| | | | | |
|---|---|---|---|---|
| | **Deep Learning** | | Semester | 7 |
| | Course Code | **BCS714A** | CIE Marks | 50 |
| | Teaching Hours/Week (L: T:P: S) | 3:0:0:0 | SEE Marks | 50 |
| | Total Hours of Pedagogy | 40 | Total Marks | 100 |
| | Credits | 03 | Exam Hours | 03 |
| | Examination type (SEE) | Theory | | |

**Course objectives:**

- Understand the basic concepts of deep learning.
- Know the basic working model of Convolutional Neural Networks and RNN in decision making.
- Illustrate the strength and weaknesses of many popular deep learning approaches.
- Introduce major deep learning algorithms, the problem settings, and their applications to solve real world problems

**Teaching-Learning Process (General Instructions)**

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation/Demonstration to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem/Practical Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills, and practical skill such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Use animations/videos to help the students to understand the concepts.
7. Demonstrate the concepts using PYTHON and its libraries wherever possible

**Module-1**

**Introducing Deep Learning**: **Biological and Machine Vision:** Biological Vision, Machine Vision: The Neocognitron, LeNet-5, The Traditional Machine Learning Approach, ImageNet and the ILSVRC, AlexNet, TensorFlow Playground. **Human and Machine Language:** Deep Learning for Natural Language Processing: Deep Learning Networks Learn Representations Automatically, Natural Language Processing, A Brief History of Deep Learning for NLP, Computational Representations of Language: One-Hot Representations of Words, Word Vectors, Word-Vector Arithmetic, word2viz, Localist Versus Distributed Representations, Elements of Natural Human Language.

**Text book 2 : Chapter 1, 2**

**Module-2**

**Regularization for Deep Learning:** Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi- Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, **Optimization for Training Deep Models:** How Learning Differs from Pure Optimization, Basic Algorithms. Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates.

**Text book 1 : Chapter 7 (7.1 to 7.10), Chapter 8 (8.1,8.3,8.4,8.5)**

**Module-3**

| | |
|---|---|
| | **Convolution neural networks:** The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Convolutional Networks and the History of Deep Learning.<br>**Text book 1 : Chapter 9 (9.1 to 9.8, 9.11)** |
| | **Module-4** |
| | **Sequence Modelling:** Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks. Long short-term memory.<br><br>**Text book 1 : Chapter 10 (10.1 to 10.6, 10.10)** |
| | **Module-5** |
| | **Interactive Applications of Deep Learning:** Natural Language Processing: Preprocessing Natural Language Data: Tokenization, Converting All Characters to Lowercase, Removing Stop Words and Punctuation, Stemming, Handling *n*-grams, Preprocessing the Full Corpus, Creating Word Embeddings with word2vec: The Essential Theory Behind word2vec, Evaluating Word Vectors, Running word2vec, Plotting Word Vectors, The Area under the ROC Curve: The Confusion Matrix, Calculating the ROC AUC Metric, Natural Language Classification with Familiar Networks: Loading the IMDb Film Reviews, Examining the IMDb Data, Standardizing the Length of the Reviews, Dense Network, Convolutional Networks, Networks Designed for Sequential Data: Recurrent Neural Networks, Long Short-Term Memory Units, Bidirectional LSTMs, Stacked Recurrent Models, Seq2seq and Attention, Transfer Learning in NLP.<br>**Text book 2 : Chapter-8** |

**Course outcomes (Course Skill Set):**

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

1. Interpret the concepts of neural networks learning processes.
2. Illustrate deep learning methods using regularization and Optimization process
3. Design deep learning models using convolutional operations.
4. Analyze sequential data to build recurrent and recursive models.
5. Demonstrate the different interactive applications of deep learning.

## Assessment Details (both CIE and SEE)

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

**Continuous Internal Evaluation:**

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

**Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.**

**Semester-End Examination:**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

**Suggested Learning Resources:**

**Books**

1. Ian Goodfellow, Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press, 2016. https://www.deeplearningbook.org/lecture_slides.html
2. John Krohn, Grant Beyleveld, Aglae Bassens, Deep Learning Illustrated, A Visual, Interactive Guide to Artificial Intelligence, Pearson, 2022.

**Web links and Video Lectures (e-Resources):**

https://www.youtube.com/watch?v=VyWAvY2CF9c
https://www.youtube.com/watch?v=7sB052Pz0sQ
https://www.youtube.com/watch?v=Mubj_fqiAv8
https://www.coursera.org/learn/neural-networks-deep-learning

- **https://onlinecourses.nptel.ac.in/noc20_cs62/preview**

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Programming Assignments, such as implementation of CNN and Recurrent neural network models - 10 Marks
- Group assignment (Group of two) on recent developments in Deep learning – Refer IEEE/ACM/Elsevier etc publications - 15 Marks

| | | | | |
|---|---|---|---|---|
| | **Financial and Cost Accounting** | | Semester | 7 |
| | Course Code | **BCB714B** | CIE Marks | 50 |
| | Teaching Hours/Week (L: T:P: S) | 3:0:0:0 | SEE Marks | 50 |
| | Total Hours of Pedagogy | 40 | Total Marks | 100 |
| | Credits | 03 | Exam Hours | 03 |
| | Examination type (SEE) | Theory | | |

**Course objectives:**

- Understand the meaning of accounting and its use in business.
- Develop the different forms of financial statements.
- Understand the process of estimation and calculation of the cost of an item.
- Understand the process and methods of software project estimation.

**Teaching-Learning Process (General Instructions)**

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
2. Chalk and Talk method for Problem Solving.
3. Adopt flipped classroom teaching method.
4. Adopt collaborative (Group Learning) learning in the class.
5. Adopt Problem Based Learning (PBL), which fosters students' an

**Module-1**

**INTRODUCTION TO ACCOUNTING:** What is accounting? Who are the users of accounting information? The conflicting interests of users, how useful is accounting information? Providing a service, weighing up the costs and benefits, accounting as an information system, the changing face of accounting, accounting for business, purpose of a business, kinds of business ownership, how are businesses organised? Balancing risk and return, accounting for ethics, not-for-profit organisations.

**Chapter 1 of Textbook 1**

**Module-2**

**MEASURING AND REPORTING FINANCIAL POSITION:** The major financial statements – an overview, the statement of financial position, the effect of trading transactions, classifying assets, classifying claims, statement layouts, capturing a moment in time, the role of accounting conventions, money measurement, valuing assets, meeting user needs, Simple numerical examples on statement of cash flows and Statement of financial position.

**Chapter 2 of Textbook 1**

**Module-3**

**MEASURING AND REPORTING FINANCIAL PERFORMANCE**: The income statement, different roles, income statement layout, further issues, recognising revenue, recognising expenses, profit, cash and accruals accounting, depreciation, costing inventories, uses and usefulness of the income statement, Numerical examples of preparing the income statement and calculation of depreciation and costing inventory methods.

**Chapter 3 of Textbook 1**

**Module-4**

**OVERVIEW OF COST ACCOUNTING (CA):** Introduction, Evolution of CA, Objectives of CA, Advantages and Limitations of CA, Importance of CA to Business Concerns, Essentials of a Good CA System, Cost Accounting versus Financial Accounting. (Chapter 1 of Textbook 2)

| | |
|---|---|
| | **Basic Concepts of Cost:** Introduction, Cost Concepts and Terms, Elements of Cost, Overheads, Classification of Costs, Types of Costing, Methods of Costing. (Chapter 2 of Textbook 2)<br>**Cost Sheet/Statement of Cost:** Introduction, Features of a Cost Sheet, Items Not Included in Total Costs (Non-cost Items), Format of a Simple Cost Sheet Simple numerical examples of calculating the cost and profit of an item.<br>**Chapter 3 of Textbook 2** |
| | **Module-5** |
| | **SOFTWARE PROJECT ESTIMATION:** Types of Project Requirements, Functional Size, Software Estimation Approaches, Estimate Ranges, Timing of Estimates Producing a Detailed Estimate, Use of Function Point Sizing (Functional Size Measurement) in Effort Estimation.<br>**Chapter 1 of Textbook 3**<br>**Software Estimation Approaches:** Estimating Using Equations - ISBSG Regression Equation Tables, Using the ISBSG Regression Equations, Creating Graphs from the Equations, Example Effort Estimate Using the Equations, Estimating Using Comparison - Using the Comparison Technique, Estimating Using Analogy, Background, Reasoning by Analogy, Estimating by Analogy, Advantages and Drawbacks of Estimating by Analogy, Estimating Using Work Breakdown Structure, Work Breakdown Structure: Introduction, Using Process Models for Micro-Estimation.<br>**Chapter 7, 8, 9, 10 of Textbook 3** |

**Course outcome (Course Skill Set)**

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

1. Explain the need of accounting in a business.
2. Develop the reports of financial position of a firm.
3. Analyse the financial performance of an organisation.
4. Outline the procedure followed for costing and calculate the cost of simple items.
5. Explain the process and various approaches related to software project estimation.

## Assessment Details (both CIE and SEE)

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

**Continuous Internal Evaluation:**

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

**Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.**

**Semester-End Examination:**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

**Suggested Learning Resources:**

**Text Books**

1. Financial Accounting for Decision makers, Peter Atrill and Eddie McLaney Pearson education limited, Tenth edition, 2022
2. Cost Accounting, K. Alex, Pearson Education, 2012. ISBN 9788131759462.
3. Practical Software Project Estimation: A Toolkit for Estimating Software Development Effort & Duration, Compiled and edited by Peter R. Hill, McGraw-Hill, ISBN: 978-0-07-171792-2.

**Reference Books**

1. Financial Management – Theory and Practice, Prasanna Chandra, Tata Mc Graw Hill, 10th Edition, 2019
2. Financial Management, I M Pande, Pearson Education, 12th Edition, 2021
3. International Financial Management, P.G. Apte, McGraw Hill Education (India) Private Limited 8th Edition, 2020.
4. Mechanical Estimating and Costing Including Contracting, T.R. Banga and S.C. Sharma, Khanna Publishers, 17th edition, 2011
5. Mechanical Estimating & Costing, Dr. Vinod Gupta, Manisha Agarwal, Neelkanth Publishers Pvt. Ltd. 2017, ISBN: 9788184446685
6. Software Estimation – Demystifying the black art, Steve McConnell, Microsoft Press, 2006, ISBN: 978-0-7356-0535-0

| **Web links and Video Lectures (e-Resources):** |
| --- |
| ● https://onlinecourses.nptel.ac.in/noc23_mg65/preview<br>● https://onlinecourses.nptel.ac.in/noc24_mg81/preview<br>● https://onlinecourses.nptel.ac.in/noc24_ec01/preview<br>● https://onlinecourses.nptel.ac.in/noc20_mg53/preview<br>● https://onlinecourses.nptel.ac.in/noc22_cs107/preview |
| **Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**<br>● Assignment-1: Solving financial accounting problem using Excel. – 15 Marks<br>● Assignment-2: Solving financial and Cost accounting problems (Numerical). – 10 Marks |

| | | | | |
|---|---|---|---|---|
| | **Total Quality Management** | | Semester | 7 |
| | Course Code | **BCB714C** | CIE Marks | 50 |
| | Teaching Hours/Week (L: T:P: S) | 3:0:0:0 | SEE Marks | 50 |
| | Total Hours of Pedagogy | 40 | Total Marks | 100 |
| | Credits | 03 | Exam Hours | 03 |
| | Examination type (SEE) | Theory | | |

**Course objectives:**

- Understand various approaches to TQM
- Understand the characteristics of quality leader and his role.
- Develop feedback and suggestion systems for quality management.
- Enhance the knowledge in Tools and Techniques of quality management

**Teaching-Learning Process (General Instructions)**

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
2. Chalk and Talk method for Problem Solving.
3. Adopt flipped classroom teaching method.
4. Adopt collaborative (Group Learning) learning in the class.
5. Adopt Problem Based Learning (PBL), which fosters students' analytical skills and develops thinking skills such as evaluating, generalizing, and analysing information.

**Module-1**

**Principles and Practice:** Definition, basic approach, gurus of TQM, contribution of Armand Feigenbaum, Philip Crosby, Kaoru Ishikawa, Taguchi, TQM Framework, awareness, defining quality, historical review, obstacles, benefits of TQM.

**Textbook: Chapter-1**

**Module-2**

**Leadership:** Definition, characteristics of quality leaders, leadership concept, characteristics of quality leaders, 7 habits of highly effective people, ethics, role of TQM leaders, Deming's Philosophy – 14 points, implementation, core values, concepts and framework, strategic planning, communication, decision making.

**Textbook: Chapter-2**

**Module-3**

**Customer Satisfaction and Customer Involvement**: Customer Satisfaction: customer and customer perception of quality, feedback, using customer complaints, Dimensions of manufacturing and service quality, translating needs into requirements, customer retention, case studies.

**Employee Involvement** – Motivation, employee surveys, empowerment, teams, suggestion system, recognition and reward, gain sharing, performance appraisal, unions and employee involvement, case studies.

**Textbook: Chapter-3, 4**

**Module-4**

| | |
|---|---|
| | **Continuous Process Improvement:** process, 7 QC tools, Juran's trilogy, improvement strategies, types of problems, PDSA Cycle, problem-solving methods, Kaizen, reengineering, six sigma, case studies.<br><br>**Information Technology** – History, Computers and Quality Function, The internet and other electronics communication, Information Quality issues, Industry 4.0.<br><br>**Textbook: Chapter-5, 9** |
| | **Module-5** |
| | **Management Tools:** 5S, 3M, Why-Why Analysis, Force Field Analysis, Nominal Group technic, Affinity diagram, interrelationship diagram, tree diagram, matrix diagram, Prioritization matrices, Process Decision Program Chart, Activity Network Diagram.<br><br>**Textbook: Chapter-17** |

**Course outcome (Course Skill Set)**

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

1. Explain the various approaches of TQM and contribution of TQM gurus to the development of TQM.
2. Contrast the leadership qualities of TQM leaders.
3. Infer on customer needs and perceptions on quality requirements.
4. Explain various statistical tools for continuous improvement of systems and the role of IT in improving the quality.
5. Apply the tools and technique for effective implementation of TQM.

## Assessment Details (both CIE and SEE)

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

**Continuous Internal Evaluation:**

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

**Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.**

**Semester-End Examination:**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

**Suggested Learning Resources:**

**Text Book:**

**1.** Total Quality Management Dale H. Besterfield, et.al., Pearson Education India, 5th Edition 03. ISBN-13: **978-9353066314**

**Reference Books**

1. Total Quality Management for Engineers M. Zairi Wood head Publishing ISBN:185573024
2. Managing for Quality and Performance Excellence James R. Evans and William M Lindsay Cengage Learning. 9th edition
3. Four revolutions in management Shoji Shiba, Alan Graham, David Walden Oregon 1990
4. Organizational Excellence through TQM H. Lal New age Publications 200864 Engineering Optimization Methods and Applications A Ravindran, K, M. Ragsdell Willey India Private Limited 2nd Edition,2006
5. Introduction to Operations Research- Concepts and Cases F.S. Hillier. G.J. Lieberman Tata McGraw Hill 9th Edition,

**Web links and Video Lectures (e-Resources):**

- https://onlinecourses.nptel.ac.in/noc20_mg34/preview
- https://archive.nptel.ac.in/courses/110/104/110104080/
- https://www.toyota-europe.com/about-us/toyota-vision-and-philosophy/toyota-production-system
- https://kanbanzone.com/resources/lean/toyota-production-system/
- https://global.toyota/en/company/vision-and-philosophy/production-system/

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Case studies related to success stories of implementation of TQM with emphasis on SONY or any other IT/Electronic company . [15 Marks]
- Assignment on the topics related to TQM. [10 marks]

| Social Network Analysis | | Semester | 7 |
|---|---|---|---|
| Course Code | **BAD714D** | CIE Marks | 50 |
| Teaching Hours/Week (L: T:P: S) | 3:0:0:0 | SEE Marks | 50 |
| Total Hours of Pedagogy | 40 | Total Marks | 100 |
| Credits | 03 | Exam Hours | 03 |
| Examination type (SEE) | Theory | | |

**Course objectives:**

- To introduce the fundamentals of Social Network Analysis and its significance in understanding societal connections and behaviors.
- To analyze various models of network growth and understand the properties of real-world networks.
- To explore link analysis algorithms and their applications in understanding relationships within a network.
- To study community detection methods and their relevance in identifying meaningful clusters within networks.
- To understand link prediction techniques and their application in forecasting future connections within a network.

**Teaching-Learning Process (General Instructions)**

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) needs not to be only traditional lecture method, can make use of digital tools to visually demonstrate key ideas that could be adopted to attain the outcomes.
2. Use think-pair-share strategies where students collaborate in pairs or groups to discuss concepts and solve small problems before sharing their understanding with the class.
3. Use real-world examples such as social media platforms or professional networks (e.g., LinkedIn) to demonstrate the concepts of Social Network Analysis.
4. Conduct practical sessions using software like Python with network libraries (e.g., NetworkX) to model and visualize network growth.
5. Use step-by-step explanations to demonstrate algorithms like PageRank and SimRank, followed by coding sessions for implementation.
6. Use network visualization tools (e.g., Gephi, Cytoscape) to help students identify and analyze communities in networks.
7. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information.
8. Demonstrate ways to solve the same problem and encourage the students to come up with their own creative solutions.

**Module-1**

**Networks and Society** - What is Social Network Analysis, why do We Study Social Networks, Applications of Social Network Analysis, Preliminaries, Three Levels of Social Network Analysis.

**Network Measures** - Network Basics, Node Centrality, Assortativity, Transitivity and Reciprocity, Similarity, Degeneracy.

**T1 – Chapter 1 (1.1. – 1.5), Chapter 2 (2.1 – 2.6)**

**Module-2**

**Network Growth Models** - Properties of Real-World Networks, Random Network Model, Ring Lattice Network Model, Watts–Strogatz Model, Preferential Attachment Model, Price's Model, Local-world Network Growth Model, Network Model with Accelerating Growth, Aging in Preferential Attachment.

**T1 – Chapter 3 (3.1 – 3.9)**

**Module-3**

**Link Analysis** - Applications of Link Analysis, Signed Networks, Strong and Weak Ties, Link Analysis Algorithms, PageRank, Personalised PageRank, DivRank, SimRank, PathSIM.
**T1 – Chapter 4 (4.1 – 4.8)**

**Module-4**

**Community Structure in Networks** - Applications of Community Detection, Types of Communities, Community Detection Methods, Disjoint Community Detection, Overlapping Community Detection, Local Community Detection, Community Detection vs Community Search, Evaluation of Community Detection Methods.
**T1 – Chapter 5 (5.1 – 5.8)**

**Module-5**

**Link Prediction** - Applications of Link Prediction, Temporal Changes in a Network, Problem Definition Evaluating Link Prediction Methods, Heuristic Models, Probabilistic Models, Supervised Random Walk, Information-theoretic Model, Latest Trends in Link Prediction.
**T1 – Chapter 6 (6.1 – 6.9)**

**Course outcome (Course Skill Set)**

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

1. Illustrate the core concepts of Social Network Analysis and its levels of study.
2. Demonstrate the different network growth models for real-world networks
3. Apply algorithms of PageRank and SimRank to analyze and interpret link relationships.
4. Apply community detection methods and evaluating their effectiveness in real-world scenarios.
5. Analyze heuristic, probabilistic, and supervised models to predict network link formations and changes.

## Assessment Details (both CIE and SEE)

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

**Continuous Internal Evaluation:**

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
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- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

**Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.**

**Semester-End Examination:**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

**Suggested Learning Resources:**

**Books**

1. Tanmoy Chakraborty, "Social Network Analysis", Wiley India Pvt. Ltd., 2021

**Reference Books**

1. Albert-Laszlo Barabasi, "Network Science", Cambridge University Press, 2016
2. Stanley Wasserman, Katherine Faust, "Social Network Analysis: Methods and Applications", Cambridge University Press, 1994

**Web links and Video Lectures (e-Resources):**

- https://onlinecourses.nptel.ac.in/noc22_cs117/preview
- https://social-network-analysis.in/
- https://www.coursera.org/learn/social-network-analysis

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

**Activity 1: Network Visualization and Analysis (10 Marks)**

**Understand network basics, measures, and visualization techniques using a real-world dataset.**

**Instructions:**

1. Choose a small real-world dataset (e.g., social media connections, collaboration networks, or communication networks).
2. Use a network analysis tool such as Gephi, NetworkX, or Cytoscape to visualize the dataset.
3. Analyze the following:
   - Node centrality measures (degree, closeness, and betweenness).
   - Network transitivity and reciprocity.
   - Similarity or assortativity in the network.
4. Submit a report that includes the network visualization and a summary of key findings.

**Assessment Criteria:**

- Clarity of visualization (3 marks)
- Accuracy in calculating and interpreting network measures (5 marks)
- Quality of the report (2 marks)

**Activity 2: Community Detection and Link Prediction Project (15 Marks)**

**Apply community detection techniques and predict future connections within a network.**

**Instructions:**

1. Select a medium-sized dataset (e.g., email communications, citation networks, or transport networks).
2. Perform the following tasks:
   - Identify and visualize communities using two different community detection methods (e.g., Disjoint and Overlapping Community Detection).
   - Evaluate the detected communities using appropriate evaluation metrics (e.g., modularity).
   - Use a link prediction algorithm (e.g., supervised random walk or probabilistic models) to forecast future connections within the network.
3. Prepare a detailed report with visuals and findings.

**Assessment Criteria:**

- Accuracy and comparison of community detection methods (7 marks)
- Implementation and results of link prediction (5 marks)
- Overall presentation and report quality (3 marks)

| Introduction to DBMS | | Semester | 7 |
|---|---|---|---|
| Course Code | **BCS755A** | CIE Marks | 50 |
| Teaching Hours/Week (L:T:P: S) | 3:0:0:0 | SEE Marks | 50 |
| Total Hours of Pedagogy | 40 | Total Marks | 100 |
| Credits | 03 | Exam Hours | 3 |
| Examination nature (SEE) | Theory | | |

**Course objectives:**

- To Provide a strong foundation in database concepts, technology, and practice.
- To Practice SQL programming through a variety of database problems.
- To Understand the relational database design principles.
- To Demonstrate the use of concurrency in database.
- To Design and build database applications for real world problems.

**Teaching-Learning Process (General Instructions)**

These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.

- Lecturer method (L) needs not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
- Use of Video/Animation to explain functioning of various concepts.
- Encourage collaborative (Group Learning) Learning in the class.
- Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
- Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
- Use any of these methods: Chalk and board, Active Learning, Case Studies.

**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.

**Textbook 1:Ch 1.1 to 1.8, 2.1 to 2.6**

**MODULE-2**

**Conceptual Data Modeling using Entities and Relationships:** Entity types, Entity sets and structural constraints, Weak entity types, ER diagrams, Specialization and Generalization.

**Mapping Conceptual Design into a Logical Design:** Relational Database Design using ER-to-Relational mapping

**Textbook 1: Ch 3.1 to 3.10, 9.1 & 9.2**

**MODULE-3**

**Relational Model**: Relational Model Concepts, Relational Model Constraints and relational database schemas, Update operations, transactions, and dealing with constraint violations.

**Relational Algebra:** Unary and Binary relational operations, additional relational operations (aggregate, grouping, etc.) Examples of Queries in relational algebra.

**Textbook 1: Ch 5.1 to 5.3, Ch 8.1 to 8.5**

**MODULE-4**

**SQL:** SQL data definition and data types, Schema change statements in SQL, specifying constraints in SQL, retrieval queries in SQL, INSERT, DELETE, and UPDATE statements in SQL, Additional features of SQL

**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.

**Textbook 1: Ch 6.1 to 6.5,14.1 to 14.7**

**MODULE-5**

**SQL: Advanced Queries:** More complex SQL retrieval queries, Specifying constraints as assertions and action triggers, Views 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.

**Textbook 1: Ch 7.1 to 7.3, 21.1 to 21.5**

**Course outcomes (Course Skill Set):**
At the end of the course, the student will be able to:

- Demonstrate the basic elements of a database management system.
- Design entity relationship and convert entity relationship diagrams into RDBMS.
- Use Structured Query Language (SQL) for database manipulation.
- Apply normalization to increase the efficiency of database design.
- Illustrate the concepts of concurrency control techniques.

**Assessment Details (both CIE and SEE)**

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

**Continuous Internal Evaluation:**

For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.

The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered

Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.

For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

**Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.**

**Semester-End Examination:**

- Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (duration 03 hours).
- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
- The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks.

**Suggested Learning Resources:**

**Text Books:**

1. Fundamentals of Database Systems, Ramez Elmasri and Shamkant B. Navathe, 7th Edition, 2017, Pearson.

**Reference Books:**

1. Database management systems, Ramakrishnan, and Gehrke, 3rd Edition, 2014, McGraw Hill

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

**Course Project (25 marks)**

- For any problem selected
    - Develop the application having at least five tables & domain areas shall include health care, agriculture & so on.

| | | | | |
|---|---|---|---|---|
| | Introduction to Algorithms | | Semester | 7 |
| | Course Code | BCS755B | CIE Marks | 50 |
| | Teaching Hours/Week (L: T:P: S) | 3:0:0:0 | SEE Marks | 50 |
| | Total Hours of Pedagogy | 40 | Total Marks | 100 |
| | Credits | 03 | Exam Hours | 03 |
| | Examination type (SEE) | Theory | | |

**Course objectives:**

- To learn the methods for analyzing algorithms and evaluating their performance.
- To demonstrate the efficiency of algorithms using asymptotic notations.
- To solve problems using various algorithm design methods, including brute force, greedy, divide and conquer, decrease and conquer, transform and conquer, dynamic programming, backtracking, and branch and bound.
- To learn the concepts of P and NP complexity classes.

**Teaching-Learning Process (General Instructions)**

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but different types of teaching methods may be adopted to achieve the outcomes.
2. Utilize video/animation films to illustrate the functioning of various concepts.
3. Promote collaborative learning (Group Learning) in the class.
4. Pose at least three HOT (Higher Order Thinking) questions in the class to stimulate critical thinking.
5. Incorporate Problem-Based Learning (PBL) to foster students' analytical skills and develop their ability to evaluate, generalize, and analyze information rather than merely recalling it.
6. Introduce topics through multiple representations.
7. Demonstrate various ways to solve the same problem and encourage students to devise their own creative solutions.
8. Discuss the real-world applications of every concept to enhance students' comprehension.

**Module-1**

**INTRODUCTION:** What is an Algorithm?, Fundamentals of Algorithmic Problem Solving, Important problem Types, Fundamental Data Structures, Analysis Framework, Asymptotic Notations and Basic Efficiency Classes, ,Analysis Framework, Asymptotic Notations and Basic Efficiency Classes,

**Chapter 1 (Sections 1.1 to 1.4), Chapter 2 (2.1, 2.2)**

**Module-2**

**FUNDAMENTALS OF THE ANALYSIS OF ALGORITHM EFFICIENCY:** Mathematical Analysis of Non-recursive Algorithms, Mathematical Analysis of Recursive Algorithms.

**BRUTE FORCE APPROACHES:** Selection Sort and Bubble Sort, Sequential Search and Brute Force String Matching.

**Chapter 2(Sections 2.3,2.4), Chapter 3(Section 3.1,3.2)**

| | |
|---|---|
| | **Module-3** |
| | **Exhaustive Search** (Travelling Salesman problem and Knapsack Problem).<br>**Depth First search and Breadth First search.**<br>**DECREASE-AND-CONQUER:** Insertion Sort, Topological Sorting.<br>**DIVIDE AND CONQUER:** Merge Sort, Binary Tree Traversals.<br><br>**Chapter 3(3.4,3.5), Chapter 4 (Sections 4.1,4.2), Chapter 5 (Section 5.1,5.3)** |
| | **Module-4** |
| | **TRANSFORM-AND-CONQUER:** Balanced Search Trees (AVL Trees), Heaps and Heapsort.<br><br>**SPACE-TIME TRADEOFFS:** Sorting by Counting: Comparison counting sort, Input Enhancement in String Matching: Horspool's Algorithm, Hashing.<br><br>**Chapter 6 (Sections 6.3,6.4), Chapter 7 (Sections 7.1,7.2, 7.3)** |
| | **Module-5** |
| | **DYNAMIC PROGRAMMING:** Three basic examples, The Knapsack Problem and Memory Functions.<br><br>**THE GREEDY METHOD:** Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees and Codes.<br><br>**Chapter 8 (Sections 8.1,8.2), Chapter 9 (Sections 9.2,9.3,9.4)** |

**Course outcome (Course Skill Set)**

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

1. Explain the algorithm design steps and computational problem types.
2. Apply the asymptotic notational method to analyze the performance of the algorithms in terms of time complexity.
3. Demonstrate divide & conquer approaches and decrease & conquer approaches to solve computational problems.
4. Make use of the transform & conquer design approach to solve the given real-world or complex computational problems.
5. Apply greedy and dynamic programming methods to solve graph & string-based computational problems.

**Assessment Details (both CIE and SEE)**

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

**Continuous Internal Evaluation:**

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

**Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.**

**Semester-End Examination:**

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

**Suggested Learning Resources:**

**Textbooks**

1. Introduction to the Design and Analysis of Algorithms, By Anany Levitin, 3rd Edition (Indian), 2017, Pearson.

**Reference books**

1. Computer Algorithms/C++, Ellis Horowitz, SatrajSahni and Rajasekaran, 2nd Edition, 2014, Universities Press.
2. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI.
3. Design and Analysis of Algorithms, S. Sridhar, Oxford (Higher Education)

**Web links and Video Lectures (e-Resources):**

- Design and Analysis of Algorithms: https://nptel.ac.in/courses/106/101/106101060/

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

1. Problem Solving - Competitive programming (Hacker Rank/ Hacker Earth / Leetcode) – 10 Marks
2. Problem solving (Numerical examples) related to different algorithms – 15 Marks

| | | | | |
|---|---|---|---|---|
| | **SOFTWARE ENGINEERING** | | Semester | 7 |
| | Course Code | **BCS755C** | CIE Marks | 50 |
| | Teaching Hours/Week (L:T:P: S) | 3:0:0:0 | SEE Marks | 50 |
| | Total Hours of Pedagogy | 50 | Total Marks | 100 |
| | Credits | 04 | Exam Hours | 3 |
| | Examination type (SEE) | Theory | | |

**Course objectives:**

To understand foundational principles and the evolving nature of software engineering.
- To learn various software process models and their practical applications.
- To acquire skills in gathering, modeling, and validating software requirements.
- To apply Agile methodologies and understand core software engineering practices.
- To build a foundation for software design, testing, and quality assurance.

**Teaching-Learning Process**

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) needs not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding
9. Use any of these methods: Chalk and board, Active Learning, Case Studies

**Module-1**

**Software and Software Engineering:** The nature of Software, The unique nature of WebApps, Software Engineering, The software Process, Software Engineering Practice, Software Myths.

**Process Models**: A generic process model, Process assessment and improvement, Prescriptive process models: Waterfall model, Incremental process models, Evolutionary process models, Concurrent models, Specialized process models. Unified Process , Personal and Team process models

**Textbook 1: Chapter 1: 1.1 to 1.6, Chapter 2: 2.1 to 2.5**

**Module-2**

| | |
|---|---|
| | **Understanding Requirements**: Requirements Engineering, Establishing the ground work, Eliciting Requirements, Developing use cases, Building the requirements model, Negotiating Requirements, Validating Requirements.<br>**Requirements Modeling Scenarios, Information and Analysis classes**: Requirement Analysis, Scenario based modeling, UML models that supplement the Use Case, Data modeling Concepts, Class-Based Modeling.<br>Requirement Modeling Strategies : Flow oriented Modeling , Behavioral Modeling.<br>**Textbook 1: Chapter 5: 5.1 to 5.7, Chapter 6: 6.1 to 6.5, Chapter 7: 7.1 to 7.3** |
| | **Module-3** |
| | **Agile Development**: What is Agility?, Agility and the cost of change. What is an agile Process?, Extreme Programming (XP), Other Agile Process Models, A tool set for Agile process .<br>**Principles that guide practice**: Software Engineering Knowledge, Core principles, Principles that guide each framework activity.<br>**Textbook 1: Chapter 3: 3.1 to 3.6, Chapter 4: 4.1 to 4.3** |
| | **Module-4** |
| | **Software Design**: Design within the context of software engineering, Design process and quality, Design concepts: abstraction, modularity, architecture, patterns.<br>**Architectural Design**: Architectural styles and patterns, reference architectures, component-level design, designing class-based components, conducting component-level design, design for reuse.<br>**Textbook 1:Chapter 8: 8.1–8.6, Chapter 9: 9.1–9.5** |
| | **Module-5** |
| | **Software Testing**: Introduction to software testing, Strategic approach, Test strategies for conventional and object-oriented software, Validation testing, System testing, White-box and Black-box testing, Basis Path Testing, Control structure testing.<br>**Software Quality:** Concepts of quality, Software quality assurance, Reviews, Software reliability and metrics.<br>**Textbook 1: Chapter 14: Sections 14.1 to 14.5,Chapter 15: Sections 15.1 to 15.5, Chapter 19: Sections 19.1 to 19.5** |

**Course outcome**

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

1. Explain the software nature, engineering practices, myths, and software process models.
2. Apply requirements engineering, elicitation, modeling, and validation in software development.
3. Demonstrate agile principles, practices, and tools for software development agility.
4. Apply design concepts, process, and architecture for quality software development.
5. Explain software testing strategies and quality assurance for reliable software.

## Assessment Details (both CIE and SEE)

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3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

## Suggested Learning Resources:

### Textbook

Roger S. Pressman: Software Engineering – A Practitioner's Approach, 7th Edition, Tata McGraw Hill, 2010.

**Web links and Video Lectures (e-Resources):**

https://www.geeksforgeeks.org/software-engineering/software-engineering/

Activity-Based Learning (Suggested Activities in Class)/Practical-Based learning

- Course project (Group of two students): Simulation that covers all the phases of SDLC - 25 marks