With effect from the academic year from 2019-20

SCHEME OF INSTRUCTION AND SYLLABI (CBCS) OF BE VII & VIII SEMESTERS OF FOUR YEAR DEGREE

IN

COMPUTER SCIENCE & ENGINEERING

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(An Autonomous Institution)

Affiliated to OU; All U.G. and 5 P.G. Programmes (Civil, CSE, ECE, Mech. & EEE)

Accredited by NBA; Accredited by NAAC - 'A' Grade (UGC);
ISO Certified 9001:2015

Chaitanya Bharathi P.O, CBIT, Campus, Gandipet, Kokapet (V),
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Website: www .cbit.ac.in Ph : 040-24193276 / 277 / 279

Institute Vision:

- To be centre of excellence in technical education and research

Institute Mission:

- To address the emerging needs through quality technical education and advanced research

Department Vision:

- To become a center of excellence in the field of Computer Science and Engineering that produces innovative, skillful, socially responsible and ethical professionals.

Department Mission:

- To provide a curriculum that balances engineering fundamentals, modern technologies and research.
- To provide opportunities for solving real world problems.
- To provide opportunities for overall personal and social skill development.

B.E. Program Educational Objectives (PEOs)

1. Practice their profession with confidence by applying new ideas and technologies for the sustainable growth of Industry & Society.
2. To pursue higher studies for professional growth with superior ethics & Character.
3. Engage in Research leading to innovations/products or become a successful Entrepreneur.

B.E. Program Outcomes (PO's)

At the end of the program, students will be able to:

1. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.
2. Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.
4. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling to complex engineering activities, with an understanding of the limitations.
6. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

B.E. Program Specific Outcomes (PSOs)

1. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
2. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)
SCHEME OF INSTRUCTION AND EXAMINATION
VII-Semester of B.E under CBCS
COMPUTER SCIENCE AND ENGINEERING

SEMESTER-VII

Sl.No	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			Credits
			Hours per week		Duration of SEE in Hours	Maximum Marks		
			L/T	P/D		CIE	SEE	
THEORY								
1	16CSC 33	Data Science and Big Data Analytics	3	-	3	30	70	3
2	16CSC 34	Free and Open Source Software	3	-	3	30	70	3
3	16CSC 35	Distributed and Cloud Computing	3	-	3	30	70	3
4	16CSC 36	Machine Learning	3/1	-	3	30	70	4
5		Elective-IV	3	-	3	30	70	3
6		Elective-V	3	-	3	30	70	3
PRACTICALS								
7	16CSC 37	DSBDA Lab	-	3	3	25	50	2
8	16CSC 38	ML Lab	-	3	3	25	50	2
9	16CSC 39	Project Seminar	-	3	3	50	-	2
TOTAL			**19**	**9**		**280**	**520**	**25**

ELECTIVE-IV	
16CSE 10	Deep Learning
16CSE 11	Design Patterns
16CSE 12	Nature Inspired Algorithm
16CSE 13	System and Network Administration

ELECTIVE-V (OE1)	
16CEO 02	Disaster Mitigation and Management
16MEO 01	Entrepreneurship
16MEO 06	Research Methodologies
16EGO 02	Gender Sensitization

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

NPTEL Courses (Enrollment :15-05-2019 to 29-07-2019)				
Exam Registration (Open and Close Dates) : 1-Jun-19 to 23-09-2019 10.00 am				
Courses	**Elective**	**Course Start Date**	**Course End Date**	**Exam Date**
Software Project Management	Elective - IV	29-07-2019	18-10-2019	02-11-2019
Ethical Hacking		29-07-2019	18-10-2019	02-11-2019
Natural Language Processing		29-07-2019	18-10-2019	02-11-2019
Block Chain Architecture Design and Use cases	Elective - V	29-07-2019	18-10-2019	03-11-2019
Social Networks		29-07-2019	18-10-2019	02-11-2019
Computer Vision		29-07-2019	18-10-2019	02-11-2019

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Social Networks		29-07-2019	18-10-2019	02-11-2019
Computer Vision		29-07-2019	18-10-2019	02-11-2019

* Out of 30 CIE, 10 marks are allotted for slip-tests (Three slip tests will be conducted, each of ten marks, and average of best two is considered) and the remaining 20 marks are based on the average of two tests, weightage for each test is 20 marks.

** The question paper will be in two parts, Part-A and Part-B. Part A is compulsory and contains short answer questions covering the entire syllabus, and carries 20 marks. Part-B carries 50 marks and covers all the units of the syllabus (student has to answer five out of seven questions).

Note: A course that has CIE but no SEE as per scheme is treated as PASS/FAIL for which pass marks are **50%** of CIE.

A candidate has earned the credits of a particular course, if he/she secures not less than the minimum marks/ grade as prescribed. Minimum pass marks in the SEE plus CIE shall be 40% for theory courses/subjects and **50%** for lab courses /Mini Project/ Project.

16CSC 33

DATA SCIENCE AND BIG DATA ANALYTICS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre Requisites: DBMS, Probability and Statistics

Course Objectives: The main objectives of this course are:

1. To Introduce a data analytics problem solving framework
2. To Develop technical skills in probability modeling and statistical inference for the practical application of statistical methods.
3. To make Use of existing and develop new statistical tools for data science problems across different applied domains.

Course Outcomes: On successful completion of this course **s**tudent will be able to:

1. Understands various phases of the data analytics life cycle.
2. Apply statistical methods to data for inferences.
3. Analyze data using Classification, Graphical and computational methods.
4. Understand Big Data technologies and NOSQL.
5. Analyze various types of data using Data Analytics Techniques.

UNIT - I

Data Analytics Life Cycle: Data Analytics Life cycle Overview, Discovery, Data Preparation, Model Planning, Model Building, Communicate Results, Operationalise, Exploratory Data Analysis, Statistical Methods for Evaluation, ANOVA.

UNIT - II

Overview of Supervised Learning: Variable Types and Terminology, Two Simple Approaches to Prediction: Least Squares and Nearest Neighbors, Model Selection and Bias–Variance Tradeoff. **Association Analysis:** Association rules, Apriori algorithm, FP-Growth Technique

UNIT - III

Time Series Analysis: Overview of Time Series Analysis, ARIMA Model; **Text Analysis:** Text Analysis Steps, Stop Word Removal, Tokenization, Stemming and Lemmatization, Representing Text: Term-Document Matrix, Term Frequency—Inverse Document Frequency (TFIDF).

UNIT - IV

Introduction to Big Data: Defining big data, 4 V's of big data, Big data types, Analytics, Examples of big data, Big data and Data Risk, Big data technologies, benefits of big data, Crowd sourcing analytics; **Hadoop Distributed File Systems:** Architecture of Apache Hadoop HDFS and other File Systems, HDFS File Blocks, HDFS File Commands

UNIT - V

NoSQL Data Management: Types of NOSQL data bases, Benefits of NO SQL, **Map Reduce:** Introduction, Map reduce example, Job Tracker, Map Operations. **Data Stream Mining:** The stream data model, streaming applications, continuous query processing and optimization, Distributed query processing.

Text Books:

1. EMC Education Services "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley Publishers, 2012.
2. Hastie, Trevor, et al., "The elements of statistical learning: Data Mining, Inference, and Prediction", Vol. 2. No. 1. New York: Springer, 2009.
3. V.K. Jain,"Big Data & Hadoop", Khanna Publishing House,2017.

Suggested Reading:

1. AnandRajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012
2. Mark Gardener, "Beginning R The statistical Programming Language", Wiley, 2015.
3. Han, Kamber, and J Pei, "Data Mining Concepts and Techniques", 3rd edition, Morgan Kaufman, 2012.
4. Big Data Black Book, DT Editorial Services, Wiley India
5. V.K. Jain, "Data Science & Analytics", Khanna Publishing House Beginner's Guide for Data Analysis using R Programming, Jeeva Jose, ISBN: 978-93-86173454.
6. Montgomery, Douglas C., and George C. Runger John, "Applied statistics and probability for engineers", Wiley & Sons, 6th edition, 2013.

16CSC 34

FREE AND OPEN SOURCE SOFTWARE

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. Familiarity with Open Source Technologies
2. Study some FOSS Projects to under the principles, methodologies of FOSS.
3. Understand the policies, licensing procedures and ethics of FOSS.

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Differentiate between Open Source and Proprietary software and Licensing.
2. Recognize the applications, benefits and features of Open Source Technologies.
3. Understand and demonstrate Version Control System along with its commands.
4. Gain knowledge to start, manage open source projects.
5. Understand and practice the Open Source Ethics.

UNIT - I

Introduction to Open Source: Open Source, need and principles of OSS, Open Source Standards, Requirements for Software, OSS success, Free Software, Examples, Licensing, Free Vs. Proprietary Software, Public Domain software, History of free software, Proprietary Vs Open Source Licensing Model, use of Open Source Software.

UNIT - II

Fault Tolerant Design: **Principles and Open Source Methodology**- History, Open Source Initiatives, Open Standards Principles, Methodologies, Philosophy, Software freedom, Open Source Software Development, Licenses, Copyright vs. Copy left, Patents, zero marginal cost, income-generation Opportunities, Internationalization.

UNIT - III

Case Studies: Apache, BSD, Linux, Mozilla Firefox, Wikipedia, Git, GNU CC, Libre Office.

UNIT - IV

Open Source Project: Starting and Maintaining an Open Source Project, Open Source Hardware, Open Source Design, Open Source Teaching (OST), Open Source Media

What Is A License, Creation of our own Licenses, Important FOSS Licenses (Apache, BSD, PL, LGPL), copyrights and copy lefts, Patent.

UNIT - V

Open Source Ethics: Open Source Vs. Closed Source, Open Source Government, Ethics of Open Source, Social and Financial Impact of Open Source Technology, Shared Software, Shared Source, Open Source as a Business Strategy.

Text Books:

1. Kailash Vadera, Bhavyesh Gandhi, "Open Source Technology", University Science Press, 1st Edition, 2009.
2. Fadi P. Deek and James A. M. McHugh, "Open Source Technology and Policy", Cambridge University Press, 2008.

Suggested Reading:

1. Wale Soyinka, "Linux Administration- A beginner's Guide", Tata McGraw Hills, 2009
2. Andrew M. St. Laurent, "Understanding Open Source and Free Software Licensing", O'Reilly Media, 2004.
3. Dan Woods, GautamGuliani, "Open Source for the Enterprise", O'Reilly Media, 2005.
4. Bernard Golden, "Succeeding with Open Source", Addison-Wesley Professional,2004.
5. Clay Shirky and Michael Cusumano, "Perspectives on Free and Open Source Software", MIT press, 2005.

16CSC 35

DISTRIBUTED AND CLOUD COMPUTING

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. To present the principles underlying the function of distributed computing
2. To understand key mechanisms of remote execution
3. To impart the fundamentals and essentials of Cloud Computing.
4. To enable students explore cloud computing driven real time systems.

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

1. Understand the characteristics and models in distributed computing.
2. Define Cloud Computing and related concepts and describe the characteristics, advantages, risks and challenges associated with cloud computing.
3. Explain and characterize various cloud services and deployment models, virtualization techniques.
4. Illustrate the concepts of cloud storage and demonstrate their use.
5. Analyze various cloud programming models and apply them to solve problems

UNIT - I

Characterization of Distributed Systems: Introduction, Examples of distributed systems, Resource sharing and the web, Challenges, **System Models:** Introduction, Architectural models, Fundamental models, **Interprocess Communication:** Introduction, The API for the internet protocols, External data representation and marshalling, Client server communication, Group communication, Interprocess communication in UNIX

UNIT - II

Distributed objects and Remote Invocation: Introduction, Communication between distributed objects, Remote procedure call, Events and notifications, **Time and Global States:** Introduction, Clocks, events and process states, Synchronizing physical clocks, Logical time and logical clocks, Global states, distributed debugging, **Coordination and Agreement:** Introduction, Distributed

mutual exclusion, Elections, Multicast communication, Consensus and related problems.

UNIT - III

Introduction to Cloud Computing: Scalable Computing Over the Internet, System Models for Distributed and Cloud Computing, Grid and Cloud, Layers and Types of Clouds, Desired Features of a Cloud, **Virtual Machines and Virtualization of Clusters and Data Centers:** Implementation Levels of Virtualization, Virtualization Structures/Tools and Mechanisms, Virtualization of CPU, Memory, and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Center Automation.

UNIT - IV

Cloud computing architecture over Virtualized Data Centers: Data-Center design and Interconnection networks, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms, GAE, AWS, Azure, Inter-cloud Resource Management.

UNIT - V

Cloud Programming and Software Environments: Features of Cloud and Grid Platforms, Parallel and distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments, **Common Standards in Cloud Computing:** The Open Cloud Consortium, the Distributed Management Task Force, Standards for Messaging, Internet Messaging Access Protocol (IMAP)

Text Books:

1. Colouris, Dollimore, Kindberg, "Distributed Systems concepts and Design",5th Ed. Pearson Education, 2016.
2. Kai Hwang. Geoffrey C.Fox, Jack J. Dongarra, "Distributed and Cloud Computing From Parallel Processing to the Internet of Things", Elsevier, 2012.

Suggested Readings:

1. Sunita Mahajan and Seema Shah,"Distributed Computing", Oxford University Press, 2013.
2. S.Ghosh, Chapman and Hall/CRC, "Distributed Systems", Taylor & Francis Group, 2010.
3. Pradeep K.Sinha, "Distributed Operating Systems Concepts and Design", PHI,
4. Andrew S. Tanenbaum, Van Steen, "Distributed Systems", Pearson Education, 2002.

16CSC 36

MACHINE LEARNING

Instruction	4 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	4

Pre-requisites: Linear Algebra and Probability theory basics

Course Objectives: The main objectives of this course are:

1. Understand the need and elements of Machine Learning
2. Study various machine learning techniques
3. Design solutions for real world problems using machine learning techniques

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Define and describe the basic concepts related to Machine Learning
2. Identify the applications of Machine Learning
3. Illustrate various Machine Learning Techniques
4. Design and develop solutions to real world problems using Machine Learning Algorithms
5. Implement and Analyze solutions.

UNIT - I

Introduction to Machine Learning: Introduction, Classic and Adaptive machines, learning types, deep learning, bio-inspired adaptive systems, Machine Learning and big data; **Elements of Machine Learning:** Data formats, Learnability, Statistical learning concepts, Class balancing, Elements of Information theory

UNIT - II

Feature Selection and Feature Engineering: Data sets, Creating training and test sets, managing categorical data, missing features, data scaling and normalization, Withering, Feature selection and filtering, PCA, Visualization of high-dimensional datasets; **Regression Algorithms**: Linear models for regression, Regression types, **Linear Classification Algorithms:** Linear classification, logistic regression, grid search, classification metrics, ROC curve

UNIT - III

Naïve Bayes and Discriminant Analysis: Bayes theorem, Naïve Bayes classifiers, Discriminant analysis; **Support Vector Machines**: Linear SVM, Kernel-based classification; **Decision Trees and Ensemble Learning**: Binary Decision trees,

Introduction to Ensemble Learning-Random Forests, AdaBoost, Gradient Tree Boosting, Voting classifier

UNIT - IV

Clustering Fundamentals: Basics, k-NN, Gaussian mixture, K-means, Evaluation methods, DBSCAN, Spectral Clustering, Hierarchical Clustering; **Introduction to Neural Networks**: Introduction to deep learning, MLPs with Keras, deep learning model layers, introduction to Tensorflow

UNIT - V

Machine Learning Architectures: Data collection, Normalization and regularization, Dimensionality reduction, Data augmentation, Modeling, Grid Search, Cross-validation, Visualization, GPU support, introduction to distributed architectures, Scikit-learn tools for ML architectures, pipelines, Feature unions

Text Books:

1. Giuseppe Bonaccorso, "Machine Learning Algorithms", 2nd Edition, Packt, 2018,
2. Tom Mitchel "Machine Learning", Tata McGraW Hill, 2017.

Suggested Reading:

1. Abhishek Vijavargia "Machine Learning using Python", BPB Publications, 1st Edition, 2018
2. ReemaThareja "Python Programming", Oxford Press, 2017
3. Yuxi Liu, "Python Machine Learning by Example", 2nd Edition, PACT, 2017

Online Resources:

1. https://www.guru99.com/machine-learning-tutorial.htm
2. https://www.tutorialspoint.com/machine_learning_with_python/index.htm
3. https://www.geeksforgeeks.org/machine-learning/

16CSC 37

DSBDA (DATA SCIENCE AND BIG DATA ANALYTICS) LAB

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives: The main objectives of this course are:

1. To introduce practical exposure on basic data science techniques.
2. To develop the skills in using data science tools for solving data intensive problems.
3. To explore the fundamental concepts of big data analytics.

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Implement and apply data science algorithms to solve problems
2. Implement various the exploratory data analysis techniques to understand the data.
3. Work with big data platform and explore the big data analytics techniques business applications.
4. Design efficient algorithms for analyzing the data from large volumes.
5. Analyze the HADOOP and Map Reduce technologies associated with big data analytics.

List of Experiments:

1. Identification and Installation of required software Technologies (Python/modules)
2. Important modules for statistical methods: Numpy, Scipy, Pandas etc.
3. Demonstration of Inferential Statistics-sampling, Hypothesis testing-Z/t tests
4. Demonstration of statistical methods Anova, Correlation and Chi-square
5. Important modules for Machine Learning: (ScikitLearn, Statsmodels, SciPy, NLTK etc.)
6. Demonstration of Sentiment analysis using NLTK
7. Time Series Forecasting with ARIMA model
8. Installation of Big data technologies and building a Hadoop cluster
9. Experiment for data loading from local machine to Hadoop
10. Demonstration of Map Reduce concept
11. Experiment for loading data from RDBMS to HDFS by using SQOOP

12. Demonstration of developing and handling a NOSQL database with HBase

Text Books:

1. Tom White, "Hadoop: The Definitive Guide: Storage and Analysis at Internet Scale", 4th Edition, O'Reilly Publications, 2015.
2. Samir Madhavan, "Mastering Python for Data Science", Packt Publishing, 2015.
3. Seema Acharya, SubhasininChellappan, "Big Data and Analytics", Wiley publications.
4. Big Data, Black Book TM , Dream Tech Press, 2015 Edition

16CSC 38

ML (MACHINE LEARNING) LAB

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives: The main objectives of this course are:

1. Make use of Data sets in implementing the machine learning algorithms.
2. Implement the machine learning concepts and algorithms in any suitable language of choice.
3. Make use of real world data to implement machine learning models.

Course Outcomes: On Successful completion of this course, student will be able to:

1. Understand complexity of Machine Learning algorithms and their limitations.
2. Identify and understand modern tools that are useful in data analysis
3. Implement analyze Machine Learning algorithms
4. Use Keras and Tensorflow packages to implement the solutions
5. Design and develop solutions to real world problems using ML techniques

LIST OF EXPERIMENTS:

1. Identification and Installation of python environment towards the machine learning, installing python modules/Packages Import Scikitlearn, Keras and Tensorflows etc.
2. Demonstration of decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a News sample.
3. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate datasets.
4. Demonstration of Naïve Bayesian classifier for a sample training data set stored as a .CSV file. Calculate the accuracy, precision, and recall for your dataset.
5. Demonstration of Bayesian network by considering standard dataset, by using Java/Python ML library classes/API.
6. Demonstration of Clustering algorithms - k-Means, K-Nearest Neighbor a, Agglomerative and DBSCAN to classify for the standard

datasets. Print both correct and wrong predictions using Java/Python ML library classes can be used for this problem.

7. Experiment the non-parametric locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graph
8. Demonstration of SVM and use for character recognition task..
9. Build the decision tree classifier compare its performance with ensemble techniques like random forest. Demonstrate it with different decision trees.
10. Experiments on mobile Robots
    a. Line, path following
    b. Autonomous distance traversing
    c. Autonomous distance traversing using GPS
    d. Miniature self-driving car using machine learning

Text Books:

1. Giuseppe Bonaccorso, "Machine Learning Algorithms", 2017, Packt Publishing.

16CSC 39

PROJECT SEMINAR

Instruction	3 Hours per week
CIE	50 Marks
Credits	2

The objective of 'Project Seminar' is to enable the student take up investigative study in the broad field of Engineering / Technology, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a supervisor. This is expected to provide a good initiation for the student(s) towards R&D. The work shall include:

1. Survey and study of published literature on the assigned topic;
2. Working out a preliminary Approach to the Problem relating to the assigned topic;
3. Conducting preliminary Analysis/Modeling/Simulation/Experiment/ Design/Feasibility;
4. Preparing a Written Report on the Study conducted for Presentation to the Department;
5. Final Seminar, as oral Presentation before a Department Review Committee.

Guidelines for the award of Marks: (**Max. Marks: 50**)

Evaluation by	Max. Marks	Evaluation Criteria / Parameter
Supervisor	20	Project Status / Review
	5	Report
Department Review Committee	5	Relevance of the Topic
	5	PPT Preparation
	5	Presentation
	5	Question and Answers
	5	Report Preparation

With effect from the academic year from 2019-20

16CSE 10

DEEP LEARNING
(ELECTIVE-IV)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. To learn Deep learning techniques and their applications.
2. To acquire the knowledge of neural network architectures, Deep learning methods and algorithms.
3. To understand CNN and RNN algorithms and their applications.

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Understand various learning models.
2. Design and develop various Neural Network Architectures.
3. Understand approximate reasoning using Convolution Neural Networks.
4. Analyze and design Deep learning algorithms in different applications.
5. Ability to apply CNN and RNN techniques to solve different applications.

UNIT - I

Introduction: Historical Trends in Deep Learning, McCulloch Pitts Neuron, Thresholding Logic, Perceptrons, Perceptron Learning Algorithm. Representation Power of MLPs, Sigmoid Neurons, Gradient Descent, Feed forward Neural Networks, Representation Power of Feed forward Neural Networks

UNIT - II

Feed Forward Neural Networks, Back propagation, Gradient Descent (GD), Momentum Based GD, Nesterov Accelerated GD, Stochastic GD, AdaGrad, RMS Prop, Adam, Eigenvalues and eigenvectors, Eigenvalue Decomposition, Basis Principal Component Analysis and its interpretations, Singular Value Decomposition

UNIT - III

Auto encoders : relation to PCA, Regularization in auto encoders, Denoising auto encoders, Sparse auto encoders, Contractive auto encoders, **Regularization:** Bias Variance Tradeoff, L2 regularization, Early stopping, Dataset augmentation, Parameter sharing and tying, Injecting noise at input, Ensemble

methods, Dropout, Greedy Layer wise Pre-training, Better activation functions, Better weight initialization methods, Batch Normalization

UNIT - IV

Convolutional Neural Network: The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Innitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types. LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet, Visualizing Convolutional Neural Networks, Guided Back propagation, Deep Dream, Deep Art, Fooling Convolutional Neural Networks

UNIT – V

Recurrent Neural Networks, Back propagation through time (BPTT), Vanishing and Exploding Gradients, Truncated BPTT, GRU, LSTMs, Encoder Decoder Models, Attention Mechanism, Attention over images

Text Books:

1. Goodfellow. I., Bengio. Y. and Courville. A., " Deep Learning", MIT Press, 2016.

Suggested Reading:

1. Tom M. Mitchell, "Machine Learning", MacGraw Hill, 1997.
2. Stephen Marsland, "Machine Learning - An Algorithmic Perspective ", CRC Press, 2009.
3. LiMin Fu, "Neural Networks in Computer Intelligence", McGraw-Hill edition, 1994.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc18_cs41/

With effect from the academic year from 2019-20

16CSE 11

DESIGN PATTERNS
(ELECTIVE-IV)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. To understand the fundamental concepts of C++ and the design patterns,
2. User interfaces, standards of designing a document editor.
3. To understand the Structural Patterns, and the Behavioral pattern.
4. To learn about the dynamics of the design patterns.

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Apply formal notations of C++, design and develop pattern of user choice and accomplish UI and design an efficient editor.
2. Determine the prototypes, abstract factory to design and develop catalog pattern.
3. Apply the behavioral modeling principles design the behavioral pattern for a system.
4. Use design patterns for real world situations.
5. List consequences of applying each pattern.

UNIT - I

Review of Formal Notations and Foundation Classes in C++: Class Diagram, Object Diagram, Interaction Diagram Examples, List, Iterator, List Iterator, Point, Rect, Coding in C++. **Introduction to Design Patterns:** Design Pattern Definition, Design Patterns in Small Talk MVC, Describing Design Patterns, Catalog of Design Patterns, Organizing The Catalog, Solving of Design Problems Using Design Patterns, Selection of A Design Pattern, Use of Design Patterns.

UNIT - II

Designing a Document Editor: A Case Study: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look and Feel Standards, Supporting Multiple Window Systems, User Operations, Spelling Checking and Hyphenation.

UNIT - III

Design Patterns Catalog: Creational Patterns, Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.
Structural Patterns-1: Adapter, Bridge, Composite, Decorator. Structural Patterns-2 and Behavioral Patterns-1: Structural Patterns: Façade, Flyweight, Proxy, Discuss of Structural Patterns.

UNIT - IV

Behavioral Patterns: Chain of Responsibility Command, Interpreter. **Behavioral Patterns-2:**Iterator, Mediator, Observer, State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns.

UNIT - V

Behavioral Patterns-3: State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns, Expectations from Design Patterns.

Text Books:

1. Gamma, Belm, Johnson, “Design Patterns: Elements of Reusable Object Oriented Software”, 1995,Pearson Education ISBN: 10:0201633612.
2. Eric Freeman, “Head First Design Patterns”, Oreilly-SPD,I SBN:1 0:0596007124.

Suggested Reading:

1. Cooper, “Java Design Patterns”, Pearson Education,ISBN:6201-48539-7.
2. Horstmann, “Object Oriented Design and Patterns”, Wiley, ISBN: 10:0471744875.

Online Resources:

1. shop.oreilly.com/product/9780596007126.do

With effect from the academic year from 2019-20

16CSE 12

NATURE INSPIRED ALGORITHM
(ELECTIVE-IV)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Prerequisites: Design and Analysis of Algorithms

Course Objectives: The main objectives of this course are:

1. Understand the fundamentals of nature inspired techniques which influence computing
2. Study the Swarm Intelligence and Immuno computing techniques
3. Familiarize the DNA Computing

Course Outcomes: On successful of this course student will be able to:

1. Understand The basics Natural systems
2. Learn the concepts of Natural systems and its applications
3. Understand different basic Natural systems functions(operations)
4. Understand Natural design considerations
5. Apply to real world problems

UNIT - I

Introduction: From Nature to Nature Computing , Philosophy , Three Branches: A Brief Overview, Individuals, Entities and agents - Parallelism and Distributivity Interactivity ,Adaptation- Feedback-Self-Organization-Complexity, Emergence and ,Bottom-up Vs Top-Down- Determination, Chaos and Fractals.

UNIT - II

Computing Inspired by Nature: Evolutionary Computing, Hill Climbing and Simulated Annealing, Darwin's Dangerous Idea, Genetics Principles, Standard Evolutionary Algorithm -Genetic Algorithms , Reproduction-Crossover, Mutation, Evolutionary Programming, Genetic Programming

UNIT - III

Swarm Intelligence: Introduction - Ant Colonies, Ant Foraging Behavior, Ant Colony Optimization, SACO and scope of ACO algorithms, Ant Colony Algorithm (ACA), Swarm Robotics, Foraging for food, Social Adaptation of Knowledge, Particle Swarm Optimization (PSO)

UNIT - IV

Immuno computing: Introduction- Immune System, Physiology and main components, Pattern Recognition and Binding , Immune Network Theory- Danger Theory, Evaluation Interaction- Immune Algorithms , Introduction – Genetic algorithms , Bone Marrow Models , Forest's Algorithm**,** Artificial Immune Networks

UNIT - V

Computing With New Natural Materials: DNA Computing: Motivation, DNA Molecule , Adleman's experiment , Test tube programming language, Universal DNA Computers, PAM Model , Splicing Systems , Lipton's Solution to SAT Problem , Scope of DNA Computing, From Classical to DNA Computing

Text Books:

1. Leandro Nunes de Castro, "Fundamentals of Natural Computing, Basic Concepts, Algorithms and Applications", Chapman & Hall/ CRC, Taylor and Francis Group, 2007
2. Floreano D. and Mattiussi C., "Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies", MIT Press, Cambridge, MA, 2008

Suggested Reading:

1. Albert Y.Zomaya, "Handbook of Nature-Inspired and Innovative Computing", Springer, 2006.
2. Marco Dorrigo, Thomas Stutzle, "Ant Colony Optimization", PHI,2005

With effect from the academic year from 2019-20

16CSE 13

SYSTEM AND NETWORK ADMINISTRATION (ELECTIVE-IV)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Operating System Concepts, Computer networking basics

Course Objectives: The main objectives of this course are:

1. **Understand the basic operation of system and networking.**
2. **Familiarize the students with system and network administration.**
3. **Analyze the system and network performance, issues.**

Course Outcomes: On successful of this course student will be able to:

1. **Understand the basics of systems administration and networking.**
2. **Identify and apply various system network administration tools/ commands.**
3. **Configure various services like mail, ftp, web hosting, security.**
4. **Analyze various system and network performance and issues.**
5. **Troubleshoot various system and network services.**

UNIT - I

Networking Overview: Protocol standards, Reference Models (ISO-OSI, TCP/ IP), Networking basics of Windows & Linux, switching, routing; Server Administration Basics: Server and Client Installation, boot process and startup Services: Xinetd, user accounts management, File Systems and Quota Management, Job Scheduling with *cron, crontab* and system log analysis, Process controlling and management

UNIT - II

Network Configuration Basics: IP addressing, Network Interface Configuration, Diagnosing Network startup issues, Linux and Microsoft, Firewall configuration, Network troubleshooting commands; **Dynamic Host Configuration Protocol (DHCP),** DHCP Principle, configuration, DHCP Options, and troubleshooting

UNIT - III

Name Server Configuration: DNS principles and Operations, Basic Name Server and Client configuration, caching, Primary and Slave Name Server, Zone Transfers, dynamic updates, delegation, DNS Server Security, Troubleshooting; **Web**

Server Configuration: HTTP Server Configuration Basics, Virtual Hosting, HTTP Caching, Proxy Caching Server Configuration, ACL, Proxy-Authentication Mechanisms, Troubleshooting

UNIT - IV

FTP, File and Print Server: Samba server and Configuration, NFS Client Configuration, CUPS configuration basics, FTP, Anonymous FTP Server, Troubleshooting; **Mail Server basics:** SMTP, POP and IMAP, SMTP Relayings, Mail Domain Administration, Basic Mail Server Configuration, SPAM control and Filtering

UNIT - V

Remote Administration and Management: Router Configuration, webmin/ usermin, Team Viewer, Telnet, SSH, SCP, Rsync

Text Books

1. Thomas A. Limoncelli, Christina J. Hogan , Strata R. Chalup,"The Practice of System and Network Administration", Second Edition, 2007
2. Roderick W. Smith, "Advanced Linux Networking", Addison-Wesley (Pearson Education), 2002.
3. Tony Bautts, Terry Dawson, Gregor N. Purdy, "Linux Network Administrator's Guide", O'Reilly, 3rd Third Edition, 2005

Online Resources:

1. https://nptel.ac.in/courses/106106157/25

With effect from the academic year from 2019-20

16CEO 02

DISASTER MITIGATION AND MANAGEMENT
ELECTIVE-V (OE1)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are

1. To equip the students with the basic knowledge of hazards, disasters, risks and vulnerabilities including natural, climatic and human induced factors and associated impacts.
2. To impart knowledge in students about the nature, causes, consequences and mitigation measures of the various natural disasters.
3. To enable the students to understand risks, vulnerabilities and human errors associated with human induced disasters.
4. To enable the students to understand and assimilate the impacts of any disaster on the affected area depending on its position/ location, environmental conditions, demographic, etc.
5. To equip the students with the knowledge of the chronological phases in a disaster management cycle and to create awareness about the disaster management framework and legislations in the context of national and global conventions.

Course Outcomes: On Successful completion of this course, student will be able to

1. Analyze and critically examine existing programs in disaster management regarding vulnerability, risk and capacity at different levels.
2. Understand and choose the appropriate activities and tools and set up priorities to build a coherent and adapted disaster management plan.
3. Understand various mechanisms and consequences of human induced disasters for the participatory role of engineers in disaster management.
4. Understand the impact on various elements affected by the disaster and to suggest and apply appropriate measures for the same.
5. Develop an awareness of the chronological phases of disaster preparedness, response and relief operations for formulating effective disaster management plans and ability to understand various participatory approaches/strategies and their application in disaster management.

UNIT - I

Introduction: Basic definitions- Hazard, Disaster, Vulnerability, Risk, Resilience, Mitigation, Management; classification of types of disaster- Natural and man-made; International Decade for natural disaster reduction (IDNDR); International strategy for disaster reduction (ISDR), National disaster management authority (NDMA).

UNIT - II

Natural Disasters: Hydro meteorological disasters: Causes, Early warning systems- monitoring and management, structural and non-structural measures for floods, drought and Tropical cyclones; Geographical based disasters: Tsunami generation, causes, zoning, Early warning systems- monitoring and management, structural and non-structural mitigation measures for earthquakes, tsunami, landslides, avalanches and forest fires. Case studies related to various hydro meteorological and geographical based disasters.

UNIT - III

Human induced hazards: Chemical disaster- Causes, impacts and mitigation measures for chemical accidents, Risks and control measures in a chemical industry, chemical disaster management; Case studies related to various chemical industrial hazards eg: Bhopal gas tragedy; Management of chemical terrorism disasters and biological disasters; Radiological Emergencies and case studies; Case studies related to major power break downs, fire accidents, traffic accidents, oil spills and stampedes, disasters due to double cellar construction in multi-storied buildings.

UNIT - IV

Disaster Impacts: Disaster impacts- environmental, physical, social, ecological, economical, political, etc.; health, psycho-social issues; demographic aspects-gender, age, special needs; hazard locations; global and national disaster trends; climate change and urban disasters.

UNIT - V

Concept of Disaster Management: Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; risk analysis, vulnerability and capacity assessment; Post-disaster environmental response-water, sanitation, food safety, waste management, disease control; Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR

programmes in India and the activities of National Disaster Management Authority.

Text Books:

1. Pradeep Sahni, "Disaster Risk Reduction in South Asia", Prentice Hall, 2003.
2. B. K. Singh, "Handbook of Disaster Management: techniques & Guidelines", Rajat Publication, 2008.

Suggested Reading:

1. Ministry of Home Affairs. Government of India, "National disaster management plan, Part I and II".
2. K. K. Ghosh," Disaster Management", APH Publishing Corporation, 2006.
3. Hazards, Disasters and your community: A booklet for students and the community, Ministry of home affairs.

Online Resources:

1. http://www.indiaenvironmentportal.org.in/files/file disaster_management_india1.pdf
2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs)
3.

16MEO 01

ENTREPRENEURSHIP
ELECTIVE-V (OE1)

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. The environment of industry and related opportunities and challenges
2. Concept and procedure of idea generation
3. Elements of business plan and its procedure
4. Project management and its techniques
5. Behavioral issues and Time management

Course Outcomes: On Successful completion of this course, student will be able to

1. Identify opportunities and deciding nature of industry
2. Brainstorm ideas for new and innovative products or services
3. Analyze the feasibility of a new business plan and preparation of Business plan
4. Use project management techniques like PERT and CPM
5. Analyze behavioural aspects and use time management matrix

UNIT - I

Indian Industrial Environment: Competence, Opportunities and Challenges, Entrepreneurship and Economic growth, Small Scale Industry in India, Objectives, Linkage among small, medium and heavy industries, Types of enterprises, Corporate Social Responsibility.

UNIT - II

Identification and Characteristics of Entrepreneurs: First generation entrepreneurs, environmental influence and women entrepreneurs, Conception and evaluation of ideas and their sources, Selection of Technology, Collaborative interaction for Technology development.

UNIT - III

Business Plan: Introduction, Elements of Business Plan and its salient features, Technical Analysis, Profitability and Financial Analysis, Marketing Analysis, Feasibility studies, Executive Summary.

UNIT - IV

Project Management: During construction phase, project organization, project planning and control using CPM, PERT techniques, Human aspects of project management, Assessment of tax burden

UNIT - V

Behavioral Aspects of Entrepreneurs: Personality, determinants, attributes and models, Leadership concepts and models, Values and attitudes, Motivation aspects, Change behavior

Time Management: Approaches of time management, their strengths and weaknesses. Time management matrix and the urgency addiction

Text Books:

1. Vasant Desai, "Dynamics of Entrepreneurial Development and Management", Himalaya Publishing House, 1997.
2. Prasanna Chandra, "Project-Planning, Analysis, Selection, Implementation and Review", Tata Mcgraw-Hill Publishing Company Ltd. 1995.
3. S.S. Khanka, "Entrepreneurial Development", S. Chand & Co. Pvt. Ltd., New Delhi

Suggested Reading:

1. Robert D. Hisrich, Michael P. Peters, "Entrepreneurship", 5/e, Tata Me Graw Hill Publishing Company Ltd., 2005.
2. Stephen R. Covey and A. Roger Merrill, "First Things First", Simon and Schuster Publication, 1994.
3. Sudha G.S., "Organizational Behavior", National Publishing House, 1996.

16MEO 06

RESEARCH METHODOLOGIES
ELECTIVE-V (OE1)

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. **To make the students to formulate the research problem**
2. **To identify various sources for literature review and data collection.**
3. **To prepare the research design**
4. **To equip the students with good methods to analyze the collected data**
5. **To explain how to interpret the results and report writing**

Course Outcomes: On successful of this course **s**tudent will be able to:

1. **Define research problem**
2. **Review and asses the quality of literature from various sources.**
3. **Understand and develop various research designs.**
4. **Analyze problem by statistical techniques: ANOVA, F-test, Chi-square**
5. **Improve the style and format of writing a report for technical paper/ Journalreport**

UNIT – I

Research Methodology: Objectives and Motivation of Research, Types of Research- Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical, Research Approaches, Significance of Research, Research Methods verses Methodology, Research process, Criteria of Good Research, Problems Encountered by Researchers in India, Technique involved in defining a problem.

UNIT–II

Literature Survey: Importance of Literature Survey, Sources of Information-primary, secondary, tertiary, Assessment of Quality of Journals and Articles, Information through Internet.

UNIT – III

Research Design: Meaning of Research Design, Need of Research Design, Feature of a Good Design Important Concepts Related to Research Design,

Different Research Designs, Basic Principles of Experimental Design, Steps in sample design

UNIT – IV

Data Collection: Collection of primary data, Secondary data, Measures of central tendency-mean, mode, median, Measures of dispersion- Range, Mean deviation, Standard deviation, Measures of asymmetry (skewness), Important parametric tests -z, t, F, Chi-Square, ANOVA significance

UNIT – V

Research Report Writing: Format of the Research report, Synopsis, Dissertation, Thesis its Differentiation, References/Bibliography/Webliography, Technical paper writing/Journal report writing, making presentation, Use of visual aids. Research Proposal Preparation- Writing a Research Proposal and Research Report, Writing Research Grant Proposal.

Text Books:

1. C.R Kothari, "Research Methodology, Methods & Technique", New Age International Publishers, 2004.
2. R. Ganesan, "Research Methodology for Engineers", MJP Publishers, 2011

Suggested Reading:

1. Vijay Upagade and AravindShende, "Research Methodology", S. Chand & Company Ltd., 2009
2. G. Nageswara Rao, "Research Methodology and Quantitative methods", BS Publications, 2012.
3. RatanKhananabis and SuvasisSaha, "Research Methodology", Universities Press, Hyderabad, 2015.

16EGO 02

GENDER SENSITIZATION
ELECTIVE-V (OE1)

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. To develop students' sensibility with regard to issues of gender in contemporary India.
2. To provide a critical perspective on the socialization of men and women.
3. To expose the students to debates on the politics and economics of work. To help students reflect critically on gender violence.

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Develop a better understanding of important issues related to what gender is in contemporary India.
2. Be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature, and film.
3. Attain a finer grasp of how gender discrimination works in our society and how to counter it. Students will acquire insight into the gendered division of labour and its relation to politics and economics.
4. Understand what constitutes sexual harassment and domestic violence and be made aware of New forums of Justice.
5. Draw solutions as to how men and women, students and professionals can be better equipped to work and live together as equals.

UNIT – I

Understanding Gender: Gender: Why Should We Study It? (*Towards a World of Equals*: Unit -1) **Socialization:** Making Women, Making Men (*Towards a World of Equals*: Unit -2)
Introduction.Preparing for Womanhood.Growing up Male.First lessons in Caste. Different Masculinities

UNIT – II

Gender and Biology: Missing Women: Sex Selection and Its Consequences (*Towards a World of Equals*: Unit -4) Declining Sex Ratio. Demographic Consequences.**Gender Spectrum:** Beyond the Binary (*Towards a World of Equals*: Unit -10) Two or Many? Struggles with Discrimination.

UNIT – III

Gender and Labour: Housework: the Invisible Labour (*Towards a World of Equals*: Unit -3) "My Mother doesn't Work." "Share the Load." **Women's Work**: Its Politics and Economics (*Towards a World of Equals*: Unit -7) Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

UNIT-IV

Issues of Violence: Sexual Harassment: Say No! (*Towards a World of Equals*: Unit -6) Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: *"Chupulu"*. **Domestic Violence:** Speaking Out (*Towards a World of Equals*: Unit -8) Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice. Thinking about Sexual Violence (*Towards a World of Equals*: Unit -11) Blaming the Victim-"I Fought for my Life…." - Additional Reading: The Caste Face of Violence.

UNIT – V

Gender: Co – Existence : Just Relationships: Being Together as Equals (*Towards a World of Equals*: Unit -12) Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Additional Reading: Rosa Parks-The Brave Heart.

Text Books:

1. Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote,VasudhaNagaraj, AsmaRasheed, GoguShyamala, DeepaSreenivas and Susie Tharu "Towards a World of Equals: A Bilingual Textbook on Gender" published by Telugu Akademi, Hyderabad, Telangana State, 2015.

Suggested Reading:

1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
2. Abdulali Sohaila. **"I Fought For My Life…and Won."** Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

Online Resources:

1. https://aifs.gov.au/publications/gender-equality-and-violence-against-women/introduction
2. https://theconversation.com/achieving-gender-equality-in-india

Note: Since it is an Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)
SCHEME OF INSTRUCTION AND EXAMINATION
VIII-Semester of B.E under CBCS
COMPUTER SCIENCE AND ENGINEERING

SEMESTER-VIII

Sl.No	Syllabus Ref. No	SUBJECT	Scheme of Instruction		Scheme of Examination			Credits
			Periods per Week		Duration Credits of SEE in Hours	Maximum Marks		
			L/T	P/D		CIE	SEE	
THEORY								
1		Elective-VI	3	-	3	30	70	3
2		Elective-VII	3	-	3	30	70	3
3		Elective-VIII	3	-	3	30	70	3
PRACTICALS								
7	16CSC 40	Seminar	-	3	3	50	-	2
8	16CSC 41	Project	-	6	3	50	100	6
		TOTAL	**9**	**9**		**190**	**310**	**17**

ELECTIVE-VI	
16CSE 14	Cyber Security
16CSE 15	Optimization Techniques
16CSE 16	Natural Language Processing
16CSE 17	Virtual Reality

ELECTIVE-VII	
16CSE 18	Bioinformatics
16CSE 19	Human Computer Interaction
16CSE 20	Social Networking and its Impact
16CSE 21	Blockchain Technology

ELECTIVE-VIII (OE2)	
16MTO 04	Quantum Computing
16MEO 02	Robotics
16MEO 04	Intellectual Property Rights
16PYO 01	History of Science and Technology

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

Assessment Procedure				
Course (in terms of credits)	**Continuous Internal Evaluation (Marks)**	**Semester end Examination (Marks)**	**Remarks**	**Duration of Semester End Examination**
Three(3)Credits/ Four(4)credits	30*	70**	Theory Course/ Engg . Graphics	3 Hours
Two(2) Credits	25	50	Lab Course/Workshop	3 Hours
One(1) Credit	15	35	Lab Course	2 Hours
One(1) Credit	50	-	Mini Project	-

* Out of 30 CIE, 10 marks are allotted for slip-tests (Three slip tests will be conducted, each of ten marks, and average of best two is considered) and the remaining 20 marks are based on the average of two tests, weightage for each test is 20 marks.

** The question paper will be in two parts, Part-A and Part-B. Part A is compulsory and contains short answer questions covering the entire syllabus, and carries 20 marks. Part-B carries 50 marks and covers all the units of the syllabus (student has to answer five out of seven questions).

Note: A course that has CIE but no SEE as per scheme is treated as PASS/FAIL for which pass marks are **50%** of CIE.

A candidate has earned the credits of a particular course, if he/she secures not less than the minimum marks/ grade as prescribed. Minimum pass marks in the SEE plus CIE shall be **40%** for theory courses/subjects and **50%** for lab courses /Mini Project// Project.

With effect from the academic year from 2019-20

16CSC 40

SEMINAR

Instruction	3Hours per week
CIE	50 Marks
Credits	2

The goal of a seminar is to introduce students to critical reading, understanding, summarizing, explaining and preparing report on state of the art topics in a broad area of his/her specialization. Seminar topics may be chosen by the students with advice from the faculty members and the student shall read further relevant articles in the domain.

The seminar must be clearly structured and the power point presentation shall include following aspects:

1. Introduction to the field
2. Literature survey
3. Consolidation of available information
4. Summary and Conclusions
5. References

Each student is required to:

1. Submit a one page synopsis of the seminar talk for display on the notice board.
2. Deliver the seminar for a maximum duration of 30 minutes, where the presentation should be for 20 minutes in Power Point, followed by Question and Answers session for 10 minutes.
3. Submit the detailed report of the seminar in spiral bound in a précised format as suggested by the department.

- Seminars are to be scheduled from **3rd week to the last week**of the semester and any change in schedule shall be discouraged.
- For the award of Sessional marks students are **judged by three (3) faculty**members and are based on oral and written presentations as well as their involvement in the discussions during the oral presentation.

Note: Topic of the seminar shall preferably be from any peer reviewed recent journal publications.

Guidelines for awarding marks		
SNo	Description	Max Marks
1.	Contents and relevance	10
2.	Presentation skills	10
3.	Preparation of PPT slides	05
4.	Questions and answers	05
5.	Report in a prescribed format	20

With effect from the academic year from 2019-20

16CSC 41

PROJECT

Instruction	6 Hours per week
CIE	50 Marks
SEE	100 Marks
Credits	6

The object of Project is to enable the student extend further the investigative study, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership. The assignment to normally include:

1. In depth study of the topic assigned.
2. Review and finalization of the approach to the problem relating to the assigned topic.
3. Preparing an action plan for conducting the investigation, including team work.
4. Detailed Analysis/Modeling/Simulation/Design/Problem Solving/ Experiment as needed.
5. Final development of product/process, testing, results, conclusions and future directions.
6. Preparing a paper for Conference presentation/ Publication in Journals, if possible.
7. Preparing a dissertation in the standard format for being evaluated by the Department.
8. Final seminar presentation before Department Review Committee (DRC).

Guidelines for the award of marks in CIE: **(Max. Marks: 50)**

Evaluation by	**Max .Marks**	**Evaluation Criteria / Parameter**
Department Review Committee	05	Review 1
	08	Review 2
	12	Submission
Supervisor	05	Regularity and Punctuality
	05	Work Progress
	05	Quality of the work which may lead to publications
	05	Report Preparation
	05	Analytical / Programming / Experimental Skills

Guidelines for awarding marks in SEE: **(Max. Marks: 100)**

Evaluation by	Max .Marks	Evaluation Criteria / Parameter
External and Internal Examiners together	20	Power Point Presentation
	40	Thesis Evaluation
	20	Quality of the project ● Innovations ● Applications ● Live Research Projects ● Scope for future study ● Application to society
	20	Viva-Voce

16CSE 14

CYBER SECURITY
(ELECTIVE-VI)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Operating System, Computer Network, Cryptography.

Course Objectives: The objectives of this course are

1. To Identify and present indicators that a cybercrime has occurred and understand methods and tools used in cybercrimes.
2. To collect, Process, Analyze and Present Computer Forensics Evidence.
3. To understand the legal perspectives and Organizational implications of Cyber Security

Course Outcomes: On Successful completion of this course, student will be able to

1. Discuss different types of cybercrimes and analyze legal frameworks to deal with these cybercrimes.
2. Describe Tools used in cybercrimes and laws governing cyberspace.
3. Analyze and resolve cyber security issues.
4. Recognize the importance of digital evidence in prosecution.
5. Analyze the commercial activities in the event of significant information security incidents in the Organization.

UNIT - I

Introduction to Cyber Crime: Cyber Crime: Definition and Origins of the Word, Cyber crime and Information Security, Classification of Cyber Crimes, Cyber Crime: The Legal Perspective, Cyber Crime: An Indian Perspective, A Global Perspective of Cyber Crime.

UNIT - II

Cyber Offenses: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector; **Tools and Methods Used in Cybercrime:** Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

UNIT - III

Cyber Security: The Legal Perspectives**:** Cyber Crime and the Legal Landscape around the World, Need of Cyber laws: the Indian Context, The Indian IT Act, Challenges to Indian Law and Cyber Crime Scenario in India, Digital Signatures and the Indian IT Act, Cyber Crime and Punishment, Cyber Law, Technology and Students: The Indian Scenario.

UNIT - IV

Understanding Cyber Forensics: Introduction ,Digital Forensics Science, Need for Computer Forensics, Cyber Forensics and Digital Evidence, Forensics Analysis of Email, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Cyber Forensics Investigation, Challenges in Computer Forensics.

UNIT - V

Cyber Security: Organizational Implications:Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

Text Books:

1. Sunit Belpre and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives", Wiley India Pvt.Ltd, 2011.
2. Kevin Mandia, Chris Prosise, "Incident Response and computer forensics", Tata McGraw Hill, 2006.

Suggested Reading:

1. Alfred Basta, Nadine Basta, Mary Brown, Ravinder Kumar, "Cyber Security and Cyber Laws", Paperback – 2018.
2. Mark F Grady, FransescoParisi, "The Law and Economics of Cyber Security", Cambridge university press, 2006.

Online Resources:

1. https://www.edx.org/learn/cybersecurity
2. https://www.coursera.org/courses?query=cyber%20security
3. https://swayam.gov.in/course/4002-cyber-law

16CSE 15

OPTIMIZATION TECHNIQUES
(ELECTIVE-VI)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. To introduce fundamentals of Operation Research and Linear Programming
2. To impart knowledge on various methods to solve balanced & unbalanced transportation problems
3. To learn the working solutions of Sequencing Problems and Assignment Problems
4. To study the categories of Integer Programming Problems and Linear Programming Approach for Game Theory
5. To obtain familiarity on Construction of Network and obtaining of Critical Path

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Get awareness about the real world problems and formulate mathematical models of these problems.
2. Understand the Transportation model, Traveling salesman and be able to find optimal solutions.
3. Understand the major limitations and capabilities of deterministic operations research modeling as applied to problems in industry or government.
4. Learn to handle, solve and analyze problems using linear programming and other mathematical programming algorithms.
5. Learn how to deal with real world scenarios of Network analysis, Project Management, for their optimal solutions.

UNIT - I

Operation Research: Introduction, Models, Areas of Application. Linear Programming (L.P.) - Mathematical Formulation of L.P. problem, Graphical Method, Simplex Method – Concept of slack, surplus & artificial variables, Manual solutions of LPP, Minimization & Maximization Problems, Special Cases – (i) Alternative optima (ii) Unbounded solutions & (iii) Infeasible solutions to be shown graphically & also by simplex method.

UNIT - II

Definition of the transportation model, Balanced / Unbalanced, Minimization / Maximization, Determination of the initial basic feasible solution using (i) North-West Corner Rule (ii) Least cost method & (iii) Vogel's approximation method for balanced & unbalanced transportation problems. Optimality Test & obtaining of optimal solution (Considering per unit transportation cost)

UNIT - III

Assignment model, Assignment Problem Formulation, Hungarian method for optimal solution, Solving unbalanced problem, Traveling salesman problem and assignment problem, Sequencing models, Solution of Sequencing Problem – Processing n Jobs through 2 Machines – Processing n Jobs through 3 Machines – Processing 2 Jobs through m machines – Processing n Jobs through m Machines.

UNIT - IV

Integer Programming Problem: Introduction, Types of Integer Programming Problems, Gomory's All-IPP Method, All IPP Algorithm, Branch and Bound Technique

Game Theory : Introduction, Game with Pure Strategies, Game with Mixed Strategies, Dominance Property, Graphical Method for 2 X n or m x 2 Games, Linear Programming Approach for Game Theory.

UNIT - V

Construction of Network – Rules & Precautions, C.P.M. & P.E.R.T. Networks, Obtaining of Critical Path, Time estimates for activities, Probability of completion of project, Determination of floats (total, free, independent & interfering)

Text Books:

1. KantiSwarup, P. K. Gupta, Man Mohan, "Operations Research", Sultan Chand Publications.
2. R. Pannerselvam, "Operations Research", PHI

16CSE 16

NATURAL LANGUAGE PROCESSING (ELECTIVE-VI)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. To learn the fundamentals of natural language processing.
2. To understand the various Parsing techniques NLP.
3. To understand the role of semantics of sentences & pragmatics

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Understand basics and applications of NLP and language modeling techniques
2. Identify the various levels in processing of natural language.
3. Analyze Natural language Generation and apply machine translation.
4. Design an innovative application using NLP Components.
5. Implement a NLP system to tackle Morphology / syntax of a language

UNIT - I

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

UNIT - II

Word Level and Syntactic Analysis: Word Level Analysis: Introduction Morphological Parsing-Spelling Error Detection and correction-Words and Word classes-Part-of Speech Tagging. **Parsing:** Constituency Parsing - Probabilistic Parsing.

UNIT - III

Semantic Analysis and Discourse Processing: Semantic Analysis: Introduction-Meaning Representation-Lexical Semantics Ambiguity-Word Sense Disambiguation. **Discourse Processing:** Introduction- cohesion-Reference Resolution Discourse Coherence and Structure.

UNIT - IV

Natural Language Generation and Machine Translation: Natural Language Generation: Introduction-Architecture of NLG Systems Generation Tasks and Representations-Application of NLG. Problems in Machine Translation, Characteristics of Indian Languages- Machine Translation Approaches-Translation involving Indian Languages.

UNIT - V

Applications and Lexical Resources: Information Extraction, Automatic Text Categorization and Text Summarization, Question-Answering System. LEXICAL RESOURCES: Introduction - WordNet- FrameNet – Stemmers - POS Tagger, Research Corpora, NLTK.

Text Books:

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

Suggested Reading:

1. Daniel Jurafsky and James H Martin, "Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", Prentice Hall, 2nd Edition, 2008.
2. James Allen, Bejamin/cummings, "Natural Language Understanding", 2nd edition, 1995.

16CSE 17

VIRTUAL REALITY
(ELECTIVE-VI)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. Provide detailed understanding of the concepts of Virtual Reality and applications
2. Understand geometric modeling and virtual environment
3. Prepare the students to develop Virtual Reality applications

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Understand the fundamental concepts of Virtual Reality
2. Identify the applications of Virtual Reality
3. Know the virtual hardware and software
4. Familiarize with various VR technologies
5. Design and Develop Virtual Reality based applications

UNIT - I

Introduction to Virtual Reality- Introduction, Computer Graphics, real time computer graphics, flight simulation, virtual environment requirement, benefits, historical development of VR, scientific landmark;

3D Computer Graphics: Virtual world space, positioning the virtual observer, perspective projection, human vision, stereo perspective projection, 3D clipping, color theory, simple 3D modeling, illumination and reflection models, shading algorithms, radiosity, Hidden surface removal, realism stereographic image

UNIT - II

Geometric Modeling: Introduction, 2D to 3D, 3D space curves, 3D boundary representation, **Geometric Transformations:** Introduction, frames of reference, modeling transformations, instances, picking, flying, scaling, collision detection; **Generic VR system**: **V**irtual environment, computer environment, VR technology, Model of interaction, VR systems

UNIT - III

Virtual Environment: Introduction, dynamics of numbers, linear and non-linear interpolation, animation of objects, linear and non-linear translation, shape and

object in between, free from deformation, particle system, **Physical Simulation:** Introduction, objects falling in a gravitational field, rotarotating wheels, elastic collisions, projectivities, simple pendulum, springs, flight dynamics of an aircraft

UNIT - IV

VR Hardware and Software: Human factors eys, ear and somatic senses; **VR Hardware**: Introduction, sensor hardware, head-coupled displays, acoustic hardware, integrated VR system; **VR Software:** Modeling virtual world, physical simulation, VR toolkits, introduction to VRML

UNIT - V

VR Applications: Engineering, Entertainment, Science, Training, **Future:** Virtual environment, modes of interaction

Text Books :

1. John Vince, "Virtual Reality Systems", Pearson Education Asia, 2007
2. Anad R., "Augmented and Virtual Reality", Khanna Publishing House, Delhi

Suggested Reading:

1. Adams, "Visualization of Virtual Reality", Tata McGraw Hill, 2000
2. Grigore C. Burdea, Philippe Coiffet, "Virtual Reality Technology", Wiley Inter Science, 2nd Edition, 2006
3. William R Sherman, Alan B Craig, "Understanding Virtual Reality: Interface, Applications and Design", Morgan Kaufman, 2008

Online Resources:

1. www.vresources.org
2. www.vrac.iastate.edu
3. www.w3.org/MarkUp/VRM

With effect from the academic year from 2019-20

16CSE 18

BIOINFORMATICS
(ELECTIVE-VII)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. Understand the basic concepts, search and visualize information.
2. Learn various bioinformatics algorithms.
3. Understand various data mining and pattern matching techniques.

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Have a basic idea of Bioinformatics.
2. Retrieve information using various algorithms.
3. Apply data mining and pattern matching techniques.
4. Sequence the databases.
5. Understand social, legal, and privacy implications of electronic storage and sharing of biological information.

UNIT - I

Introduction to Bio-Linux and Networks: Introduction to networking in Linux, Basic commands in Linux-pwd, awk, grep, sed, ls, remote login, ftp, wget, different shells such as c shell, Network basics and tools, File Transfer protocol in Linux, Network File System, Domain Name Services, Networks, Geographical Scope, Communication Models, Transmissions Technology.

UNIT - II

Bio-Basics: Kingdom of life-Bacteria, virus, plant, animal-Central dogma-chromosome-Prokaryotic genes and eukaryotic genes, Gene expression,-Genetic code-Protein synthesis basics, protein structures.

UNIT - III

Pattern matching: Pair-wise sequence alignment ,Local versus global alignment ,BLAST and its versions, Multiple sequence alignment , Dot Matrix analysis , Substitution matrices ,Dynamic Programming , Word methods , Bayesian methods , Multiple sequence alignment , Dynamic Programming ,Progressive strategies ,Iterative strategies ,Tools , Nucleotide Pattern Matching , Polypeptide pattern

matching ,Utilities ,Sequence Databases protein structure determination- abinito-threading- homology modeling methods.

UNIT IV

Bio-Statistics: Statistical concepts, Imperfect Data, Randomness, Variability, Approximation, Interface Noise, Assumptions, Sampling and Distributions, Hypothesis Testing, Quantifying Randomness, Data Analysis, Tool selection statistics of Alignment, Clustering and Classification.

UNIT V

Biodatabases and Data Mining: Biodatabase- basics of PHP, MySQL or MongoDB, HTML, CSS, java scripting Basics or Wordpress, Data Mining: Methods, Selection and Sampling, Preprocessing and Cleaning, Transformation and Reduction, Data Mining Methods, Evaluation, Visualization, Designing new queries, Pattern Recognition and Discovery, Machine Learning ,Text Mining , Tools.

Text Books:

1. Bryan Bergeron, "Bio Informatics Computing", Second Edition, Pearson Education, 2015.
2. T.K.Attwood and D.J. Perry Smith, "Introduction to Bio Informatics, Longman Essen, 1999.
3. JinXiong, "Essential Bio Informatics", Cambridge University Press,2006.

Suggested Readings:

1. Neil C.Jones, PaveA. Pevzner, "An Introduction to, Bioinformatics Algorithms (Computational Molecular Biology)", MIT Press 2004.

Online Resources:

1. https://nptel.ac.in/courses/102106065/
2. https://www.ncbi.nlm.nih.gov/

16CSE 19

HUMAN COMPUTER INTERACTION
(ELECTIVE-VII)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. Learn the foundations of Human Computer Interaction.
2. Familiarize with the design technologies for computer interaction.
3. Learn the design strategies, guidelines, models and theories for developing a user friendly interface.

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Understand the structure of models and theories of human computer interaction.
2. Understand the vision of a computer user.
3. Understand the recognition and remembrance limitations of a computer user.
4. Understand the design rules and design process.
5. Apply the models and theories of human computer interaction to real-time problems

UNIT - I

Foundations:The human, The computer, The Interaction, Paradigms. Introduction, Our perception is biased, Our vision is optimized to see structure

UNIT - II

We Seek and Use Visual Structure, Our Color Vision is Limited, Our Peripheral Vision is Poor, Reading is Unnatural, Our Attention is Limited; Our Memory is Imperfect, Limits on Attention Shape Our Thought and Action

UNIT - III

Recognition is Easy; Recall is Hard, Problem Solving and Calculation are Hard, Many Factors Affect Learning, Human Decision Making is Rarely Rational

UNIT - IV

Our Hand–Eye Coordination Follows Laws, We Have Time Requirements, Well-known User-Interface Design Rules, Design Process**:** Interaction design basics, HCI in the software process, Design rules

UNIT - V

Models and Theories: Cognitive models, Socio-organizational issues and stakeholder requirements, Communication and collaboration models, Task analysis, Hypertext, multimedia and the World Wide Web.

Text books:

1. Jeff Johnson, "Designing with the Mind in Mind – Simple Guide to Understanding", 2nd edition, Elsevier Inc., 2010.
2. Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale, "Human Computer Interaction", 3rd edition, Pearson Education Limited, 2004.
3.

Suggested Reading:

1. Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven Jacobs, "Designing the User Interface", 5th Edition, Pearson Education Limited, 2013.
2. John Haugeland, "Mind Design II", 2nd Edition, Revised and enlarged edition, The MIT Press, 1997.

16CSE 20

SOCIAL NETWORKING
(ELECTIVE-VII)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. Familiarize the students with social networks and their representation.
2. Understand the impact of social networks on society.
3. Study and Analyze the social network search models.

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Understand a broad range of social networks concepts and theories.
2. Appreciate how network analysis can contribute to increasing knowledge about diverse aspects of society.
3. Analyze social network links and web search.
4. Communicate the analysis results and impact of social networks.
5. Differentiate between centralized and decentralized search models.

UNIT - I

Introduction: to Social Networks: Introduction to Social Networks, Challenges, Google page rank, Searching on network, link prediction, contagious, marketing on social networks; **Graphs**: Basic definitions, paths and connectivity, distance and breadth first search, network datasets. **Strong and Weak Ties**: Triadic closure, strength of weak Ties, Tie strength and network structure in large-scale data, Tie strength, social media and passive engagement, closure, structured holes and social capital.

UNIT - II

Networks in surrounding contexts: Homophily, selection and social influence, affiliation, tracking link formation in online data, spatial model of segregation. **Positive and negative relationships**: Structural balance, characterizing the structure of balanced networks, applications of structured balance.

UNIT - III

Link analysis and Web search: Searching the web, ranking, link analysis using hubs and authorities, page rank, link analysis in modern web search, applications beyond web; **Cascading behavior in networks**: Diffusion in networks, modeling

diffusion, cascades and clusters, diffusion, thresholds and role of weak Ties, extensions of cascade model, knowledge, thresholds and collective actions

UNIT - IV

Power Laws and Rich-get-Richer Phenomena: Popularity as a network phenomenon, power laws, rich-get-richer models, unpredictability of rich-get-richer effects, effects of search tools and recommender systems, analysis of rich-get-richer processes. Pseudo core- how to go viral on the web

UNIT - V

Small world phenomenon: Six degrees of separation, structured and randomness, decentralized search, modeling the process of decentralization search, empirical analysis and generalized models, core-peiphery structures and difficulties in decentralized search, analysis of decentralized search.

Text Books:

1. David Easley, Jon Kleinberg, "Networks, Crowds and Markets", Cambridge Press, 2010 (free download).
2. Mathew O Jackson "Social and Economic Networks", Princeton University, 2010.

Online Resources:

1. https://nptel.ac.in/downloads/106106169/

16CSE 21

BLOCK CHAIN TECHNOLOGY
(ELECTIVE-VII)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Prerequisites: Computer Networks, Network Security

Course Objectives: The main objectives of this course are:

1. Understand the basic concepts and architecture of blockchain
2. Interpret working of Hyperledger Fabric
3. Applications of blockchain in various domains

Course Outcomes: On successful of this course **s**tudent will be able to:

1. State the basic concepts of blockchain
2. Understand the list of Consensus
3. Demonstrate and Interpret working of Hyperledger Fabric, SDK composer tool
4. Demonstrate the supply chain.
5. Apply to various use cases from different domains

UNIT - I

Introduction: 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

UNIT - II

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

UNIT - III

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

UNIT - IV

Use Case I: 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

UNIT - V

Use Case III: Blockchain for Government: Digital identity, land records and other kinds of record keeping between government entities, public distribution system / social welfare systems :Blockchain Cryptography : Privacy and Security on Blockchain

Text Books:

1. Mark Gates, "Blockchain: Ultimate guide to understanding blockchain, bitcoin, cryptocurrencies, smart contracts and the future of money", Wise Fox Publishing and Mark Gates, 2017.
2. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O'Dowd, Venkatraman Ramakrishna, "Hands-On Blockchain with Hyperledger: Building decentralized applications with Hyperledger Fabric and Composer", 2018.
3. ArshdeepBahga, Vijay Madisetti, "Blockchain Applications: A Hands-On Approach", ArshdeepBahga, Vijay Madisetti publishers 2017.

Suggested Reading:

1. Andreas Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", O'Reilly, 2014.
2. Melanie Swa, "Blockchain ",O'Reilly Media, 2014

E-Books and online Resources:

1. Blockchain Applications- https://www.blockchain-books.com
2. Hyperledger Fabric - https://www.hyperledger.org/projects/fabric
3. Zero to Blockchain - An IBM Redbooks course, by Bob Dill, David Smits, 2017 (https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.html)
4. https://onlinecourses.nptel.ac.in/noc18_cs47/preview
5. https://www.udemy.com/blockchain-and-bitcoin-fundamentals/

16MTO 04

QUANTUM COMPUTING
ELECTIVE-VIII (OE2)

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30Marks
Credits	3

Course Objectives: The main objectives of this course are :

1. Translate fluently between the major mathematical representations and its quantum operations.
2. Implement basic quantum algorithms.
3. Explain quantum decoherence in systems for computation.
4. Discuss the physical basis of uniquely quantum phenomena.

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Explain the working of a Quantum Computing Program, its architecture and program model.
2. Compute basic mathematical operations.
3. Develop quantum logic gate circuits.
4. Develop quantum algorithm.
5. Program quantum algorithm on major toolkits.

UNIT – I

Introduction to Quantum Computing: Motivation for Studying Quantum Computing, Major players in the industry (IBM, Microsoft, Rigetti, D-Wave etc), Origin of Quantum Computing, Overview of major concepts in Quantum Commuting (Qubits and multi-qubits states, Bra-ket notation, Bloch Sphere representation, Quantum Superposition, Quantum Entanglement).

UNIT – II

Math Foundation for Quantum Computing: Matrix Algebra: Basis vectors and orthogonality, inner product and Hilbert spaces, matrices and tensors, unitary operators and projectors, Dirac notation, Eigen values and Eigen Vectors.

UNIT – III

Building Blocks for Quantum Program: Architecture of a Quantum Computing Platform, Details of q-bit system of information representation (Block Sphere, Multi-qubits States, Quantum superposition of qubits (valid and invalid

superposition), Quantum Entanglement, Useful states from Quantum algorithmic perceptive e.g. Bell State.

UNIT – IV

Quantum Logic gates and Circuits: Quantum Logic gates and Circuit:Pauli, Hadamard, Phase shift, controlled gates, ising, Deutsch, Swap etc.), Programming model for a Quantum Computing program (Steps performed on classical computer, steps performed on Quantum Computer, Moving data between bits and qubits).

UNIT – V

Quantum Algorithms: Basic techniques exploited by quantum algorithms (Amplitude amplification, Quantum Fourier Transform, Phase Kick-back, Quantum Phase estimation, Quantum walks), Major Algorithms (Shor's Algorithm, Grover's Algorithm, Deutsch's Algorithm, Deutsch-Jozsa Algorithm), OSS Toolkits for implementing Quantum program (IBM quantum experience, Microsoft Q, RigettiPyQuil (QPU/QVM)).

Text Books:

1. Michael A.Nielsen, "Quantum Computation and Quantum Information", Cambridge University Press.
2. David McMahon, "Quanturm Computing Explained", Wiley.

16MEO 02

ROBOTICS
ELECTIVE-VIII (OE2)

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. The configuration, work envelop and motion controls and applications
2. The kinematics and dynamics of robots.
3. Robot end effectors and their design.
4. Robot Programming Languages and Programming methods of robot.
5. Various Sensors and drives and their applications in robots

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Equipped with the knowledge of robot anatomy, work volume and robot applications
2. Familiarized with the kinematic motions of robot and robot dynamics
3. Having good knowledge about robot end effectors and their design concepts
4. Equipped with the Programming methods & drives used in robots
5. Equipped with the principles of various Sensors and their applications in robots.

UNIT-I

Introduction to Robotics: History and evolution of robots, basic configuration, degree of freedom, work envelope, motion control methods. Various applications in industry: material handling, loading & unloading, processing, welding & painting, assembly and inspection. Requirements and Specifications of Robots

UNIT-II

Rigid Motions and Homogeneous Transformations: Rotation matrix, Homogenous transformation matrix, Denavit-Hartenberg convention, Euler angles, RPY representation, Direct and inverse kinematics for industrial robots for position and orientation.

UNIT-III

Velocity Kinematics – The Manipulator Jacobian: Joint, End effector velocity, direct and inverse velocity analysis. **Trajectory Planning**, interpolation, cubic

polynomial, linear segments with parabolic blending, static force and moment transformation, solvability, stiffness, singularities.

UNIT-IV

Robot Dynamics: Lagrangian formulation, link inertia tensor and manipulator inertia tensor. **Newton**-Euler formulation for RR & RP manipulators.**Control**: Individual joint, computed torque.

UNIT-V

End Effectors: Position and velocity measurement, **Sensors**: Proximity and range, tactile, force and torque, Drives for Robots: Electrical, Hydraulic and Pneumatic. **Robot Vision**: Introduction to technique, image acquisition and processing, introduction to robot programming languages.

Text Books:

1. Spong and Vidyasagar, "Robot Dynamics and Control", John Wile and Sons, 1990
2. R.K. Mittal, I.J. Nagrath, "Robotics and control", Tata Mcgraw-Hill Publishing Company Ltd. 2003
3. Groover, "Industrial Robotics", Mcgraw-Hill Publishing Company Ltd. 2003

Suggested Reading:

1. Asada and Slotine, "Robot analysis and Intelligence", Wiley Interscience, 1986
2. K.S. Fu GonZalezRC., lEEc.S.G., "Robotics, Control Sensing Vision and Intelligence", McGraw Hill, Int. Ed., 1987
3. Richard S. Paul, "Robot Manipulators: Mathematics, Programming, and Control", MIT Press

16MEO 04

INTELLECTUAL PROPERTY RIGHTS
ELECTIVE-VIII (OE2)

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. Fundamental aspects of IP
2. Aspects of IPR acts.
3. Awareness of multi disciplinary audience
4. Awareness for innovation and its importance
5. The changes in IPR culture and techno-business aspects of IPR

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Will respect intellectual property of others
2. Learn the art of understanding IPR
3. Develop the capability of searching the stage of innovations.
4. Will be capable of filing a patent document independently.
5. Completely understand the techno-legal business angle of IPR and converting creativity into IPR and effectively protect it.

UNIT-I

Overview of Intellectual Property: Introduction and the need for intellectual property right (IPR), IPR in India – Genesis and Development, IPR abroad, Some important examples of IPR. Importance of WTO, TRIPS agreement, International Conventions and PCT, **Patents:** Macro economic impact of the patent system, Patent and kind of inventions protected by a patent, Patent document, How to protect your inventions. Granting of patent, Rights of a patent, how extensive is patent protection. Why protect inventions by patents. Searching a patent, Drafting of a patent, Filing of a patent, the different layers of the international patent system, (national, regional and international options), compulsory licensing and licensers of right & revocation, Utility models, Differences between a utility model and a patent. Trade secrets and know-how agreements

UNIT-II

Industrial Designs: What is an industrial design. How can industrial designs be protected? What kind of protection is provided by industrial designs? How long does the protection last? Why protect industrial designs?

UNIT-III

Trademarks: What is a trademark, Rights of trademark? What kind of signs can be used as trademarks. Types of trademark, function does a trademark perform, How is a trademark protected? How is a trademark registered. How long is a registered trademark protected for? How extensive is trademark protection. What are well-known marks and how are they protected? Domain name and how does it relate to trademarks? Trademark infringement and passing off.

UNIT-IV

Copyright: What is copyright. What is covered by copyright. How long does copyright last? Why protect copyright? Related Rights: what are related rights.Distinction between related rights and copyright. Rights covered by copyright? Copy rights in computer programming.

UNIT-V

Enforcement of Intellectual Property Rights: Infringement of intellectual property rights Enforcement Measures Emerging issues in Intellectual property protection. Case studies of patents and IP Protection. **Unfair Competition:** What is unfair competition.Relationship between unfair competition and intellectual property laws.

Text Books:

1. AjitParulekar and Sarita D' Souza, "Indian Patents Law – Legal & Business Implications", Macmillan India ltd , 2006
2. B. L.Wadehra; "Law Relating to Patents, Trade Marks, Copyright, Designs & Geographical Indications", Universal law Publishing Pvt. Ltd., India 2000
3. P. Narayanan, "Law of Copyright and Industrial Designs", Eastern law House, Delhi 2010

Suggested Reading:

1. W.R1 Cronish, "Intellectual Property; Patents, copyright, Trad and Allied rights", Sweet & Maxwell, 1993.
2. P. Narayanan, "Intellectual Property Law", Eastern Law Edn., 1997.
3. Robin Jacob and Daniel Alexander, "A Guide Book to Intellectual Property Patents, Trademarks, Copy rights and designs", 4/e, Sweet, Maxwell.

16PYO 01

HISTORY OF SCIENCE AND TECHNOLOGY
ELECTIVE-VIII (OE2)

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. Enable students to understand science as a socio-cultural product in specific socio-historical contexts.
2. Expose students to philosophical, historical and sociological perspectives to look at science as a practice deeply embedded in culture and society.
3. Inculcate the scientific culture and ethics in the development of technologies.

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Demonstrate knowledge of broad concepts in the history of science, technology ranging over time, space and cultures.
2. Recognize the values of a wide range of methodologies, conceptual approaches and the impact of competing narratives within the history of science, technology.
3. Identify, locate and analyze relevant primary and secondary sources in order to construct evidence-based arguments.
4. Think independently and critically, using appropriate methodologies and technologies to engage with problems in the history of science, technology.
5. Demonstrate academic rigour and sensitivity to cultural and other diversity, and understanding of the ethical implications of historical and scientific inquiry within a global context.

UNIT - I

Science - The Beginning: Stone Ages, Knowledge among hunter gatherers, Agricultural and other revolutions, Civilization, Major advances. **Science in Antiquity:** Philosophy, a precursor to science, Hellenistic world and the Roman Empire, Other cultures of the period, major advances.

UNIT - II

Medieval Science: Decline of science in Europe, Science in China, Science and mathematics in India, Arab science, revival of science in Europe, technology revolution of the Middle ages, Major advances. **Renaissance and the Scientific Revolution:** Renaissance, Scientific Revolution, Technology, Major advances.

UNIT - III

Scientific Method: European domination, The scientific method, Major advances. **Industrial Revolution:** Industrial Revolution, Rise of the engineer, Major Advances.

UNIT - IV

19th Century Science and Technology: philosophical basis of 19th-century science, Science and the public, Science and technology, Major advances. **Rise of Modern Science and Technology:** The growth of 20thcentury science, New philosophies, Quantum reality, Energy sources, Electricity, Major advances.

UNIT - V

Big Science and the Post-Industrial Society: Big science, Specialization and changing categories, Technology changes society, Major advances. **Information Age:** Information and society, Globalization, The post-industrial society, Problems of the Information age, Major Advances

Text Books:

1. Bryan and Alexander Hellemans, "The History of Science and Technology", Houghton Mifflin Company, 2004.
2. JD Bernal, "Science in History", 4 volumes, Kindle Edition.

Suggested Readings:

1. "The 100 Most Influential Scientists of All Time", Edited by Kara Rogers, Britannica Ed., 2010
2. Alberto Hernandez, "A Visual History of Science and Technology", The Rosen Publishing Group, 2016