



B. Tech -
Computer Science and Engineering
Specialization with Data Science
Curriculum and Syllabus
Regulation 2021

(Based on Choice Based Credit System (CBCS)

and

Outcome Based Education (OBE))

Effective from the Academic year

2021-2022

Department Of
Computer Science and Engineering

School of Engineering

VISION AND MISSION OF THE DEPARTMENT

VISION

To develop a knowledge hub for Computer Science Engineers and Technocrats in application of their competence for the betterment of the Individual, Industry and Society.

MISSION

- To nurture the students to be industry ready by providing a strong conceptual foundation and by enhancing their employability and entrepreneurial skills.
- To provide holistic growth by conducting relevant enrichment programs, which includes curricular, co-curricular, extra-curricular and extension activities.
- To inculcate innovation and creativity through practically viable Internships and Project works.
- To create a Research oriented mindset and focus in fulfilling growing demands of the society through mentoring and lifelong learning.

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

PEO1: Graduates will be engineering practitioners and leaders who will contribute to the solution of industry's technological problems.

PEO2: Graduates will be engineering professionals, innovators, or entrepreneurs working in industry on technology development, deployment, or engineering system implementation.

PEO3: Graduates will perform their jobs with social awareness and responsibility.

PEO4: Graduates will interact with their peers in other disciplines in industry and society, contributing to the country's economic growth.

PROGRAM OUTCOMES (PO)

- PO 1: Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO 2: Problem analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- PO 3: Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- PO 4: Conduct investigations of complex problems:** 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.
- PO 5: Modern tool usage:** 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.
- PO 6: The engineer and society:** 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.
- PO 7: Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- PO 8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO 9: Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO 10: Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- PO 11: Project management and finance:** 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.
- PO 12: Life-long learning:** 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.

PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO 1: Apply database design principles and techniques to improve decision-support systems for business analytics.

PSO 2: Design and apply appropriate data analytics models for data profiling and to enrich software standards.

Competencies and Performance Indicators

PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.

1.1	Demonstrate competence in mathematical modelling	1.1.1	Apply the knowledge of discrete structures, linear algebra, statistics and numerical techniques to solve problems
		1.1.2	Apply the concepts of probability, statistics and queuing theory in modeling of computer-based system, data and network protocols.
1.2	Demonstrate competence in basic sciences	1.2.1	Apply laws of natural science to an engineering problem
1.3	Demonstrate competence in engineering fundamentals	1.3.1	Apply engineering fundamentals
1.4	Demonstrate competence in specialized engineering knowledge to the program	1.4.1	Apply theory and principles of computer science and engineering to solve an engineering problem

PO 2: Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

2.1	Demonstrate an ability to identify and formulate complex engineering problem	2.1.1	Evaluate problem statements and identifies objectives
		2.1.2	Identify processes/modules/algorithms of a computer-based system and parameters to solve a problem
		2.1.3	Identify mathematical algorithmic knowledge that applies to a given problem
2.2	Demonstrate an ability to formulate a solution plan and methodology for an engineering problem	2.2.1	Reframe the computer-based system into interconnected subsystems
		2.2.2	Identify functionalities and computing resources.
		2.2.3	Identify existing solution/methods to solve the problem, including forming justified approximations and assumptions
		2.2.4	Compare and contrast alternative solution/methods to select the best methods
		2.2.5	Compare and contrast alternative solution processes to select the best process.
2.3	Demonstrate an ability to formulate and interpret a model	2.3.1	Able to apply computer engineering principles to formulate modules of a system with required applicability and performance.
		2.3.2	Identify design constraints for required performance criteria.
2.4	Demonstrate an ability to execute a solution process and analyze results	2.4.1	Applies engineering mathematics to implement the solution.
		2.4.2	Analyze and interpret the results using contemporary tools.
		2.4.3	Identify the limitations of the solution and sources/causes.
		2.4.1	Arrive at conclusions with respect to the objectives.

PO 3: Design/Development of Solutions: 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.			
3.1	Demonstrate an ability to define a complex/ open-ended problem in engineering terms	3.5.1	Able to define a precise problem statement with objectives and scope
		3.1.2	Able to identify and document system requirements from stake- holders
		3.1.3	Able to review state-of-the-art literature to synthesize system requirements.
		3.1.4	Able to choose appropriate quality attributes as defined by ISO/IEC/IEEE standard
		3.1.5	Explore and synthesize system requirements from larger social and professional
		3.1.6	Able to develop software requirement specifications (SRS).
3.2	Demonstrate an ability to generate a diverse set of alternative design solutions	3.2.1	Able to explore design alternatives.
		3.2.2	Able to produce a variety of potential design solutions suited to meet functional requirements.
		3.2.3	Identify suitable non-functional requirements for evaluation of alternate design solutions.
3.3	Demonstrate an ability to select optimal design scheme for further development	3.3.1	Able to perform systematic evaluation of the degree to which several design concepts meet the criteria.
		3.3.2	Consult with domain experts and stakeholders to select candidate engineering
3.4	Demonstrate an ability to advance an engineering design to defined end state	3.4.1	Able to refine architecture design into a detailed design within the existing constraints.
		3.4.2	Able to implement and integrate the modules.
		3.4.3	Able to verify the functionalities and validate the design.
PO 4: Conduct investigations of complex problems: 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.			
4.1	Demonstrate an ability to conduct investigations of technical issues consistent with their level of knowledge and understanding	4.1.1	Define a problem for purposes of investigation, its scope and importance
		4.1.2	Able to choose appropriate procedure/algorithm, dataset and test cases.
		4.1.3	Able to choose appropriate hardware/software tools to conduct the experiment.
4.2	Demonstrate an ability to design experiments to solve open-ended problems	4.2.1	Design and develop appropriate procedures/methodologies based on the study objectives
4.3	Demonstrate an ability to analyze data and reach a valid conclusion	4.3.1	Use appropriate procedures, tools and techniques to collect and analyze data
		4.3.2	Critically analyze data for trends and correlations, stating possible errors and limitations

		4.3.3	Represent data (in tabular and/or graphical forms) so as to facilitate analysis and explanation of the data, and drawing of conclusions
		4.3.4	Synthesize information and knowledge about the problem from the raw data to reach appropriate conclusions
PO 5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.			
5.1	Demonstrate an ability to identify/create modern engineering tools, techniques and resources	5.1.1	Identify modern engineering tools, techniques and resources for engineering activities
		5.1.2	Create/adapt/modify/extend tools and techniques to solve engineering problems
5.2	Demonstrate an ability to select and apply discipline specific tools, techniques and resources	5.2.1	Identify the strengths and limitations of tools for (i) acquiring information, (ii) modeling and simulating, (iii) monitoring system performance, and (iv) creating engineering designs.
		5.2.2	Demonstrate proficiency in using discipline-specific tools
5.3	Demonstrate an ability to evaluate the suitability and limitations of tools used to solve an engineering problem	5.3.1	Discuss limitations and validate tools, techniques and resources
		5.3.2	Verify the credibility of results from tool use with reference to the accuracy and limitations, and the assumptions inherent in their use.
PO 6: The engineer and society: 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.			
6.1	Demonstrate an ability to describe engineering roles in a broader context, e.g. pertaining to the environment, health, safety, legal and public welfare	6.1.1	Identify and describe various engineering roles; particularly as pertains to protection of the public and public interest at the global, regional and local level
6.2	Demonstrate an understanding of professional engineering regulations, legislation and standards	6.2.1	Interpret legislation, regulations, codes, and standards relevant to your discipline and explain its contribution to the protection of the public
PO 7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable development.			
7.1	Demonstrate an understanding of the impact of engineering and industrial practices on social, environmental and in economic contexts	7.1.1	Identify risks/impacts in the life-cycle of an engineering product or activity
		7.1.2	Understand the relationship between the technical, socio-economic and environmental dimensions of sustainability

7.2	Demonstrate an ability to apply principles of sustainable design and development	7.2.1	Describe management techniques for sustainable development
		7.2.2	Apply principles of preventive engineering and sustainable development to an engineering activity or product relevant to the discipline
PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.			
8.1	Demonstrate an ability to recognize ethical dilemmas	8.1.1	Identify situations of unethical professional conduct and propose ethical alternatives
8.2	Demonstrate an ability to apply the Code of Ethics	8.2.1	Identify tenets of the ASME professional code of ethics
		8.2.2	Examine and apply moral & ethical principles to known case studies
PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.			
9.1	Demonstrate an ability to form a team and define a role for each member	9.1.1	Recognize a variety of working and learning preferences; appreciate the value of diversity on a team
		9.1.2	Implement the norms of practice (e.g. rules, roles, charters, agendas, etc.) of effective team work, to accomplish a goal.
9.2	Demonstrate effective individual and team operations-- communication, problem solving, conflict resolution and leadership skills	9.2.1	Demonstrate effective communication, problem-solving, conflict resolution and leadership skills
		9.2.2	Treat other team members respectfully
		9.2.3	Listen to other members
		9.2.4	Maintain composure in difficult situations
9.6	Demonstrate success in a team-based project	9.6.1	Present results as a team, with smooth integration of contributions from all individual efforts
PO 10: Communication: 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			
10.1	Demonstrate an ability to comprehend technical literature and document project work	10.1.1	Read, understand and interpret technical and non-technical information
		10.1.2	Produce clear, well-constructed, and well-supported written engineering documents
		10.1.3	Create flow in a document or presentation - a logical progression of ideas so that the main point is clear
10.2	Demonstrate competence in listening, speaking, and presentation	10.2.1	Listen to and comprehend information, instructions, and viewpoints of others
		10.2.2	Deliver effective oral presentations to technical and non-technical audiences
10.3	Demonstrate the ability to integrate different modes of	10.3.1	Create engineering-standard figures, reports and drawings to complement writing and presentations

	communication	10.3.2	Use a variety of media effectively to convey a message in a document or a presentation
PO 11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's work, as a member and leader in a team, to manage projects and in multidisciplinary environments. Competency			
11.1	Demonstrate an ability to evaluate the economic and financial performance of an engineering activity	11.1.1	Describe various economic and financial costs/benefits of an engineering activity
		11.1.2	Analyze different forms of financial statements to evaluate the financial status of an engineering project
11.2	Demonstrate an ability to compare and contrast the costs/benefits of alternate proposals for an engineering activity	11.2.1	Analyze and select the most appropriate proposal based on economic and financial considerations.
11.3	Demonstrate an ability to plan/manage an engineering activity within time and budget constraints	11.3.1	Identify the tasks required to complete an engineering activity, and the resources required to complete the tasks.
		11.3.2	Use project management tools to schedule an engineering project, so it is completed on time and on budget.
PO 12: Life-long learning: 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.			
12.1	Demonstrate an ability to identify gaps in knowledge and a strategy to close these gaps	12.1.1	Describe the rationale for the requirement for continuing professional development
		12.1.2	Identify deficiencies or gaps in knowledge and demonstrate an ability to source information to close this gap
12.2	Demonstrate an ability to identify changing trends in engineering knowledge and practice	12.2.1	Identify historic points of technological advance in engineering that required practitioners to seek education in order to stay current
		12.2.2	Recognize the need and be able to clearly explain why it is vitally important to keep current regarding new developments in your field
12.3	Demonstrate an ability to identify and access sources for new information	12.3.1	Source and comprehend technical literature and other credible sources of information
		12.3.2	Analyze sourced technical and popular information for feasibility, viability, sustainability, etc.
PSO 1: Apply database design principles and techniques to improve decision-support systems for business analytics.			
13.1	Ability to investigate complex problems	13.1.1	Identify problem statements and develop smart solutions for real time applications

		13.1.2	Investigate all the probable solutions towards the identified problem
13.2	Design and Develop solutions systematically	13.2.1	Apply database design principles and techniques to propose solutions for business analytics
		13.2.2	Analyze and suggest the testing strategies to develop an optimal solution
		13.2.3	Implement a customized solution using appropriate data analytic techniques
PSO 2: Design and apply appropriate data analytics models for data profiling and to enrich software standards.			
14.1	Develop cost benefit solutions using engineering principles and practices	14.1.1	Describe the rationale for choosing solutions based on engineering principles
		14.1.2	Conduct feasibility and cost-benefit analysis for implementing the solution
14.2	Ability to visualize data through augmented, virtual and mixed reality	14.2.1	Identify the problem and develop an hybrid vision system
		14.2.2	Develop an innovative solution with ethics in multi-disciplinary areas

**VELS INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES(VISTAS)
SCHOOL OF ENGINEERING**

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

The Panel members for Board of studies meeting are listed below

S. No	Name of the Board Member	Designation	Institute / Industry
Internal Members			
1	Dr. R. Anandan	Professor & Head Department of Computer Science and Engineering Vel's Institute of Science, Technology & Advanced Studies (VISTAS)	Chairman
2	Dr. S. Arun	Director, IQAC Vel's Institute of Science, Technology & Advanced Studies (VISTAS)	Internal Member
3	Dr. R. A. Karthika	Associate Professor Department of Computer Science and Engineering Vel's Institute of Science, Technology & Advanced Studies (VISTAS)	Internal Member
4	Dr. A. Rajesh	Associate Professor Department of Computer Science and Engineering Vel's Institute of Science, Technology & Advanced Studies (VISTAS)	Internal Member
5	Dr. K. Kalaivani	Assistant Professor Department of Computer Science and Engineering Vel's Institute of Science, Technology & Advanced Studies (VISTAS)	Internal Member
External Expert Members			
1	Dr. Asnath Vicky Phamila Y	Associate Professor School of Computer Science and Engineering Vellore Institute of Technology - VIT Chennai	Academic Expert
2	Mr. Santhosh Gopynadhan	Senior Director Optum Global Solutions (India) Private Limited, Chennai	Industrial Expert
Student Member			
1	Mr. Pavan Srivatsav	Project Associate Cognizant Technology Solutions, Chennai	Alumni

**VELS INSTITUTE OF SCIENCE, TECHNOLOGY AND ADVANCED STUDIES
SCHOOL OF ENGINEERING**

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CREDIT DISTRIBUTION

B.TECH CSE DATA SCIENCE										
Credits Per Semester										
S. No	Course Category	1	2	3	4	5	6	7	8	Total Credits
1	HSC	-	3	2	2	2	2	-	-	11
2	BSC	10	10	4	7	-	-	-	-	31
3	ESC	8	8	3	-	-	-	-	-	19
4	PCC	-	-	13	15	13	9	4	-	54
5	PEC	-	-	-	-	3	7	7	3	20
6	OEC	-	-	-	-	3	3	6	6	18
7	Project	-	-	-	-	-	-	5	10	15
8	MC	-	-	2	-	-	-	-	-	2
	TOTAL	18	21	24	24	21	21	22	19	170

HSC	Humanities and Social Science Courses
BSC	Basic Science Courses
ESC	Engineering Science Courses
PCC	Professional Core Courses
PEC	Professional Elective Courses
OEC	Open Elective Courses
EEC	Employability Enhancement Courses
MC	Mandatory Courses

B. TECH CSE Data Science (Regulation 2021-22)								
Category	Course Title	Lecture	Tutorial	Practical	Credits	CA	SEE	Total
SEMESTER I								
BSC	Chemistry	3	1	-	4	40	60	100
BSC	Mathematics I (Calculus and Linear Algebra)	3	1	-	4	40	60	100
ESC	Programming for Problem Solving	3	-	-	3	40	60	100
BSC	Chemistry Laboratory	-	-	4	2	40	60	100
ESC	Programming for Problem Solving Laboratory	-	-	4	2	40	60	100
ESC	Workshop and Manufacturing Practices	1	-	4	3	40	60	100
		10	2	12	18			
SEMESTER II								
HSC	English	2	-	-	2	40	60	100
BSC	Physics (Semiconductor Physics)	3	1	-	4	40	60	100
BSC	Mathematics II (Probability and Statistics)	3	1	-	4	40	60	100
ESC	Basic Electrical Engineering	3	1	-	4	40	60	100
ESC	Engineering Graphics and Design	1	-	4	3	40	60	100
HSC	English Laboratory	-	-	2	1	40	60	100
BSC	Physics Laboratory (Semiconductor Physics)	-	-	4	2	40	60	100
ESC	Electrical Engineering Laboratory	-	-	2	1	40	60	100
		12	3	12	21			
SEMESTER III								
BSC	Mathematics III (Fourier Series and Transforms)	3	1	-	4	40	60	100
ESC	Digital Electronics	3	-	-	3	40	60	100
PCC	Operating Systems	3	-	-	3	40	60	100
PCC	Data Structures and Algorithms	3	1	-	4	40	60	100
PCC	Introduction to AI and ML	3	-	2	4	40	60	100
PCC	Operating Systems Lab	-	-	2	1	40	60	100
PCC	Data Structures and Algorithms Lab	-	-	2	1	40	60	100
HSC	Personality Development I	2	-	-	2	40	60	100
MC	Basic Life Skills	2	-	-	2			100
		19	2	6	24			

SEMESTER IV								
BSC	Mathematics IV (Random Process and Queuing Theory)	3	1	-	4	40	60	100
PCC	Computer Organization and Architecture	3	-	-	3	40	60	100
PCC	Database Management Systems	3	-	-	3	40	60	100
PCC	Computer Networks	3	-	-	3	40	60	100
PCC	Introduction to Data Science	3	-	2	4	40	60	100
PCC	Database Management Systems Lab	-	-	2	1	40	60	100
PCC	Computer Networks Lab	-	-	2	1	40	60	100
HSC	Personality Development II	2	-	-	2	40	60	100
BSC	Environmental Science and Engineering	3	-	-	3	40	60	100
MC	Constitution of India	2	-	-	-			100
		22	1	6	24			
SEMESTER V								
PCC	Java and Web Programming	3	-	-	3	40	60	100
PCC	Mobile Application Development	3	-	-	3	40	60	100
PEC	Professional Elective Course - I	3	-	-	3	40	60	100
OEC	Open Elective Course - I	3	-	-	3	40	60	100
PCC	Deep Learning and Predictive Modeling	3	-	2	4	40	60	100
PCC	Java and Web Programming Lab	-	-	2	1	40	60	100
PCC	Mobile Application Development Lab	-	-	2	1	40	60	100
HSC	Personality Development III	2	-	-	2	40	60	100
PCC	Industrial Training/ Mini Project/ MOOC Course (NPTEL/SWAYAM/Coursera/Math works) - Minimum 4 weeks	-	-	2	1			100
		17	-	8	21			
SEMESTER VI								
PCC	.Net Programming	3	-	-	3	40	60	100
PCC	Computational Data Analytics	3	-	-	3	40	60	100
PEC	Professional Elective Course - II	3	-	-	3	40	60	100
PEC	Professional Elective Course - III	3	-	2	4	40	60	100
OEC	Open Elective Course - II	3	-	-	3	40	60	100
PCC	.Net Programming Lab	-	-	2	1	40	60	100
PCC	Computational Data Analytics Lab	-	-	2	1	40	60	100
HSC	Personality Development - IV	2	-	-	2	40	60	100
PCC	Summer Internship (4 weeks)	-	-	2	1			100
		17	-	8	21			

SEMESTER VII								
PCC	Full Stack Web Development	3	-	-	3	40	60	100
OEC	Open Elective Course - III	3	-	-	3	40	60	100
OEC	Open Elective Course - IV	3	-	-	3	40	60	100
PEC	Professional Elective Course - IV	3	-	-	3	40	60	100
PEC	Professional Elective Course - V	3	-	2	4	40	60	100
PCC	Full Stack Web Development Lab	-	-	2	1	40	60	100
Project	Project Phase I	-	-	10	5	40	60	100
		15	-	14	22			
SEMESTER VIII								
PEC	Professional Elective Course - VI	3	-	-	3	40	60	100
OEC	Open Elective Course - V	3	-	-	3	40	60	100
OEC	Open Elective Course - VI	3	-	-	3	40	60	100
Project	Project Phase II	-	-	20	10	40	60	100
		9	-	20	19			

LIST OF ALL BASIC SCIENCE COURSES

S.NO	COURSE TITLE	Hours / Week			Credits
		Lecture	Tutorial	Practical	
BSC - 01	Physics	3	1	-	4
BSC - 02	Mathematics I (Calculus and Linear Algebra)	3	1	-	4
BSC - 03	Physics Laboratory (Semiconductor Physics)	-	-	4	2
BSC - 04	Chemistry	3	1	-	4
BSC - 05	Mathematics II (Probability and Statistics)	3	1	-	4
BSC - 06	Chemistry Laboratory	-	-	4	2
BSC - 07	Mathematics III (Fourier Series and Transforms)	3	1	-	4
BSC - 08	Environmental Science and Engineering	3	-	-	3
BSC - 09	Mathematics IV (Random Process and Queuing Theory)	3	1	-	4

LIST OF ALL HUMANITIES AND SOCIAL SCIENCES COURSES

S.NO	COURSE TITLE	Hours / Week			Credits
		Lecture	Tutorial	Practical	
HSC-01	English	2	-	-	2
HSC-02	English Laboratory	-	-	2	1
HSC-03	Personality Development I (Effective Technical Communication)	2	-	-	2
HSC-04	Personality Development II	2	-	-	2
HSC-05	Personality Development III	2	-	-	2
HSC-06	Personality Development IV	2	-	-	2

LIST OF ALL ENGINEERING SCIENCE COURSES

S.NO	COURSE TITLE	Hours / Week			Credits
		Lecture	Tutorial	Practical	
ESC-01	Basic Electrical Engineering	3	1	-	4
ESC-02	Engineering Graphics and Design	1	-	4	3
ESC-03	Electrical Engineering Laboratory	-	-	2	1
ESC-04	Programming for Problem Solving	3	-	-	3
ESC-05	Workshop and Manufacturing Practices	1	-	4	3
ESC-06	Programming for Problem Solving Laboratory	-	-	4	2

LIST OF ALL PROFESSIONAL ELECTIVE COURSES

S.NO	COURSE TITLE	Hours / Week			Credits
		Lecture	Tutorial	Practical	
PEC-01	Applied Cryptography	3	-	-	3
PEC-02	Big-Data Programming	3	-	-	3
PEC-03	Cloud Computing	3	-	-	3
PEC-04	Cryptography and Network Security	3	-	-	3
PEC-05	Cyber Forensics	3	-	-	3
PEC-06	Data Warehousing and Data Mining	3	-	-	3
PEC-07	Digital Image Processing	3	-	-	3
PEC-08	E- Commerce	3	-	-	3
PEC-09	Ethical Hacking	3	-	-	3
PEC-10	Information Retrieval	3	-	-	3
PEC-11	Object Oriented Analysis and Design	3	-	-	3
PEC-12	Soft Computing	3	-	-	3
PEC-13	Software Engineering	3	-	-	3
PEC-14	Software Project Management	3	-	-	3
PEC-15	Software Quality Assurance	3	-	-	3
PEC-16	Software Testing	3	-	-	3
PEC-17	System Software	3	-	-	3
PEC-18	User Interface Design	3	-	-	3
PEC-19	Virtual Reality	3	-	-	3
PEC-20	Agile Methodologies	3	-	-	3
PEC-21	Information Security	3	-	-	3
PEC-22	Software Defined Networks	3	-	-	3
PEC-23	Block Chain Technologies	3	-	-	3
PEC-24	Natural Language Processing	3	-	-	3
PEC-25	Applications of AI	3	-	-	3
PEC-26	Information Security Analysis and Audit	3	-	-	3
PEC-27	Intelligent Database System	3	-	-	3
PEC-28	Data Exploration and Visualization	3	-	2	4
PEC-29	Big Data Analytics	3	-	2	4
PEC-30	Python for Data Science	3	-	2	4
PEC-31	NOSQL Database	3	-	2	4
PEC-32	Game Programming	3	-	2	4
PEC-33	Robotics and its applications	3	-	2	4
PEC-34	Concepts of Virtual and Augmented Reality	3	-	2	4
PEC-35	Embedded System for Internet of Things	3	-	2	4

LIST OF ALL MANDATORY COURSES

S.NO	COURSE TITLE	Hours / Week			Credits
		Lecture	Tutorial	Practical	
MC	Constitution of India	2	-	-	-
MC	Basic Life Skills	2	-	-	2

LIST OF OPEN ELECTIVE COURSES OFFERED TO OTHER PROGRAMS

S.NO	COURSE TITLE	Hours / Week			Credits
		Lecture	Tutorial	Practical	
OEC-01	Data Structures and Algorithms	3	-	-	3
OEC-02	Internet of Things	3	-	-	3
OEC-03	Python Programming	3	-	-	3
OEC-04	Artificial Intelligence	3	-	-	3
OEC-05	Cloud Computing	3	-	-	3
OEC-06	E-Commerce	3	-	-	3
OEC-07	Ethical Hacking	3	-	-	3
OEC-08	Introduction to Data Analytics	3	-	-	3
OEC-09	Fundamentals of AI and ML	3	-	-	3