini project has to be evaluated for 30 Marks.
  3. Report should be prepared in a standard format prescribed for project work.
  4. Students are allowed to pick one experiment from the lot.
  5. Strictly follow the instructions as printed on the cover page of answer script.
  6. Marks distribution: a) Part A: Procedure + Conduction + Viva: 5 + 10 +5 =20 Marks
     b) Part B: Demonstration + Report + Viva voce = 15+10+05 = 30 Marks

Change of experiment is allowed only once and marks allotted to the procedure part to be made zero.

Textbooks:

1. Database systems Models, Languages, Design and Application Programming, Ramez Elmasri and Shamkant B. Navathe, 7th Edition, 2017, Pearson.
2. Database management systems, Ramakrishnan, and Gehrke, 3rd Edition, 2014, McGraw Hill

B.E COMPUTER SCIENCE AND ENGINEERING
Choice Based Credit System (CBCS)
SEMESTER – V

Operating Systems Laboratory (0:0:2) 1
(Effective from the academic year 2021 -22)

Course Code	21CSL58B	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	50
Total Number of Contact Hours	25	Exam Hours	3 Hours

Course Objectives:

This course will enable students to

1. Analyse the design aspects of operating system concepts through simulation.
2. Simulate and demonstrate the performance of algorithm's used to perform services in operating system.

Laboratory Exercises:

Part A: Implement using Java/Python programming Language

1. Write a program to simulate the following non-preemptive CPU scheduling algorithms to find turnaround time and waiting time. a) FCFS b) SJF c) Round Robin d) Priority
2. Write a program to simulate producer-consumer problem using semaphores.
3. Write a program to simulate the concept of Dining-Philosophers problem.
4. Write a C program to simulate the MULTI PROGRAMMING WITH VARIABLE NUMBER OF TASKS (MVT) and MULTI PROGRAMMING WITH FIXED NUMBER OF TASKS (MFT) memory management techniques.
5. Write a program to simulate the following contiguous memory allocation techniques a) Worst-fit b) Best-fit c) First-fit
6. Write a program to simulate deadlock avoidance using banker's algorithm.
7. Write a program to simulate deadlock detection using safety algorithm.
8. Write a program to simulate page replacement algorithms a) FIFO b) LRU c) LFU
9. Write a program to simulate paging technique of memory management.
10. Write a program to simulate the following DISK SCHEDULING ALGORITHMS a) FCFS b) SCAN c) C-SCAN

Course Outcomes:

The students will be able to

CO1: Apply the scheduling algorithms for the given problem.
CO2: Analyse the performance of processes with and without process synchronisation techniques.
CO3: Design resource allocation algorithms to detect and avoid deadlock.
CO4: Use different memory management techniques to allocate memory and analyse its performance

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Data Communication and Networks Laboratory (0:0:2) 1

(Effective from the academic year 2021 -22)

Course Code	21CSL58C	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	50
Total Number of Contact Hours	25	Exam Hours	3 Hours

Course Objectives:

This course will enable students to

1. Implement the techniques and protocols of datalink, network, transport and Application layers.
2. Simulate and demonstrate the performance of wired and wireless network using NS2/NS3.

Laboratory Exercises:

Part A: Implement using Java/Python programming Language

1. Implementation of Cyclic Redundancy Check for error correction and detection.
2. Implementation Of Address Resolution Protocol
3. Write a program for congestion control using leaky bucket algorithm.
4. Implement a Client Server program using TCP/IP.
5. Write a program to find the shortest path between vertices using bellman-ford algorithm
6. Write a program to implement FTP protocol.

Part B: Simulation using NS2/NS3

7. Implement three nodes point – to – point network with duplex links between them. Set the queue size, vary the bandwidth and find the number of packets dropped.
8. Simulate a four node point-to-point network with the links connected as follows: n0 – n2, n1 – n2 and n2 – n3. Apply TCP agent between n0-n3 and UDP between n1-n3. Apply relevant applications over TCP and UDP agents, changing the parameter and determine the number of packets sent by TCP / UDP.
9. Simulate an Ethernet LAN using n nodes (6-10), change error rate and data rate and compare throughput.
10. Implement an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination.
11. Implement transmission of ping messages/trace route over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion.
12. Implement simple ESS and with transmitting nodes in wire-less LAN by simulation and determine the performance with respect to transmission of packets.

Part C: Group Assignments

13. Implement Bit stuffing and Character stuffing in data link layer framing.
14. Implementation of Hamming code algorithm
15. Implement a Datagram socket for client server application.
16. Write program to develop a DNS client server to resolve the given hostname.
17. Implementation of Go Back-N and selective repeat protocols.
18. Write a program to find the shortest path between vertices using dijkstra's algorithm.

Course Outcomes:

The students will be able to

CO1: Using NS2 design network topology as per the given problem and investigate the problem by analyzing the performance for the set of network parameters for different no of trails , tabulate the results, draw graphs to represent the observed values and arrive at valid conclusions.

CO2: Apply different techniques to ensure the reliable/ secured communication in wired / wireless communication , implement using java Programming language , verify the results and give valid conclusions

CO3: Write a report on each problem solved in the laboratory and systematically communicate within the stipulated time period as per the defined procedure.

B.E COMPUTER SCIENCE and ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Blockchain Technology (3:0:0) 3

(Effective from the academic year 2021-22)

Course Code	21CSE541	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3

Course Objectives:

1. Explore the operations of the blockchain technology.
2. Demonstrate and interpret working of Hyperledger Fabric.
3. Compare different types of hacking tools.
4. Test blocks chain system for any vulnerability.

Module – 1

Preamble: Block chain technology has the potential to revolutionize interactions between governments, businesses and citizens. Block chain drew global attention in terms of the secured deployment of various services across multiple industries. National Governance facing unique challenges in various modalities are addressed by block chain leading improvement. Block chain technology has the potential to boost GDP over next decade.

Introduction to Blockchain, History: Digital Money to Distributed Ledgers -Design Primitives: Protocols, Security, Consensus, Permissions, Privacy- : Blockchain Architecture and Design-Basic crypto primitives: Hash, Signature, Hashchain to Blockchain-Basic consensus mechanisms.

(9 Hours)

Module – 2

Requirements for the consensus protocols-Proof of Work (PoW)-Scalability aspects of Blockchain consensus protocols: Permissioned Blockchains-Design goals-Consensus protocols for Permissioned Blockchains.

(7 Hours)

Module – 3

Consensus: Decomposing the consensus process-Hyperledger fabric components-Chaincode Design and Implementation: Hyperledger Fabric II:-Beyond Chaincode: fabric SDK and Front End-Hyperledger composer tool.

(7 Hours)

Module – 4

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.

(8 Hours)

Module – 5

Blockchain in Financial Software and Systems (FSS): -Settlements, -KYC, -Capital markets-Insurance, Use case II: Blockchain in trade/supply chain: Provenance of goods, visibility, trade/supply chain finance, invoice management/discounting.

Recap/Summary: Overview of various techniques under hacking and application of block chain.

(9 Hours)

Course Outcomes: The students will be able to:

CO1: Demonstrate the basics of the Blockchain concepts using modern tools and technologies.
CO2: Analyse the role of block chain applications in different domains.
CO3: Compare among various consensus mechanisms for a given problem.
CO4: Evaluate security, privacy, and efficiency of a given blockchain system for the selected problem.

Question paper pattern:

- **SEE** will be conducted for 100 marks.
- **Part A:** First question with 20 MCQs carrying 1 mark each.
- **Part B:** Each full question is for 16 marks. (Answer five full questions out of 10 questions with intra modular choice). In every question, there will be a maximum of three sub-questions.
- **CIE** will be announced prior to the commencement of the course.
- 25 marks for the test. Average of three tests will be taken.
- 25 marks for Alternate Assessment Method.

Textbooks:

1. Mark Gates, ―Blockchain: Ultimate guide to understanding blockchain, bitcoin, crypto currencies, smart contracts and the future of money‖, Wise Fox Publishing and Mark Gates, 2017.
2. Stuart McClure, Joel Scambray and Goerge Kurtz, Hacking Exposed 7: Network Security Secrets & Solutions, Tata Mc Graw Hill, 2010.

References:

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, First Edition, Princeton University Press, 2016
2. Arshdeep Bahga, Vijay Madisetti, ―Blockchain Applications: A Hands-On Approach, Arshdeep Bahga, Vijay Madisetti publishers 2017.
3. Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, Gray Hat, Hacking The Ethical Hackers Handbook, 3rd Edition, Tata Mc Graw Hill, 2011.
4. Ebook: Blockchain Applications- https://www.blockchain-books.com
5. https://onlinecourses.nptel.ac.in/noc18_cs47/unit?unit=45&lesson=68

B.E COMPUTER SCIENCE and ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Advanced Software Engineering (3:0:0) 3

(Effective from the academic year 2021-22)

Course Code	21CSE542	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3 hrs

Course Objectives:

1. To apply principles of software development and evolution.
2. To specify, abstract, verify and validate solutions to large-size problems,
3. To plan, develop and manage large software and learn emerging trends in software engineering.

Module – 1

Software Project Management and Requirements

Project Management: Management Activities, Project Pl Software Project Management and Requirements Project Management: Management Activities, Project Planning, Project Scheduling, Risk Management; Software Requirements: Functional and Non-Functional Requirements, User Requirements, System Requirements, Requirements Document; Requirements Engineering Process: Feasibility Studies, Requirements Elicitation and Analysis, Requirements Validation, Requirements Management.

Module – 2

Software Models, software Prototyping and Specification

System Models, Software Prototyping and Specifications System models: Context, Behavioural, Data, and Object models, CASE Workbenches; Software Prototyping: Prototyping in the Software Process, Rapid Prototyping Techniques, User Interface Prototyping; Specifications: Formal Specification in the Software Process, Interface Specification, Behavioural Specification.

Architectural Design

Introduction: System Structuring; Control Models; Modular Decomposition; Domain- Specific Architectures; Distributed Systems Architectures: Multiprocessor Architectures; Client-Server Architectures, Distributed Object Architectures; CORBA (Common Object Request Broker Architecture)

Module – 3

Software Design

Object Oriented Design: Objects and Object Classes, Object-Oriented Design Process, Design Evolution; Real Time Software Design: Systems Design, Real-Time Executives, Monitoring and Control Systems, Data Acquisition Systems; Design with Reuse: Component-Based Development, Application Families, Design Patterns; User Interface Design: Principles, User Interaction, Information Presentation, User Support, Interface Evaluation.

Module – 4

Verification, Validation and Testing

Verification and Validation (V & V): Static and Dynamic V & V, V & V Goals, V & V vs. Debugging,

Software Inspections / Reviews, Clean-Room Software Development; Software Testing: Defect Testing, Integration Testing, Interface Testing, Object-Oriented Testing, Testing Workbenches

Managing People

Introduction; Limits to Thinking; Memory Organization; Knowledge Modeling; Motivation; Group Working; Choosing and Keeping People; the People Capability Maturity Model

Module – 5

Software Cost Estimation and Quality Management

Software Cost Estimation: Productivity, Estimation Techniques, Algorithmic Cost Modelling, Project Duration and Staffing. Quality Management: Quality Assurance and Standards, Quality Planning, Quality Control, Software Measurement and Metrics; Process Improvement: Process and Product Quality, Process Analysis and Modelling, Process Measurement, the SEI Process Maturity Model, and Process Classification

Evolution

Legacy Systems: Structures, Design, and Assessment; Software Change: Program Evolution Dynamics, Software Maintenance, Architectural Evolution; Software Re- Engineering: Source Code Translation, Reverse Engineering, Program Structure Improvement, Program Modularization, Data Re-Engineering; Configuration Management

Course Outcomes: The students will be able to:

CO1: Acquire knowledge on the wider perspective of software engineering and architecture issues

CO2: Implement the mathematical notation of the software systems through formal methods

CO3: Design and construct the software systems using reusable software "components" by acquiring the knowledge about domain engineering and component based development

CO4: Merge the conventional principles, concepts and methods in software engineering with the elements of object oriented and CBSE to create client/server systems

CO5 Create high quality web applications by using software engineering concepts and principles like formulation, planning, analysis testing and evaluation.

Question paper pattern:

- **SEE** will be conducted for 100 marks.
- **Part A:** First question with 20 MCQs carrying 1 mark each.
- **Part B:** Each full question is for 16 marks. (Answer five full questions out of 10 questions with intra modular choice). In every question, there will be a maximum of three sub-questions.
- **CIE** will be announced prior to the commencement of the course.
- 25 marks for test. Average of three test will be taken.
  25 marks for Alternate Assessment Method.

Textbooks:

1. Software Engineering: An Engineering Approach, by J.F.Peters and W. Pedrycz, Publisher: John Wiley and Sons.
2. Software Engineering: A Practitioner's Approach by Roger Pressman, Publisher: McGraw-Hill

References:

1. Fundamentals of Software Engineering by Ghezzi, Jayazeri, and Mandrioli, Publisher: Prentice-Hall
2. Software Engineering Fundamentals by Ali Behforooz, and Frederick J.Hudson, Publisher: Oxford University Press

B.E COMPUTER SCIENCE and ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

INTERNET OF THINGS (3:0:0) 3

(Effective from the academic year 2021-22)

Course Code	21CSE543	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3 hrs

Course Objectives:

1. To develop knowledge in Industrial Internet of Things (IIoT) fundamentals.
2. To understand and design methodologies for M2M and SDN architectures.
3. To plan and develop IOT based solutions to real world problems.

Module – 1

Introduction to Internet of Things Definition & Characteristics of IoT, Physical Design of IoT Things in IoT, IoT Protocols, Logical Design of IoT, IoT Functional Blocks, IoT Communication Models, IoT Communication APIs, IoT Enabling Technologies, Wireless Sensor Networks, Cloud Computing Big Data Analytics, Communication Protocols, Embedded Systems IoT Levels & Deployment Templates, IoT Level-1,IoT Level-2,IoT Level-3,IoT Level-4,IoT Level-5,
IoT Level-6.

(8 Hours)

Module – 2

IoT and M2M: Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT, Software Defined Networking, Network Function Virtualization, IoT System Management with
NETCONF-YANG, Need for IoT Systems Management, Simple Network Management Protocol
(SNMP), Limitations of SNMP, Network Operator Requirements, NETCONF, YANG IoT Systems
Management with NETCONF-YANG, NETOPEER.-

(8 Hours)

Module – 3

IoT Platforms Design Methodology: IoT Design Methodology , Purpose & Requirements Specification,Process Specification,Domain Model Specification,Information Model Specification, Service Specifications, IoT Level Specification, Functional View Specification, Operational View Specification, Device & Component Integration, Application Development, IoT Systems – Logical Design using Python ,Functions Modules ,Packages ,File Handling Operations Classes, Python Packages of Interest for IoT ,JSON, XML, HTTPLib & URLLib ,SMTPLib-

(8 Hours)

Module – 4

Raspberry Pi, About the Board, Linux on Raspberry Pi, Raspberry Pi Interfaces, Serial SPI, I2C,
Programming Raspberry Pi with Python, Controlling LED with Raspberry Pi , Interfacing an LED and Switch with Raspberry, Interfacing a Light Sensor (LDR) with Raspberry Pi ,Other IoT Devices, pcDuino, BeagleBone Black, Cubie board. IoT Physical Servers & Cloud

Offerings, WAMP - AutoBahn for IoT, Xively Cloud for IoT.

(8 Hours)

Module – 5

Python Web Application Framework – Django, Django Architecture, Starting Development with
Django, Designing a RESTful Web API, Amazon Web Services for IoT, Amazon EC2, Amazon AutoScaling, Amazon S3, Amazon RDS Amazon DynamoDB, Amazon Kinesis, Amazon SQS, Amazon EMR, SkyNet IoT Messaging Platform, INTEL Gen2, UDDO Board example.-

(8 Hours)

Course Outcomes: The students will be able to:

CO1: Understand the design issues and fundamentals of IoT.
CO2: Design various methodologies for M2M and SDN architectures.
CO3: Distinguish different cloud based solutions for IoT.
CO4: Develop IoT based solutions for real world problems.
CO5: Analyze the various data analytical tools in IoT.

Question paper pattern:

SEE will be conducted for 100 marks.
Part A: First question with 20 MCQs carrying 1 mark each.
Part B: Each full question is for 16 marks. (Answer five full questions out of 10 questions with intra modular choice). In every question, there will be a maximum of three sub-questions.
CIE will be announced prior to the commencement of the course.
25 marks for the test. Average of three tests will be taken. 25 marks for Alternate Assessment Method.

Textbooks:

. Internet of Things (A Hands-on-Approach) by Arshdeep Bagha, Vijay Madisetti University press 2015.

References:

. Enterprise IoT: Strategies and Best Practices for Connected Products and Services By Dirk Slama, Frank Puhlmann, Jim Morrish, Rishi M Bhatnagar

B.E COMPUTER SCIENCE and ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Image Processing and Computer Vision (3:0:0) 3

Course Code	21CSE544	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3

Course Objectives:

1. Implement fundamental image processing techniques required for computer vision and shape analysis.
2. Explain the fundamentals of image processing.
3. Compare the different transformation algorithms.
4. Contrast the different enhancement, segmentation and compression techniques.

Preamble: Significance and Scope of the course, Importance of the course in societal, political and economic growth of the nation, Impact of the course on societal and ethical issues and career perspective.

Module – 1

Digital Image Fundamentals: Fundamental steps in DIP, Components of digital image processing, elements of visual perception, Structure of the human eye, Image formation in the eye, Brightness adaptation and discrimination, light, Image sensing and acquisition, image formation model, definition and some properties of two dimensional system, Discrete 2D convolution, 2D discrete Fourier transform and its properties, optical and modulation transfer function, Spectral density function. Sampling and quantization of images, Two dimensional sampling theory, representation of digital image, Spatial and gray level resolution, zooming and shrinking, some basic relationships between pixel

(9 Hours)

Module – 2

Image Enhancement in the Spatial Domain: Gray Level Transformations, Piecewise linear transformation, Histogram Processing, Enhancement Using Arithmetic/Logic Operations. Basics of Spatial Filtering, Smoothing and Sharpening Spatial Filters, Use of first order and second order derivative in enhancement.

(8 Hours)

Module – 3

Image Enhancement in the Frequency Domain: Two dimensional Fourier Transform, properties of frequency domain, correspondence between filtering in spatial and frequency domain, Smoothing and Sharpening frequency domain filters, Homomorphic Filtering.

Image Restoration: Model of the Image Degradation/Restoration Process, Noise Models, Noise reduction in spatial domain and frequency domain, Inverse filtering, Wiener filtering.

(7 Hours)

Module – 4

Image Compression: Fundamentals of Image Compression, Image compression models, concepts of Information Theory, Fundamental coding theorems, Estimation of entropy, Variable length coding, Huffman coding, Near optimal variable length coding, Near optimal variable length coding, Arithmetic coding, constant area coding, run length coding, image

compression standards (JPEG, JPEG2000).

(7 Hours)

Module – 5

Image Segmentation: Detection of Discontinuities (point, line edge), Edge Linking and Boundary Detection, Thresholding, Basic global Thresholding, Adaptive Thresholding, Region- Based Segmentation, region growing, splitting and merging.

Recap/Summary

(9 Hours)

Course Outcomes: The students will be able to:

CO1 Apply image processing algorithms for practical applications.

CO2 Analyze various types of images, intensity transformations and spatial filtering.

CO3 Design the solution for various problems in frequency and spatial domain.

CO4 Evaluate the methodologies for image segmentation, restoration etc.

Question paper pattern:

- **SEE** will be conducted for 100 marks.
- **Part A:** First question with 20 MCQs carrying 1 mark each.
- **Part B:** Each full question is for 16 marks. (Answer five full questions out of 10 questions with intra modular choice). In every question, there will be a maximum of three sub-questions.
- **CIE** will be announced prior to the commencement of the course.
- 25 marks for the test. Average of three tests will be taken.
- 25 marks for Alternate Assessment Method.

Textbooks:

1. Rafael C G., Woods R E. and Eddins S L, Digital Image Processing, Prentice Hall, 3rd edition, 2008.
2. David A. Forsyth and Jean Ponce: Computer Vision – A Modern Approach, PHI Learning (Indian Edition), 2009.

References:

1. Milan Sonka, Image Processing, analysis and Machine Vision, Fourth Edition, Thomson Press India Ltd.
2. Anil K. Jain, Fundamentals of Digital Image Processing, 2nd Edition, Prentice Hall of India
3. S. Sridhar, Digital Image Processing, Oxford University Press, 2nd Ed, 2016.

B.E COMPUTER SCIENCE and ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Natural Language Processing(3:0:0) 3

(Effective from the academic year 2021-22)

Course Code	21CSE545	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3

Course Objectives:

1. Learn the techniques in natural language processing
2. Be familiar with the natural language generation
3. Be exposed to Text Mining
4. Understand the information retrieval techniques

Preamble: This course starts with the basics of text processing including basic pre-processing, spelling correction, language modeling, Part-of-Speech tagging, Constituency and Dependency Parsing, Lexical Semantics, distributional Semantics and topic models. Finally, the course also covers some of the most interesting applications of text mining (information retrieval) such as entity linking, relation extraction, text summarization, text classification, sentiment analysis and opinion mining.

Module – 1

Overview and language modeling: Overview: Origins and challenges of NLP- Language and Grammar-Processing Indian Languages- NLP Applications- Information Retrieval. Language Modeling: Various Grammar- based Language Models-Statistical Language Model.

(9 Hours)

Module – 2

Word level and syntactic analysis: Word Level Analysis: Regular Expressions- Finite-State Automata-Morphological Parsing-Spelling Error Detection and Correction-Words and Word classes-Part-of Speech Tagging. Syntactic Analysis: Context-free Grammar-Constituency- Parsing-Probabilistic Parsing.

(7 Hours)

Module – 3

Extracting Relations from Text: From Word Sequences to Dependency Paths:

Introduction, Subsequence Kernels for Relation Extraction, A Dependency-Path Kernel for Relation Extraction and Experimental Evaluation. Mining Diagnostic Text Reports by Learning to Annotate Knowledge Roles: Introduction, Domain Knowledge and Knowledge Roles, Frame Semantics and Semantic Role Labeling, Learning to Annotate Cases with Knowledge Roles and Evaluations.

A Case Study in Natural Language Based Web Search: InFact System Overview, The GlobalSecurity.org Experience

(7 Hours)

Module – 4

Evaluating Self-Explanations in iSTART: Word Matching, Latent Semantic Analysis, and Topic Models: Introduction, iSTART: Feedback Systems, iSTART: Evaluation of Feedback Systems,

Textual Signatures: Identifying Text-Types Using Latent Semantic Analysis to Measure the Cohesion of Text Structures: Introduction, Cohesion, Coh- Metrix, Approaches to analyzing Texts, Latent Semantic Analysis, Predictions, Results of Experiments. Automatic Document Separation: A Combination of Probabilistic Classification and Finite-State Sequence Modeling: Introduction, Related Work, Data Preparation, Document Separation as a Sequence Mapping Problem, Results.

Evolving Explanatory Novel Patterns for Semantically-Based Text Mining:

Related Work, A Semantically Guided Model for Effective Text Mining.

(8 Hours)

Module – 5

INFORMATION RETRIEVAL AND LEXICAL RESOURCES: Information Retrieval: Design features of Information Retrieval Systems-Classical, Non classical, and Alternative Models of Information Retrieval – valuation Lexical Resources: World Net-Frame Net- Stemmers-POS Tagger- Research Corpora.

(9 Hours)

Course Outcomes: The students will be able to:

CO1: **Illustrate the fundamental concepts and techniques of natural language**

CO2: **Utilize appropriate natural language generation, retrieval text mining probabilistic classification and semantic techniques to solve the real-world problem. (K3)**

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CO3: **Analyze the text data generated from the given real-world applications. (K4)**

CO4: **Build a real time application for the given NLP problem.**

Question paper pattern:

- **SEE** will be conducted for 100 marks.
- **Part A:** First question with 20 MCQs carrying 1 mark each.
- **Part B:** Each full question is for 16 marks. (Answer five full questions out of 10 questions with intra modular choice). In every question, there will be a maximum of three sub-questions.
- **CIE** will be announced prior to the commencement of the course.
- 25 marks for test. Average of three test will be taken.
- 25 marks for Alternate Assessment Method.

Textbooks:

1. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.

2. Anne Kao and Stephen R. Poteet (Eds), "Natural LanguageProcessing and Text

Mining", Springer-Verlag London Limited 2007.

References:

11. Daniel Jurafsky and James H Martin, "Speech and Language Processing: Anintroduction to Natural Language Processing, Computational Linguistics and SpeechRecognition", 2nd Edition, Prentice Hall, 2008.

2. James Allen, "Natural Language Understanding", 2nd edition, Benjamin/Cummingspublishing company, 1995

3. 1. Gerald J. Kowalski and Mark.T. Maybury, "Information Storage and Retrieval systems", Kluwer academic Publishers, 2000.