

Chaitanya Bharathi Institute of Technology

Department of Information Technology



Criteria 3

Course Outcomes

**Course Outcome Statements of the
courses of Regulations**

R-20

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I. B.E. IT Course Outcome Statements: R-20 Regulation

S.No	Course Code & Name of the Course	Course outcomes
2020-21 – I Semester		
1.	20MT C01 Linear Algebra & Calculus	<ol style="list-style-type: none"> 1. Apply the Matrix Methods to solve the system of linear equations 2. Test the convergence and divergence of the infinite Series. 3. Determine the extreme values of functions of two variables. 3. Apply the vector differential operator to scalar and vector functions 4. Solve line, surface & volume integrals by Greens, Gauss and Stoke's theorems.
2.	20EG C01 English	<ol style="list-style-type: none"> 1. Illustrate the nature, process and types of communication and communicate effectively without barriers. 2. Construct and compose coherent paragraphs, emails and adhering to appropriate mobile etiquette. 3. Apply techniques of precision to write a précis and formal letters by using acceptable grammar and appropriate vocabulary. 4. Distinguish formal from informal reports and demonstrate advanced writing skills by drafting formal reports. 5. Critique passages by applying effective reading techniques
3.	20PY C01 Optics and Semiconductor Physics	<ol style="list-style-type: none"> 1. Demonstrate the physical properties of light. 2. Explain characteristic properties of lasers and fiber optics 3. Find the applications of quantum mechanics 4. Classify the solids depending upon electrical conductivity 5. Identify different types of semiconductors
4.	20CS C01 Programming for Problem Solving	<ol style="list-style-type: none"> 1. Identify and understand the computing environments for scientific and mathematical problems. 2. Formulate solutions to problems with alternate approaches and represent them using algorithms / Flowcharts. 3. Choose data types and control structures to solve mathematical and scientific problem. 4. Decompose a problem into modules and use functions to implement the modules. 5. Apply arrays, pointers, structures, and unions to solve mathematical and scientific problems. 6. Develop applications using file I/O.
5.	20MT C02 Linear Algebra & Calculus Lab	<ol style="list-style-type: none"> 1. Apply the Matrix operations in executing various programmes. 2. Test the convergence and divergence of the infinite Series. 3. Explore the extreme values of functions of two variables. 4. Determine the gradient, divergent and curl of scalar and vector point functions. 5. Solve line, surface & volume integrals by Greens, Gauss and Stoke's theorems
6.	20EG C02 English lab	<ol style="list-style-type: none"> 1. Define the speech sounds in English and understand the nuances of pronunciation in English 2. Apply stress correctly and speak with the proper tone, intonation and rhythm. 3. Analyze IELTS and TOEFL listening comprehension texts to enhance their listening skills. 4. Determine the context and speak appropriately in various situations. 5. Design and present effective posters while working in teams, and discuss and participate in Group discussions.
7.	20PY C03 Optics and Semiconductor Physics Lab	<ol style="list-style-type: none"> 1. Interpret the errors in the results of an experiment. 2. Demonstrate physical properties of light experimentally 3. Make use of lasers and optical fibers for engineering applications 4. Explain the V-I characteristics of some optoelectronic and

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		semiconductor devices 5. Find the applications thermistor
8.	20CS C02 Programming for problem Solving Lab	1. Identify and setup program development environment. 2. Design and test programs to solve mathematical and scientific problems. 3. Identify and rectify the syntax errors and debug program for semantic errors 4. Implement modular programs using functions. 5. Represent data in arrays, pointers, structures and manipulate them through a program. 6. Create, read, and write to and from simple text files.
9.	20ME C01 CAD and Drafting	1. Become conversant with appropriate use of CAD software for drafting. 2. Recognize BIS, ISO Standards and conventions in Engineering Drafting. 3. Construct the projections of points, lines, planes, solids 4. Analyse the internal details of solids through sectional views 5. Create an isometric projections and view
10.	20MB C02 Community Engagement	1. Gain an understanding of Rural life, Culture and Social realities. 2. Develop a sense of empathy and bonds of mutuality with Local Communities. 3. Appreciate significant contributions of Local communities to Indian Society and Economy. 4. Exhibit the knowledge of Rural Institutions and contributing to Community's Socio-Economic improvements. 5. Utilise the opportunities provided by Rural Development Programmes.
2020-21 – II Semester		
11.	20MT C03 Differential Equations & Transform Theory	1. Calculate the solutions of first order linear differential equations. 2. Calculate the solutions of higher order linear differential equations. 3. Examine the series solutions for higher order differential equations. 4. Evaluate the Improper integrals by Fourier Transform. 5. Solve the difference equations by Z-transforms
12.	20CY C01 Chemistry	1. Identify the microscopic chemistry in terms of molecular orbitals, intermolecular forces and rate of chemical reactions. 2. Discuss the properties and processes using thermodynamic functions, electrochemical cells and their role in batteries and fuel cells. 3. Illustrate the major chemical reactions that are used in the synthesis of organic molecules. 4. Classify the various methods used in treatment of water for domestic and industrial use. 5. Outline the synthesis of various Engineering materials & Drugs.
13.	20IT C01 Data Structures and Algorithm	1. Analyse time complexity of both iterative and recursive functions. 2. Understand various sorting algorithms and their performance 3. Build optimal solutions using linear and nonlinear data structures. 4. Apply pattern matching. 5. Understand hash functions and collision handling
14.	20IT C02 Object Oriented Programming using Python	1. Understand the concepts Object-Oriented Programming 2. Make use of Python programming constructs to implement solutions to problems 3. Model the problem using OOP strategies and handle exceptions 4. Make use of files and perform file handling operations. 5. Develop GUI's
15.	20MT C04 Differential Equations & Transform Theory Lab	1. Explore all the possible solutions of first order differential equation. 2. Analyse the solutions of higher order linear differential equations. 3. Examine the series solutions for higher order differential equations.

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		<ol style="list-style-type: none"> Evaluate the Improper integrals by Fourier Transform. Apply the Z-transform to solve the difference equations
16.	20CYC02 Chemistry Lab	<ol style="list-style-type: none"> Identify the basic chemical methods to analyse the substances quantitatively & qualitatively. Estimate the amount of chemical substances by volumetric analysis. Determine the rate constants of reactions from concentration of reactants/ products as a function of time. Calculate the concentration and amount of various substances using instrumental techniques. Develop the basic drug molecules and polymeric compounds.
17.	20IT C03 Data Structures and Algorithms Lab	<ol style="list-style-type: none"> Make use of predefined data structures of python to process data. Evaluate the performance of Sorting algorithms Demonstrate Arrays, Linked lists, Stacks, Queues, Binary Search Trees, Graphs Make use of Hashing and perform data storing and retrieval Build optimal solutions using linear and nonlinear data structures to real world problems.
18.	20IT C04 Object Oriented Programming using Python Lab	<ol style="list-style-type: none"> Make use of Python programming constructs to implement solutions to problems Model the problem using OOP strategies and handle exceptions Make use of files and perform file handling operations. Develop GUI's Build solutions to real world problems
19.	20MEC02 Workshop / Manufacturing Practice	<ol style="list-style-type: none"> Understand safety measures to be followed in workshop to avoid accidents. Identify various tools used in fitting, carpentry, tin smithy, house wiring, welding, casting and machining processes. Make a given model by using workshop trades including fitting, carpentry, tin smithy and House wiring. Perform various operations in welding, machining and casting processes. Conceptualize and produce simple device/mechanism of their choice.
20.	20ME C03 Engineering Exploration	<ol style="list-style-type: none"> Understand the role of an engineer as a problem solver. Identify multi-disciplinary approaches in solving an engineering problem. Build simple systems using engineering design process. Analyze engineering solutions from ethical and sustainability perspectives. Use basics of engineering project management skills in doing projects.
2020-21 – III Semester		
21.	20ECC34 DC Circuits, Sensors and Transducers	<ol style="list-style-type: none"> Understand about the basics of lower power systems, DC circuits. Use semiconductor devices in making circuits like rectifiers, filters, regulators, etc. Design transistorized circuits of amplifiers and oscillators Acquire the data from various sensors and transducers with the help of DAQ. Analyze usage of sensors/transducer for the development of real-time applications.
22.	20ITC05 Digital Logic and Computer Architecture	<ol style="list-style-type: none"> Understand simplification of logic gates, fundamentals of combinational and sequential logic gates. Design of registers, counters and representation of data using numbers. Understand the architecture and functionality of central

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		<p>processing unit.</p> <ol style="list-style-type: none"> Discuss the techniques that computers use to communicate with I/O devices for data transfer. Comprehend memory hierarchy, cache memory and virtual memory.
23.	20ITC06 Discrete Mathematics and Applications	<ol style="list-style-type: none"> Symbolize the given sentence using propositional logic and apply the onto and one-to-one functions between the sets. Understand the mathematical induction and apply the modular arithmetic for cryptography and congruence applications. Apply permutations and combinations to handle different types of objects, understand Solving homogeneous and Non-homogeneous recurrence using generating functions. Apply relations and graph concepts for basic problem solving. Demonstrate Algebraic systems and their Properties.
24.	20ITC07 Java Programming & Enterprise Frameworks	<ol style="list-style-type: none"> To understand fundamentals of object-oriented programming paradigm. To apply knowledge of string handling, interfaces, packages and inner classes. To implement Exception handling mechanisms and Multithreading. To demonstrate knowledge on collection framework, stream classes. To develop web applications using Servlets and JSP.
25.	20ITC08 Database Management Systems	<ol style="list-style-type: none"> Understand the purpose of database systems and design any domain specific database using E-R model. Design and implement a database using Relational data model, formulate Relational algebra expressions. Use SQL for efficient data retrieval. Access databases from high level languages, define triggers and apply normalization. Understand the concepts of database transactions, locking protocols and concurrency control Efficiently organize and manage data using indexing, hashing, and recovery techniques.
26.	20EG M01 Indian Constitution and Fundamental Principles	<ol style="list-style-type: none"> Understand the making of the Indian Constitution and its features. Identify the difference among Right To equality, Right To freedom and Right to Liberty. Analyze the structuring of the Indian Union and differentiate the powers between Union and States. Distinguish between the functioning of Lok Sabha and Rajya Sabha while appreciating the importance of Judiciary. Differentiate between the functions underlying Municipalities, Panchayats and Co-operative Societies.
27.	20EGM02 Indian Traditional Knowledge	<ol style="list-style-type: none"> Understand philosophy of Indian culture Distinguish the Indian languages and literature Learn the philosophy of ancient, medieval and modern India Acquire the information about the fine arts in India Know the contribution of scientists of different eras.
28.	20ITC09 Java Programming & Enterprise Frameworks Lab	<ol style="list-style-type: none"> To gain the fundamental programming knowledge of OOPs. To use exception handling mechanisms in application development. To apply knowledge of generics and Collections Framework in application development

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		<ol style="list-style-type: none"> To use the stream, reader and writer classes in applications To build applications using Hibernate and MVC Spring Boot 2.0
29.	20ITC10 DBMS Lab	<ol style="list-style-type: none"> Design and implement database schemas by enforcing integrity constraints. Use SQL for database administration, data manipulation and retrieval. Develop PL/SQL programs and use cursors for the databases. Design triggers for database validation. Handle Exceptions in PL/SQL programs.
30.	20ITC11 IT Workshop	<ol style="list-style-type: none"> Identify the basic components of a computer, gain knowledge on assembling and disassembling of a PC. Implement with Virtual machine setup, Install operating systems and execute Linux commands. Inspect internet connectivity issues and secure a computer from cyber threats. Outline productivity tools and their usage. Make use of cloud based productivity collaboration tools, typesetting system.
31.	20ITC12 Mini Project-1	<ol style="list-style-type: none"> Interpret Literature with the purpose of formulating a project proposal. Plan, Analyse, Design and implement a project. Find the solution of identified problem with the help of modern Technology and give priority to real time scenarios. Plan to work as a team and to focus on getting a working project done and submit a report within a stipulated period of time. Prepare and submit the Report and deliver presentation before the departmental Committee.
32.	20ITI01 MOOCs/Training/Internship	
2020-21 – IV Semester		
33.	20MTC12 Probability and Queueing Theory	<ol style="list-style-type: none"> Apply the principle of Least Squares approximating for estimating the value Choose the basic probability model's for fitting the Random phenomenon. Analyze the probability function using statistical averages Distinguishing the data using different methods of hypothesis testing. Analyze the Queue model for the probabilistic nature.
34.	20ITC13 Software Engineering	<ol style="list-style-type: none"> Identify the minimum requirements for the development of application. Build a system, component, or process to meet desired needs of a customer. Involve in analysis and design of UML models for various case studies. Acquire thorough knowledge of standard UML notations. Know the risks, formulate and implement software projects.
35.	20ITC14 Automata Theory and Compiler Design	<ol style="list-style-type: none"> Design deterministic, nondeterministic finite automata and regular expressions.

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		<ol style="list-style-type: none"> Construct context-free grammars for certain languages, test closure properties, decision properties of CFL's, design PDAs and TMs. Identify recursively enumerable languages, undecidable problems. Understand compiler phases and build top-down, bottom-up parsers. Infer syntax directed translation schemes for the CFGs and develop intermediate code for annotated parse trees. Understand runtime environments, translate intermediate code into target code and apply code optimization.
36.	20ITC15 Design and Analysis of Algorithms	<ol style="list-style-type: none"> Analyze best, average and worst case complexities of algorithms and choose appropriate data structure for designing algorithm. Develop solutions using Divide and Conquer, Greedy techniques. Design algorithms using dynamic programming approach, apply traversal and search techniques. Apply backtracking, branch and bound techniques to solve problems. Identify P, NP, NP-Complete and NP-Hard classes to which an algorithm belongs and design a feasible solution.
37.	20ITE01 Digital Image Processing	<ol style="list-style-type: none"> Illuminate the fundamental concepts and applications of digital image processing techniques. Demonstrate intensity transformations, spatial filtering, smoothing and sharpening in both spatial and frequency domains, image restoration concepts. Demonstrate image restoration and morphological image processing methods. Apply object recognition techniques by using image segmentation and image representation & description methods. Illustrate the various colour models and Application of image compression methods.
38.	20ADE01 Data Analysis and Visualization with Python	<ol style="list-style-type: none"> Efficiently store and manipulate dense data in arrays with Numpy Apply high level mathematical functions to aggregate, broadcast, index and sort multidimensional arrays. Create Series and DataFrame objects to operate on datasets. Perform Data cleaning, transformation, merging, aggregation on datasets. Apply 2-D and 3-D plotting techniques on datasets
39.	20ITE02 Mobile Application Development with Android and Kotlin	<ol style="list-style-type: none"> Understand the benefits of using Kotlin for Mobile application development Understand the android project structure Understand activity and fragment life cycles Apply various styles, themes and material design to apps Apply best practices to prepare and publish apps on Playstore
40.	20ITE03 Fundamentals of Cryptography	<ol style="list-style-type: none"> Demonstrate the key security concepts, security attacks and cryptography techniques. Analyze block ciphers, symmetric encryption algorithms. Describe the operations of asymmetric key cryptography and key exchange. Comprehend cryptographic hash functions, message authentication codes. Inspect the digital signature process, key distribution, user authentication.
41.	20ITE04 Data Warehousing and Data Mining	<ol style="list-style-type: none"> Understand the concepts and issues of data mining, apply preprocessing techniques. Build multidimensional data model and perform OLAP operations, generate association rules.

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		<ol style="list-style-type: none"> Evaluate various models for classification and prediction. Analyze advanced classification methods and clustering techniques. Understand outlier detection and real time applications of data mining.
42.	20MBC01 Engineering Economics & Accountancy	<ol style="list-style-type: none"> Apply fundamental knowledge of Managerial Economics concepts and tools. Analyze various aspects of Demand Analysis, Supply and Demand Forecasting. Understand Production and Cost relationships to make best use of resources available. Apply Accountancy Concepts and Conventions and preparation of Final Accounts. Evaluate Capital and Capital Budgeting decision based on any technique.
43.	20CEM01 Environmental Science	<ol style="list-style-type: none"> Identify the natural resources and realise the importance of water, food, forest, mineral, energy, land resources and affects of over utilisation. Understand the concept of ecosystems and realise the importance of interlinking of food chains. Contribute for the conservation of bio-diversity. Suggest suitable remedial measure for the problems of environmental pollution and contribute for the framing of legislation for protection of environment. Follow the environmental ethics and contribute to the mitigation and management of environmental disasters.
44.	20ITC16 Software Engineering Lab	<ol style="list-style-type: none"> Interpret user requirements using the UML notation. Illustrate Dynamic models of a software system. Analyze and develop class diagrams that model a software system. Develop Activity and swimlane models. Outline analysis and design models.
45.	20ITC17 Design and Analysis of Algorithms Lab	<ol style="list-style-type: none"> Implement Divide and Conquer Algorithms. Build solutions using Greedy technique. Apply Dynamic programming algorithms to solve problems. Implement connected and biconnected components algorithms. Design solutions using Backtracking technique.
46.	20ADC03 Artificial Intelligence & Machine Learning Tools, Techniques and Applications	<ol style="list-style-type: none"> Understand the importance of AI. Understand concepts of Machine Learning algorithms and their limitations. Develop Chatbots based on the requirements. Analyse complex problems involving image processing, such as quality control, visual surveillance, multimodal human-machine interfaces, and image compression. Understand the application of Reinforcement Learning.
47.	20ITC18 Mini Project – II	<ol style="list-style-type: none"> Interpret Literature with the purpose of formulating a project proposal. Plan, Analyse, Design and implement a project using SDLC model. Find the solution of identified problem with the help of modern Technology and give priority to real time scenarios. Plan to work as a team and to focus on getting a working project done and submit a report within a stipulated period of time. Prepare and submit the Report and deliver presentation before the departmental Committee.

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S.No	Course Code	Name of the Course	Course outcomes
2020-21 – V Semester			
48.	20ITC19	Operating Systems	<ol style="list-style-type: none"> 1. Demonstrate operating system services, inter process communication and multithreaded Programming. 2. Apply suitable process scheduling, deadlocks handling algorithms and solve process-synchronization. 3. Make use of advanced techniques such as paging, segmentation and virtual memory for memory management. 4. Illustrate file system interfaces and its implementation. 5. Identify the Operating System Security problems and Threats.
49.	20ITC20	Computer Networks	<ol style="list-style-type: none"> 1. Summarize functions of each layer in the OSI and TCP/IP reference models and demonstrate the systematic understanding of data communication Techniques. 2. Solve problems related to Addressing, Routing and Interoperability among heterogeneous networks. 3. Identify issues in Internetwork Routing issues and Congestion in computer networks. 4. Appraise the functions and performance of Internet Transport Protocols TCP and UDP. 5. Analyze the operating principles of Domain Name System and Electronic Mail, WWW.
50.	20ITC21	Basic Machine Learning	<ol style="list-style-type: none"> 1. Explain the types of machine learning and handle the challenges of machine learning. 2. Construct Decision Trees, Measure performance of classifiers. 3. Apply Regression, Logistic Regression and gradient descent to solve problems. 4. Design solutions using Bayesian classifier, SVMs and Ensemble methods. 5. Perform Dimensionality reduction and clustering of data.
51.	20ADC07	Full Stack Development	<ol style="list-style-type: none"> 1. Create web pages with good aesthetic sense of design using HTML and CSS. 2. Create real-world React web applications and related tools. 3. Become an agile practitioner with the ability to quickly complete projects. 4. Build an end-to-end application from scratch using NODE JS. 5. Understand and build logical relationships between documents using MongoDB.
52.	20ITC22	Networks And Security Lab	<ol style="list-style-type: none"> 1. Identify Errors using CRC, Implement routing algorithms and congestion control algorithms. 2. Demonstrate client-server communication using TCP, UDP protocols. 3. Experiment with rootkits to detect malware, wire shark to capture the packets and interfaces. 4. Make use of tools, techniques to protect the system from attacks. 5. Acquire thorough knowledge on tcpdump, dumpcap and nmap.
53.	20ITC23	Basic Machine Learning Lab	<ol style="list-style-type: none"> 1. Perform dimensionality reduction of a dataset. 2. Build decision trees for classification.

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			<ol style="list-style-type: none"> 3. Design solutions using SVM, KNN, Regression algorithms. 4. Perform clustering of data. 5. Use principle Component Analysis for feature Extraction.
54.	20ADC09	Minor Project- I(Full Stack Development Lab)	<ol style="list-style-type: none"> 1. Interpret Literature with the purpose of formulating a project proposal. 2. Plan, analyze, Design and implement a project. 3. Find the solution of identified problem with the help of modern Technology and give priority to real time scenarios. 4. Plan to work as a team and to focus on getting a working project done and submit a report within a stipulated period of time. 5. Prepare and submit the Report and deliver a presentation before the departmental Committee.
Professional Elective – 2			
55.	20ITE05	Information Retrieval Systems	<ol style="list-style-type: none"> 1. Understand different Information Retrieval models. 2. Apply query language to retrieve the data and evaluate performance. 3. Analyze various methods to improve the retrieval results. 4. Perform operations on text and build indices. 5. Analyze searching techniques and understand Parallel and Distributed IR models.
56.	20ITE06	Advanced Databases	<ol style="list-style-type: none"> 1. Acquire knowledge on distributed, parallel and multimedia databases. 2. Distinguish the design, query processing and transaction management activities in centralized and distributed databases. 3. Apply query optimization principles for optimizing query performance in distributed database systems. 4. Utilize distributed transaction principles for handling transactions in distributed database applications. 5. Develop databases for various applications.
57.	20ITE07	Augmented Reality and Virtual Reality	<ol style="list-style-type: none"> 1. Describe the basic concepts of Virtual Reality and 3D Computer Graphics. 2. Apply 3D manipulation techniques in Virtual Reality. 3. Analyze Development Tools and Frameworks in Virtual Reality. 4. Develop a Virtual Reality application. 5. Evaluate Augmented Reality Systems
58.	20ITE08	Cyber Security	<ol style="list-style-type: none"> 1. Describe legal frameworks to handle cybercrimes. 2. Identify the functioning of different kinds of malware used in cybercrimes. 3. Examine the legal perspectives of cybercrimes in Indian and international context. 4. Describe the need of Digital Forensics and the importance of digital evidence in prosecution 5. Interpret the commercial activities in the event of significant information security incidents in the Organization.
59.	20ITE09	Software Project Management	<ol style="list-style-type: none"> 1. Understand Project Management principles while developing software. 2. Obtain adequate knowledge about software process models and software effort estimation techniques. 3. Estimate the risks involved in various project activities. 4. Define the checkpoints, project reporting structure, project progress and tracking mechanisms using project management principles. 5. Learn staff selection process and the issues related to people

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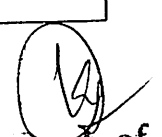
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2020-21 – VI Semester			
60.	20ADC14	Big Data Analytics	<ol style="list-style-type: none"> 1. Understand the processing large datasets in Hadoop framework and Apply MapReduce architecture to solve real world problems. 2. Develop scripts using Pig over large datasets and query using Hive. 3. Understand the fundamentals of Spark and the Scala programming. 4. Expertise in using Resilient Distributed Datasets (RDD) for creating applications in Spark and query using SparkSQL. 5. Understand NoSQL databases and Develop data models using MongoDB.
61.	20ITC24	Embedded Systems and IoT	<ol style="list-style-type: none"> 1. Demonstrate Embedded Systems using 8051 Microcontroller. 2. Interpret the various IoT enabling technologies, Levels. 3. Apply IoT design methodology to build a model using devices like Raspberry Pi3. 4. Develop Domain specific Applications and able to differentiate between M2M and IoT. 5. Infer on Industrial IoT through Real case studies.
62.	20ADC10	Deep Learning	<ol style="list-style-type: none"> 1. Explain the basic principles of neural networks and deep learning. 2. Implement simple neural network algorithms. 3. Compare modeling aspects of various neural network architecture. 4. Evaluate Convolutional Neural Network models on real data sets. 5. Analyze and optimize Recurrent Neural Network models for various applications.
63.	20ITC25	Cloud Computing	<ol style="list-style-type: none"> 1. Understand the basic ideas of Cloud Computing and its services. 2. Analyze the architecture, deployment models and infrastructure models of Cloud Computing. 3. Realize distributed storage and performance for implementing virtualization. 4. Analyze cloud computing security, federation, presence, identity, and privacy. 5. Use IaaS / PaaS service offered by cloud service providers
64.	20EGM03	Universal Human ValuesII: Understanding Harmony	<ol style="list-style-type: none"> 1. Students are expected to become more aware of themselves, and their surroundings (family, society, nature) 2. They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind. 3. They would have better critical ability. 4. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). 5. It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.
65.	20ADC15	Big Data Analytics Lab	<ol style="list-style-type: none"> 1. Explain Hadoop working environment and develop applications using MapReduce framework. 2. Develop scripts using Pig to solve real world problems and query the datasets using Hive. 3. Develop applications in Spark environment using RDDs. 4. Query real time data using SparkSQL.

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			5. Query large datasets using NoSQL.
66.	20ITC26	Embedded Systems and IoT Lab	<ol style="list-style-type: none"> 1. Develop Embedded System using 8051 in Embedded 'c' 2. Implement Python scripts that run on Raspberry Pi/Arduino. 3. Build IoT Applications using sensors. 4. Demonstrate Read and write cloud data using Thing speak. 5. Interpret the Case studies in different domains.
67.	20ITC27	Minor Project-II (Deep Learning Lab)	<ol style="list-style-type: none"> 1. Define a project proposal by interpreting real time scenarios and the Literature. 2. Plan, analyse, Design and implement a project. 3. Develop solution of the identified problem with the help of modern technologies 4. Work as a team and develop a collaborative learning environment. 5. Prepare and submit the Report and deliver a presentation before the departmental Committee.
68.	20EGCO3	Employability Skills	<ol style="list-style-type: none"> 1. Become effective communicators, participate in group discussions with confidence and be able to make presentations in a professional context. 2. Write resumes, prepare and face interviews confidently. 3. Be assertive and set short term and long term goals, learn to manage time effectively and deal with stress. 4. Make the transition smoothly from campus to work, use media with etiquette and understand the academic ethics. 5. Enrich their vocabulary, frame accurate sentences and comprehend passages confidently
Professional Elective – 3			
69.	20ADE03	Natural Language Processing	<ol style="list-style-type: none"> 1. Justify the various steps necessary for processing natural language 2. Suggest appropriate semantic modeling and sequence labeling techniques for a particular application. 3. Apply appropriate neural network based models for a contextual application 4. Analyse existing encoder-decoder models and information extraction techniques. 5. Identify the significance of word net and analyze the applications of Natural Language Processing such as Question Answering and chatbots.
70.	20ITE10	Data Compression	<ol style="list-style-type: none"> 1. Understand the Mathematical Preliminaries involved in compression techniques. 2. Analyze Hoffman and Arithmetic coding for Lossless image compression, Text compression, and Audio Compression 3. Apply LZ77, LZ78 dictionary-based compression techniques. 4. Identify appropriate Lossless and Lossy algorithms for compression of given digital information. 5. Evaluate scalar and vector quantization techniques
71.	20ADE06	Microservices With Spring Boot	<ol style="list-style-type: none"> 1. Acquire the basic concepts of the Spring Framework 2. Interact with databases using Spring's support for JDBC and JPA. 3. Build spring boot applications using Dependency Injection concept 4. Apply Transaction Management concepts of spring in Enterprise Application Development and develop

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			the Spring-MVC based Applications to solve the real-world problems. 5. Use Spring Unit testing framework and configure security on Spring MVC Applications
72.	20ITE11	Ethical Hacking	1. Identify the vulnerabilities/threats/attacks. 2. Describe penetration & security testing. 3. Interpret safe penetration techniques on the World Wide Web. 4. Design a computer against a variety of security attacks using various tools. 5. Become a professional ethical hacker.
73.	20ITE12	Agile Methodologies	1. Compare Agile model with traditional models and explain the principles of agile model. 2. Perform iterative agile software processes. 3. Analyze the impact of agile knowledge management in the software development process. 4. Realize the importance of interacting with business stakeholders in determining the requirements for agile software system. 5. Develop techniques and tools for improving team collaboration and agile software quality.
2020-21 – VII Semester			
Professional Elective – 4			
74.	20ITE13	Computer Vision	1. Summarize the fundamentals of Image formation and describe the Geometric primitives and Transformations. 2. Describe different approaches to recognition of objects. 3. Inspect algorithms for feature detection and feature alignment. 4. Analyze images and videos for problems such as tracking and structure from motion. 5. Design recovered 3D structure for ill-posed scenes.
75.	20ITE14	Applied Predictive Analytics	1. Comprehend predictive modeling and assess the performance. 2. Apply regression techniques and analyse the performance. 3. Demonstrate Support Vector Machines and build an efficient networking model. 4. Analyze ensemble methods by choosing Tree based classifiers. 5. Select appropriate probabilistic Graphic models and identify topics through topic modeling.
76.	20ITE15	Unmanned Aerial Vehicles	1. Identify the parts and functions of UAV and drones 2. Demonstrate the concepts of Aerodynamics, Propulsion & Structures of Model Aircrafts 3. Determine the payload and its corresponding propeller's RPM to successfully fly the drone 4. Design a drone with automatic recovery mechanism. 5. Understand Navigation of UAV.
77.	20ITE16	Fundamentals Of Blockchain Technology	1. Describe the concepts of distributed systems and blockchain properties. 2. Discuss the concepts of bitcoin and consensus mechanisms in bitcoin mining. 3. Explore the consensus mechanisms and technologies that support Ethereum. 4. Outline the Hyperledger Fabric architecture and Hyperledger Projects. 5. Analyse blockchain use cases in various domains.

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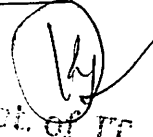
78.	20ITE17	Software Architecture And Design Patterns	<ol style="list-style-type: none"> 1. Realize the basic concepts to identify state & behaviour of real world objects. 2. Apply Object Oriented Analysis and Design concepts to solve complex problems. 3. Construct various UML models using the appropriate notation for specific problem context. 4. Design models to Show the importance of systems analysis and design in solving complex problems using case studies. 5. Study of Pattern Oriented approach for real world problems.
79.	20ITE18	Computer Vision Lab	<ol style="list-style-type: none"> 1. Demonstrate the fundamental image processing operations. 2. Relate computer vision system for real world problems. 3. Implement image enhancement techniques. 4. Make use of kernels and transformations to detect edges in an image. 5. Apply histogram processing and conversion between various colour spaces.
80.	20ITE19	Applied Predictive Analytics Lab	<ol style="list-style-type: none"> 1. Demonstrate the basic functions and implement R packages and commands 2. Apply regression analysis methods and infer the problems 3. Develop applications of neural networks and evaluate the techniques 4. Evaluation of ensemble methods 5. Build a system to perform topic modeling on real time datasets
81.	20ITE20	Unmanned Aerial Vehicles Lab	<ol style="list-style-type: none"> 1. Identify the parts and functions of UAV and drones 2. Demonstrate the concepts of Aerodynamics, Propulsion & Structures of Model Aircrafts 3. Determine the payload and its corresponding propeller's RPM to successfully fly the drone 4. Design a drone with an automatic recovery mechanism. 5. Design a mission-controlled surveillance drone.
82.	20ITE21	Fundamentals of Blockchain Technology lab	<ol style="list-style-type: none"> 1. Explore the working of blockchain fundamentals such as cryptography and distributed computing. 2. Implement smart contract on the Ethereum blockchain. 3. Build smart contracts using Solidity programming language 4. Write smart contracts using the Remix tool. 5. Acquire thorough knowledge of Hyperledger fabric.
83.	20ITE22	Software Architecture and Design Patterns Lab	<ol style="list-style-type: none"> 1. Describe all important concepts of Software Architecture and design 2. Construct software architecture and OO design models (artifacts) for given complex problem in a team. 3. Investigate existing solutions i.e. architectural styles and software design patterns of a particular complex software system design problem for evaluation. 4. Translate the architectural views into an implementable architectural model using CASE tools. 5. Apply the various technologies for design pattern
Professional Elective – 5			
84.	20ITE23	Social Media Analytics	<ol style="list-style-type: none"> 1. Demonstrate the basics on social media analytics and its significance 2. Find the communities based on computations. 3. Apply the different data mining techniques to get the task relevant information. 4. Demonstrate the skill in developing various applications to

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			influence social media resource. 5. Discuss about the various application based on the analytics.
85.	20ADE10	Robotic Process Automation	<ol style="list-style-type: none"> 1. To Understand the basic concepts of RPA 2. To Describe various components and platforms of RPA 3. To Describe the different types of variables, control flow and data manipulation techniques 4. To Understand various control techniques and OCR in RPA 5. To Describe various types and strategies to handle exception
86.	20ADE11	Business Intelligence	<ol style="list-style-type: none"> 1. Understand the concepts and components of Business Intelligence (BI) and Decision support systems. 2. Analyze how BI will help an organization and whether it will help yours. 3. Identify the technological architecture that makes up BI systems 4. Use the tools that make up BI (data science). 5. Plan the implementation of a BI system
87.	20ITE24	Mobile Computing	<ol style="list-style-type: none"> 1. Describe GSM architecture, services and protocols 2. Examine challenges in medium access control in wireless and mobile context and associated protocols 3. Analyze the need for mobile IP and its associated functionalities in mobile environments. 4. Evaluate the mobile TCP protocols in terms of their functionality, advantages and limitations 5. Identify and solve database issues using hoarding techniques
88.	20ADE07	Explainable Artificial Intelligence	<ol style="list-style-type: none"> 1. Describe the context of the machine learning application and why explainability would help, but also scrutinise which kind of explainability technique is necessary. 2. Understand the concepts that are important in model validation, evaluation, and performance visualization for both supervised and unsupervised learning. 3. Install and set up one or more post hoc explainability techniques through a self-chosen set of programming platforms. 4. Critically reflect on the results from Explainable deep learning techniques and suggest how it helps the problem context. 5. Demonstrate comprehension of challenges and future related to Explainable AI
Professional Elective – 6			
89.	20ADE13	Reinforcement Learning	<ol style="list-style-type: none"> 1. Explain the fundamental concepts of reinforcement learning and finite markov decision process. 2. Design a Reinforcement Learning system that knows how to make automated decisions 3. Illustrate the integration of model-based and model-free methods. 4. Analyse how a learning algorithm can be implemented in a different ways to obtain computational advantages. 5. Discuss parallels between reinforcement learning and neuroscience

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90.	20ITE25	Software Defined Networks	<ol style="list-style-type: none"> 1. Differentiate between traditional networks and software defined networks. 2. Understand advanced and emerging networking technologies. 3. Learn how to use SDN controllers to perform complex networking tasks. 4. Demonstrate the skills to do advanced networking research and programming. 5. Apply the knowledge on SDN and security measures to solve real world problems
91.	20ADE12	Serverless Computing	<ol style="list-style-type: none"> 1. Understand the evolution of computing and architectures. 2. Summarize the requirements of serverless computing. 3. Develop event driven applications. 4. Use AWS Lambda for serverless applications. 5. Develop Functions for serverless applications in AWS Lambda
92.	20ITE26	Digital Forensics	<ol style="list-style-type: none"> 1. Describe digital forensics and relate it to an investigative process. 2. Explain the legal issues of preparing for and performing digital forensic analysis based on the investigator's position and duty. 3. Interpret the cyber pieces of evidence, Digital forensic process model and their legal perspective. 4. Demonstrate various forensic tools to investigate the cybercrime and to identify the digital pieces of evidence. 5. Analyse the digital evidence used to commit cyber offenses
93.	20ITE27	Real Time Operating Systems	<ol style="list-style-type: none"> 1. Gain knowledge about Stimulability analysis. 2. Ability to learn Real-time programming environments. 3. Develop efficient algorithms for real-time task scheduling in uniprocessor and multi-processor environments. 4. Knowledge about real time communication protocols. 5. Able to use real-time databases.
Open Elective- 1			
94.	20MEO03	Research Methodologies	<ol style="list-style-type: none"> 1. Define research problem. 2. Review and assess the quality of literature from various sources. 3. Understand and develop various search 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/Journal report.
95.	20MEO12	3d Printing	<ol style="list-style-type: none"> 1. Understand the concept of 3D printing processes, advantages and limitations. 2. Evaluate real-life scenarios and recommend the appropriate 3D printing technology. 3. Analyze various pre-processing and post processing techniques. 4. Explain current and emerging 3D printing technologies in diversified applications. 5. Identify components required in construction of 3D printer.
96.	20ECO14	Neural Networks And Fuzzy Logic	<ol style="list-style-type: none"> 1. Understand the principles of Neural Networks and Fuzzy Logic fundamentals. 2. Apply the basic concepts to model the Neural Networks and Fuzzy Logic systems. 3. Compare the Neural Network based systems and Fuzzy Logic based systems. 4. Analyze Fuzzy Logic controllers and its applications.


			5. Explain the concepts of Fuzzy target tracing control systems.
97.	20EGO01	Technical Writing Skills	<ol style="list-style-type: none"> 1. Communicate effectively, without barriers and understand aspects of technical communication. 2. Differentiate between general writing and technical writing and write error free sentences using technology specific words 3. Apply techniques of writing in business correspondence and in writing articles. 4. Draft technical reports and technical proposals. 5. Prepare agenda and minutes of a meeting and demonstrate effective technical presentation skills.
98.	20BTO04	Bio-Informatics	<ol style="list-style-type: none"> 1. Explain the basic concepts of biology and bioinformatics 2. Identify various types of biological databases used for the retrieval and analysis of the information 3. Explain the sequence analysis and data mining 4. Discuss the methods used for sequence alignment and construction of the phylogenetic tree 5. Describe the methods used for gene and protein structure prediction
99.	20EGMO4	Gender Sensitization	<ol style="list-style-type: none"> 1. Understand the difference between "Sex" and "Gender" and be able to explain socially constructed theories of identity. 2. Recognize shifting definitions of "Man" and "Women" in relation to evolving notions of "Masculinity" and "Femininity". 3. Appreciate women's contributions to society historically, culturally and politically. 4. Analyze the contemporary system of privilege and oppressions, with special attention to the ways gender intersects with race, class, sexuality, ethnicity, ability, religion, and nationality. 5. Demonstrate an understanding of personal life, the workplace, the community and active civic engagement through classroom learning.
100.	20ITC28	Project Part-1	<ol style="list-style-type: none"> 1. Identify problem from literature survey in his/her area of interest 2. Formulate possible solutions for the selected problem and compare with existing ones 3. Prepare synopsis of the selected problem 4. Gather the required information to set up the environment for the implementation of preliminary experimentation 5. Communicate the work effectively in both oral and written forms
2020-21 – VIII Semester			
Open Elective- 2			
101.	20MEO04	Principles Of Entrepreneurship	<ol style="list-style-type: none"> 1. Understand the concept and essence of entrepreneurship. 2. Identify business opportunities and nature of enterprise. 3. Analyze the feasibility of new business plan. 4. Apply project management techniques like PERT and CPM for effective planning and execution of projects. 5. Use behavioral, leadership and time management aspects in

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			entrepreneurial journey
102.	20MEO10	Introduction To Operations Research	<ol style="list-style-type: none"> 1. Understand the concepts of linear programming problem. 2. Solve the given transportation problem. 3. Develop optimum pair of operations and resources by using assignment technique. 4. Analyze project management techniques like CPM and PERT to plan and execute projects successfully. 5. Apply sequencing concepts for industry applications.
103.	20EEO04	Energy Conservation	<ol style="list-style-type: none"> 1. Know the current energy scenario and importance of energy conservation. 2. Understand the concepts of energy conservation. 3. Evaluate the performance of existing engineering systems 4. Explore the methods of improving energy efficiency in different engineering systems. 5. Understand different energy efficient devices.
104.	20BTO05	Cognitive Neuro Science	<ol style="list-style-type: none"> 1. Gain familiarity and basic knowledge about brain systems and functions. 2. Understand brain's neuro-transmitter system. 3. Understanding the brain's methods gives rise to behaviour whether we engage in any activity (e.g., walking, talking, etc.). 4. Identify the patterns of varied activities in neurons that correspond to a person's attempts to move in particular ways. 5. Understand the feedback system and brain disorders.
105.	20ECO06	Principles Of VLSI	<ol style="list-style-type: none"> 1. Understand characteristic behavior of MOSFET. 2. Describe various MOS layers and layout design rules. 3. Implement various CMOS logic circuits. 4. Design various MOS memories. 5. Understand the concepts of VLSI technology.
Open Elective- 3			
106.	20MEO07	Intellectual Property Rights	<ol style="list-style-type: none"> 1. Understand the evolution of IP, working of organization's at global level to protect and promote IP. 2. Familiarize with the patent filing process at national and international level. 3. Draw the logical conclusion of research, innovation and patent filing. 4. Compare different kinds of IP and their patenting system. 5. Understand the techno-legal-business angle of IP, infringement and enforcement mechanisms for protection.
107.	20MEO15	Principles Of Industry 4.0	<ol style="list-style-type: none"> 1. Understand the Basics and applications of Digital Manufacturing and Industry 4.0. 2. Understand the role of Additive Manufacturing, Virtual prototyping and Reverse Engineering processes and their adaptability to Digital Manufacturing. 3. Understand the concepts of digital manufacturing based product life cycle and its management. 4. Understand the concept of Industry 4.0 and allied technologies.

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			5. Understand the basics of Internet of things and cloud computing pertaining the fourth industrial revolution.
108.	20ECO01	Remote Sensing And GIS	<ol style="list-style-type: none"> 1. Demonstrate the understanding of basic concepts of remote sensing and interpret energy interactions. 2. Choose an appropriate technique for a given scenario by appreciating the types of remote sensing. 3. Distinguish the principle behind the working of microwave and LiDAR sensing. 4. Apply Microwave remote sensing techniques 5. Explain the procedure for encoding data and geospatial data analysis.
109.	20CEO02	Disaster Risk Reduction And Management	<ol style="list-style-type: none"> 1. Identify and understand the concepts of hazards, causes and impacts of disasters. 2. Develop a critical capacity to evaluate the principles and practices of disaster risk reduction and management. 3. Develop a deep awareness of disaster resilience, risk mitigation, and recovery policies as they arise from natural hazards around the globe. 4. Apply knowledge about existing global frameworks and existing agreements and role of community in successful Disaster Risk Reduction. 5. Evaluate DM study including data search, analysis and presentation as a case study.
110.	20MTO03	Quantum Computing	<ol style="list-style-type: none"> 1. Compute basic mathematical operations on Quantum bits. 2. Will be able to execute Quantum operations of Quantum computing. 3. To build quantum programs. 4. Develop quantum Logical gates and circuits. 5. Develop the quantum algorithm.
111.	20ITC29	Technical Seminar	<ol style="list-style-type: none"> 1. Collect Organize, Analyze and Consolidate information about emerging technologies from the literature. 2. Exhibit effective communication skills, stage courage, and confidence. 3. Demonstrate intrapersonal skills. 4. Explain new innovations/inventions in the relevant field. 5. Prepare Seminar Report in a prescribed format.
112.	20ITC30	Project Part-2	<ol style="list-style-type: none"> 1. Demonstrate a sound technical knowledge of their selected topic. 2. Conduct investigations by using research-based knowledge and methods to provide valid conclusions. 3. Provide solutions to societal complex problems utilizing gained engineering knowledge as an individual or by team work. 4. Create/select/use modern tools to overcome the limitation of complex engineering solutions. 5. Communicate with engineering experts and the community at large in written and oral forms.



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