



**R-21**

# **CURRICULUM ESSENTIALS**

**Handbook on Outcome Based Education**

**COMPUTER SCIENCE AND ENGINEERING**

**NARULA INSTITUTE OF TECHNOLOGY**

**[WWW.NIT.AC.IN](http://WWW.NIT.AC.IN)**

## Institute Vision

To make the Institute excellent in technological education and research by imparting equitable, inclusive, ethical, flexible and multidisciplinary knowledge to budding technologists to serve the society.

## Institute Mission

- To establish continuously improving academic ambience in the Institute in order to prepare the students with beyond curriculum knowledge, creativity, innovation, problem solving abilities, teamwork, communication skills etc. for their holistic development.
- To collaborate with Institutes of higher education, Professional Societies, R&D and Industrial organisations for continuous improvement of academic, research environment in the Institute and to build a strong Industry-Institute interface.
- To promote and nurture entrepreneurial and innovative quality of the students providing proper education, training and supportive facilities so that future entrepreneurs emerge with flying colors.
- To strengthen quality and knowledge-base of faculty through faculty development programmes for continuous upgradation to remain in tune with dynamically changing technology.
- To become a responsible contributor in the socio-economic development of the society through excellence in education and research.

## Institute Quality Policy

- Adoption of appropriate standards and practices for good governance, to bring in transparency of all operations and thereby improve credibility at all levels.
- Industry-ready professionals to be developed through interactive teaching learning process involving state of the art class rooms, laboratories, libraries, corporate exposure and innovative project work.
- Higher studies/research for faculty & staff to be encouraged for up gradation of knowledge through participation in Quality Improvement Programs, Seminars, Workshops, Webinars etc.
- Laboratory facilities would be upgraded in emerging areas to promote R&D activities including participation in Govt. and Industry funded projects.
- Industrial consultancy to be carried out in an effective manner for developing sense of accomplishment.
- Interaction with Professional Societies would be encouraged for the professional growth and development of the students, faculties and staff for mutual benefit.
- NBA Accreditation for all AICTE approved programs to be obtained at the earliest and maintained on a long-term basis.
- The innovative and entrepreneurial skills of the students to be nurtured through Innovation & Incubation centre, finally culminating in start-ups.

## Department Vision

To develop responsible citizens who would 'think global and act local' and become the change agents of society to meet the challenges of future.

## Department Mission

The mission of the Computer Science and Engineering Department is to build and sustain a high quality and broad area-based teaching and research program in computer science, to prepare students for successful professional careers both in industry, academics and as entrepreneurs, and to provide service to the nation as a good human being.

## Program Educational Objectives (PEOs)

### B. Tech in Computer Science and Engineering

- PEO1.** Graduates are prepared to be employed in IT industries and be engaged in learning, understanding, and applying new ideas.
- PEO2.** Graduates are prepared to take up Masters / Research programs.
- PEO3.** Graduates are prepared to be responsible computing professionals in their own area of interest.
- PEO4.** Graduates are prepared to be good entrepreneurs and responsible social representatives.

## Program outcomes (POs)

### Engineering Graduates will be able to:

- 1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 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.
- 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.
- 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.
- 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.
- 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.
- 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 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.
- 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.
- 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.

## Program Specific Outcomes (PSOs)

### B. Tech in Computer Science and Engineering

- PEO5.** The ability to understand, illustrate, discuss, explain the fundamental design and working principle of any existing or new computing model or concept related to the field of computer science and engineering and analyze the utility of the model or concept in respect of its capability of addressing and solving the relevant issues or problems.
- PEO6.** The ability to identify and formulate a problem within the scope of computer science and engineering domain for proposing software application-based or research-based solution models with adequate justification by applying the relevant domain knowledge.
- PEO7.** The ability to ideate, design, implements and analyse a solution proposal with proper documentation demonstrating adequate software engineering management skill along with the necessary technical skill for driving propensity towards technological innovation boosted with research and entrepreneurial aptitude for producing globally competent engineering professionals capable of making meaningful contributions in the field of computer science and engineering.

# Curriculum Structure

Department: Computer Science and Engineering

1 <sup>st</sup> Semester									
Sl. No.	Category	Course	Course Title	Hours per				Credits	
A. THEORY				L	T	P	Total		
1	Basic Science course	PH101	Physics-I	3	0	0	3	3	
2	Basic Science course	M101	Mathematics –I	4	0	0	4	4	
3	Humanities and Social Sciences including Management courses	HSMC 101	Professional Communication						
B. PRACTICAL									
4	Basic Science course	PH191	Physics-I Lab	0	0	3	3	1.5	
5	Engineering Science Courses	ME 191	Workshop & Manufacturing	0	0	3	3	1.5	
6	PROJECT	PR191	Theme based Project I	0	0	1	1	0.5	
7	PROJECT	PR192	Skill Development I: Soft Skill	0	0	1	1	0.5	
C. MANDATORY ACTIVITIES / COURSES									
8	Mandatory Course	MC181	Induction Program	0	0	0	0	2Units	
<b>TOTAL CREDIT</b>								13	

2nd Semester								
Sl. No.	Category	Course Code	Course Title	Hours per week			Credits	
A. THEORY				L	T	P		Total
1	Basic Science courses	CH 201	Chemistry-I	3	0	0	3	3
2	Basic Science courses	M 201	Mathematics –II	4	0	0	4	4
3	Engineering Science Courses	EE 201	Basic Electrical Engineering	3	0	0	3	3
4	Engineering Science Courses	CS 201	Programming for Problem Solving	3	0	0	3	3
B. PRACTICAL								
5	Basic Science course	CH 291	Chemistry-I Lab	0	0	3	3	1.5
6	Humanities and Social Sciences including Management courses	HSMC 291	Professional Communication LAB	0	0	2	2	1
7	Engineering Science Courses	EE 291	Basic Electrical Engineering Lab	0	0	3	3	1.5
8	Engineering Science Courses	ME 292	Engineering Graphics & Design Lab	0	0	3	3	1.5
9	Engineering Science Courses	CS 291	Programming for Problem Solving Lab	0	0	3	3	1.5
10	PROJECT	PR291	Theme based Project II	0	0	1	1	0.5
11	PROJECT	PR292	Skill Development II: Life Skill	1	0	0	1	0.5
C. MANDATORY ACTIVITIES / COURSES								
12	Mandatory Course	MC281	NSS/Physical Activities / Meditation & Yoga / Photography	0	0	3	3	3 Units
<b>TOTAL CREDIT</b>							21	

3 <sup>rd</sup> Semester								
Sl. No.	Category	Course Code	Course Title	Hours per week				Credits
				L	T	P	Total	
<b>A. THEORY</b>								
1	Basic Science course	M(CSE)301	Discrete Mathematics	3	0	0	3	3
2	Engineering Science Courses	ESC301	Analog Electronics	3	0	0	3	3
3	Engineering Science Courses	ESC302	Digital Logic and Electronics	3	0	0	3	3
4	Program Core Course	PCC-CS301	ITWorkshop (SciLab/MATLAB/C++)	3	0	0	3	3
5	Program Core Course	PCC-CS302	Data Structures	3	0	0	3	3
6	Humanities and Social Sciences including Management courses	HSMC 303	Universal Human Values 2: Understanding Harmony	3	0	0	3	3
<b>B. PRACTICAL</b>								
7	Engineering Science Courses	M(CSE)391	Numerical Methods Lab	1	0	3	3	2.5
8	Engineering Science Courses	ESC391	Digital and Analog Electronics Lab	0	0	3	3	1.5
9	Program Core Course	PCC-CS391	ITWorkshop Lab (SciLab/MATLAB/C++)	0	0	3	3	1.5
10	Program Core Course	PCC-CS392	Data Structures Lab	0	0	3	3	1.5
11	PROJECT	PR391	Theme based Project III	0	0	1	1	0.5
12	PROJECT	PR392	Skill Development III: Technical Seminar Presentation	1	0	0	1	0.5
<b>C. MANDATORY ACTIVITIES / COURSES</b>								
13	MC	MC 301	Environmental Science	0	0	3	3	3 Units
<b>TOTAL CREDIT WITHOUT MOOCS COURSES</b>								26
<b>D.MOOCS COURSES**</b>								
14	MOOCS COURSES	HM301	MOOCS COURSE-I	1	3	1	4	4
<b>TOTAL CREDIT WITH MOOCS COURSES</b>								<b>30</b>

4 <sup>th</sup> Semester								
Sl. N	Category	Course Code	Course Title	Hours per week				Credits
				L	T	P	Total	
<b>A. THEORY</b>								
1	Program Core Course	PCC-CS401	Computer Organization and Architecture	3	0	0	3	3
2	Program Core Course	PCC-CS402	Design and Analysis of Algorithms	3	0	0	3	3
3	Program Core Course	PCC-CS403	Operating Systems	3	0	0	3	3
4	Program Core Course	PCC-CS404	Formal Language and Automata Theory	3	0	0	3	3
5	Humanities and Social Sciences including Management courses	HSMC 402	Gender Culture and Development	2	0	0	2	2
6	Basic Science course	M(CSE) 401	Probability and Statistics	3	0	0	3	3
<b>B. PRACTICAL</b>								
7	Program Core Course	PCC-CS491	Computer Organization and Architecture Lab	0	0	3	3	1.5
8	Program Core Course	PCC-CS492	Design and Analysis of Algorithms Lab	0	0	3	3	1.5
9	Program Core Course	PCC-CS493	Operating Systems Lab	0	0	3	3	1.5
10	Engineering Science Courses	ESC491	Programming using Python	0	0	3	3	1.5
11	PROJECT	PR 491	Theme based Project IV	0	0	1	1	0.5
12	PROJECT	PR492	Skill Development IV: Soft Skill & Aptitude-I	1	0	0	1	0.5
<b>C. MANDATORY ACTIVITIES / COURSES</b>								
13	MC	MC 481	Learning an Art Form [vocal or instrumental, dance, painting, clay modeling, etc.] OR Environmental Protection Initiatives	0	0	0	3	3 Units
<b>TOTAL CREDIT WITHOUT MOOCS COURSES</b>								24
<b>D.MOOCs</b>								
14	MOOCS COURSES	HM401	MOOCS COURSE-II	3	1	0	4	4
<b>TOTAL CREDIT WITH MOOCS COURSES</b>								<b>28</b>

5 <sup>th</sup> Semester								
Sl. No.	Category	Course Code	Course Title	Hours per week				Credits
				L	T	P	Total	
<b>A. THEORY</b>								
1	Humanities and Social Sciences including Management courses	HSMC 505	Principles of Management	2	0	0	2	2
2	Program Core Course	PCC-CS501	Compiler Design	3	0	0	3	3
3	Program Core Course	PCC-CS502	Database Management Systems	3	0	0	3	3
4	Program Core Course	PCC-CS503	Object Oriented Programming using Java	3	0	0	3	3
5	Professional Elective courses	PEC-CS-T-501	Advanced Algorithms	3	0	0	3	3
		PEC-CS-S-501	Advanced Computer Architecture					
		PEC-CS-D-501	Neural Networks and Deep Learning					
		PEC-CS-A-501	Artificial Intelligence					
<b>B. PRACTICAL</b>								
6	Program Core Course	PCC-CS591	Compiler Design Lab	0	0	3	3	1.5
7	Program Core Course	PCC-CS592	Database Management Systems Lab	0	0	3	3	1.5
8	Program Core Course	PCC-CS593	Object Oriented Programming using Java Lab	0	0	3	3	1.5
9	Professional Elective courses	PEC-CS-T-591	Advanced Algorithms Lab	0	0	3	3	1.5
		PEC-CS-S-591	Advanced Computer Architecture Lab					
		PEC-CS-D-591	Neural Networks and Deep Learning Lab					
		PEC-CS-A-591	Artificial Intelligence Lab					
10	PROJECT	PR 591	Minor Project I	0	0	3	2	1
11	PROJECT	PR 592	Skill Development V:	1	0	0	1	0.5
			Soft Skill & Aptitude-II					
<b>C. MANDATORY ACTIVITIES / COURSES</b>								
12	MC	MC 501	Constitution of India	3	0	0	3	3Units
<b>TOTAL CREDIT WITHOUT MOOCS COURSES</b>								21.5
<b>D. MOOCS</b>								
13	MOOCS	HM501	MOOCS COURSE-III	3	1	0	4	4
<b>TOTAL CREDIT WITH MOOCS COURSES</b>								25.5

6 <sup>th</sup> Semester								
Sl. No.	Category	Course Code	Course Title	Hours per			Credits	
				L	T	P		Total
<b>A. THEORY</b>								
1	Humanities and Social Sciences including Management courses	HSMC 604	Economics for Engineers	2	0	0	2	2
2	Program Core Course	PCC-S601	Computer Networks	3	0	0	3	3
3	Program Core Course	PCC-S602	Software Engineering	3	0	0	3	3
4	Professional Elective courses	PEC-CS-T-601	Microprocessor and Microcontroller	3	0	0	3	3
		PEC-CS-S-601	Advanced Operating Systems					
		PEC-CS-D-601	Machine Learning					
		PEC-CS-A-601	Web and Internet Technology					
5	Professional Elective courses	PEC-CS-T-602	Parallel and Distributed Algorithms	3	0	0	3	3
		PEC-CS-S-602	Embedded Systems					
		PEC-CS-D-602	Soft Computing					
		PEC-CS-A-602	Human Computer Interaction					
6	Open Elective courses	OEC-CS-601A	Introduction to Internet of Things	3	0	0	3	3
		OEC-CS-601B	Bio-informatics					
		OEC-CS-601C	Robotics					

6 <sup>th</sup> Semester								
Sl. No	Category	Course Code	Course Title	Hours per			Credits	
				L	T	P		Tota
<b>B. PRACTICAL</b>								
7	Program Core Course	PCC-CS691	Computer Networks Lab	0	0	3	3	1.5
8	Program Core Course	PCC-CS692	Software Engineering Lab	0	0	3	3	1.5
9	Professional Elective courses	PEC-CS-T-691	Microprocessor and Microcontroller Lab	0	0	3	3	1.5
		PEC-CS-S-691	Advanced Operating Systems					
		PEC-CS-D-691	Machine Learning Lab					
		PEC-CS-A-691	Web and Internet Technology					
10	PROJEC	PR 691	Minor Project II	0	0	3	2	1
11	PROJEC	PR 692	Skill Development	1	0	0	1	0.5
<b>C. MANDATORY ACTIVITIES / COURSES</b>								
12	MC	MC 601	Intellectual Property Right	3	0	0	3	3Unit
<b>TOTAL CREDIT WITHOUT MOOCS COURSES</b>								23
<b>D.MOOCs</b>								
13	MOOCS COURSES	HM601	MOOCS COURSE-IV	3	1	0	4	4
<b>TOTAL CREDIT WITH MOOCS COURSES</b>								<b>27</b>

## 7<sup>th</sup> Semester

Sl No	Course Code	Paper Code	Theory	Contact Hours /Week				Credit Points
				L	T	P	Total	
<b>A. THEORY</b>								
1	Professional Elective courses	PEC-CS-T-701	Information Theory and Coding	3	0	0	3	3
		PEC-CS-S-701	Ad-Hoc and Sensor Networks					
		PEC-CS-D-701	Data Mining and Data Warehouse					
		PEC-CS-A-701	Cloud Computing					
2	Professional Elective courses	PEC-CS-T-702	Quantum Computing	3	0	0	3	3
		PEC-CS-S-702	Mobile Computing					
		PEC-CS-D-702	Natural Language Processing					
		PEC-CS-A-702	Cryptography and Network Security					
3	Open Elective courses	OEC-CS-701A	High Performance Computing	3	0	0	3	3
		OEC-CS-701B	Image Processing					
		OEC-CS-701C	Optimization Techniques					
4	Open Elective courses	OEC-CS-702A	Cyber Law and Ethics	3	0	0	3	3
		OEC-CS-702B	Soft Skills and Interpersonal Communication					
		OEC-CS-702C	Foreign Language					

7 <sup>th</sup> Semester								
Sl No	Course Code	Paper Code	Theory	Contact Hours /Week				Credit Points
				L	T	P	Total	
<b>B. PRACTICAL</b>								
5	Professional Elective courses	PEC-CS-T-791	Information Theory and Coding Lab	3	0	0	3	1.5
		PEC-CS-S-791	Ad-Hoc and Sensor Networks Lab					
		PEC-CS-D-791	Data Mining and Data Warehousing					
		PEC-CS-A-791	Cloud Computing Lab					
6	Open Elective courses	OEC-CS-791A	High Performance Computing Lab	3	0	0	3	1.5
		OEC-CS-791B	Image Processing Lab					
		OEC-CS-791C	Optimization Techniques Lab					
7	PROJECT	PR 791	Major Project-I	0	0	0	4	2
8	PROJECT	PR 792*	Industrial Training / Internship	0	0	0	0	1
9	PROJECT	PR 793	Skill Development VII: Seminar & Group Discussion	1	0	0	1	0.5
<b>C. MANDATORY ACTIVITIES / COURSES</b>								
10	MC	MC 781	Entrepreneurship & Innovation	3	0	0	3	3 Units
<b>TOTAL CREDIT WITHOUT MOOCS COURSES</b>								18.5
11	MOOCS COURSES	HM701	MOOCS COURSE-V	3	1	0	4	4
<b>TOTAL CREDIT WITH MOOCS COURSES</b>								22.5

8 <sup>th</sup> Semester								
Sl No	Course Code	Paper Code	Theory	Contact Hours				Credit Points
				L	T	P	Total	
<b>A. THEORY</b>								
1	Professional Elective courses	PEC-CS-T-801	Advance Graph Algorithms	3	0	0	3	3
		PEC-CS-S-801	Real Time System					
		PEC-CS-D-801	Data Analytics					
		PEC-CS-A-801	Computer Graphics					
2	Open Elective courses	OEC-CS-801A	Human Resource Development and Organizational Behaviour	3	0	0	3	3
		OEC-CS-801B	VLSI					
		OEC-CS-801C	Simulation and Modeling					
3	Open Elective courses	OEC-CS-802A	Values and Ethics in Profession	3	0	0	3	3
		OEC-CS-802B	History of Science					
		OEC-CS-802C	Economic Policies in India					
<b>B. PRACTICAL</b>								
4	PROJECT	PR 891	Major Project-II	0	0	0	12	6
5	PROJECT	PR 892	Grand Viva	0	0	0	0	1
<b>C. MANDATORY ACTIVITIES / COURSES</b>								
6	MC	MC 801	Essence of Indian Knowledge Tradition	0	0	3	3	3 Units
<b>TOTAL</b>								16

**Course Name: Mathematics –I**

**Course Code: M101**

**Contact: 3:1:0**

**Total Contact Hours: 48**

**Credits: 4**

**Course Outcomes (COs):**

After completion of the course students would be able to

<b>CO1</b>	Understand and recall the properties and formula related to matrix algebra, differential calculus,
<b>CO2</b>	Determine the solutions of the problems related to matrix algebra, differential calculus, multivariable calculus, vector calculus and infinite series.
<b>CO3</b>	Apply the appropriate mathematical tools of matrix algebra, differential calculus, multivariable calculus, vector calculus and infinite series for the solutions of the problems.
<b>CO4</b>	Analyze different engineering problems linked with matrix algebra, differential calculus, multivariable calculus, vector calculus
<b>CO5</b>	Apply different engineering problems linked with matrix algebra, differential calculus, multivariable calculus, vector calculus

**CO-PO Mapping**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>M101.1</b>	3	2	3	2								2
<b>M101.2</b>	3	3	3	3								2
<b>M101.3</b>	3	3	3	3								2
<b>M101.4</b>	3	3	3	3								2
<b>M101.5</b>	3	3	3	3								2

**CO-PSO Mapping**

COs	PSO1	PSO2	PSO3
<b>M101.1</b>	2	2	2
<b>M101.2</b>	2	2	2
<b>M101.3</b>	2	2	2
<b>M101.4</b>	2	2	2
<b>M101.5</b>	2	2	2

**Course Name: Physics**  
**Course Code: PH101**  
**Contact: 3:1:0**  
**Total Contact Hours: 48**  
**Credits: 4**

**Course Outcomes (COs):**

After completion of the course students would be able to

<b>PH101.1</b>	Describe various types of mechanical resonance and its electrical equivalence
<b>PH101.2</b>	Explain basic principles of Laser, Optical fibers and Polarization of light
<b>PH101.3</b>	Apply superposition principle to explain interference and diffraction
<b>PH101.4</b>	Analyze different crystallographic structures according to their co-ordination number and packing factors
<b>PH101.5</b>	Determine and justify the need of a quantum mechanics as remedy to overcome limitations imposed by classical physics

**CO-**  
**PO**

**Mapping**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>PH101.1</b>	3	3	2	2								
<b>PH101.2</b>	3	3	2	2								
<b>PH101.3</b>	3	3	2	2								
<b>PH101.4</b>	3	3	2	2								
<b>PH101.5</b>	3	3	2	2								

**CO-PSO Mapping**

COs	PSO1	PSO2	PSO3
<b>PH101.1</b>	2	2	2
<b>PH101.2</b>	2	2	2
<b>PH101.3</b>	2	2	2
<b>PH101.4</b>	2	2	2
<b>PH101.5</b>	2	2	2

**Course Name: Professional Communication**

**Course Code: HSMC 101**

**Contact: 2:0:0**

**Total Contact Hours: 26**

**Credits: 2**

**Course Outcomes (COs):**

After completion of the course students would be able to

<b>CO1</b>	Understand about and use the modalities and nuances of communication in a workplace context.
<b>CO2</b>	Understand about communicating across cultures and societies.
<b>CO3</b>	Understand and know about and apply the basic formats, templates of business and official communication.
<b>CO4</b>	Understand and know about and employ formal communication modes in meetings and reports.
<b>CO5</b>	Understand and know about and use objective and culturally neutral language in interpersonal and business communication.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>HSMC 101.1</b>						2			3	3		3
<b>HSMC 101.2</b>						2			3	3		3
<b>HSMC 101.3</b>						2			3	3		3
<b>HSMC 101.4</b>						2			3	3		3
<b>HSMC 101.5</b>						2			3	3		3

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>HSMC 101.1</b>	2	2	2
<b>HSMC 101.2</b>	2	2	2
<b>HSMC 101.3</b>	2	2	2
<b>HSMC 101.4</b>	2	2	2
<b>HSMC 101.5</b>	2	2	2

**Course Name: Physics I Lab**

**Course Code: PH 191**

**Contact Hours: 0:0:3**

**Credit: 2**

**Course Outcomes (COs):**

After completion of the course students would be able to

<b>CO1</b>	Demonstrate experiments allied to their theoretical concepts
<b>CO2</b>	Conduct experiments using LASER, Optical fiber, Torsional pendulum, Spectrometer
<b>CO3</b>	Analyze and participate as an individual and as a member or leader in groups in laboratory sessions actively.
<b>CO4</b>	Analyze experimental data from graphical representations, and to communicate effectively them in Laboratory reports including innovative experiments.
<b>CO5</b>	Design solutions for real life challenges.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PH191.1</b>	2	3	2	3	3							
<b>PH191.2</b>	2	3	2	3	3							
<b>PH191.3</b>	2	3	2	3	3							
<b>PH191.4</b>	2	3	2	3	3							
<b>PH191.5</b>	2	3	2	3	3							

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PH191.1</b>	2	2	2
<b>PH191.2</b>	2	2	2
<b>PH191.3</b>	2	2	2
<b>PH191.4</b>	2	2	2
<b>PH191.5</b>	2	2	2

**Course Name: Workshop & Manufacturing Practices Lab**

**Course Code: ME 191**

**Contact Hours: 0:0:3**

**Total Contact Hours: 36**

**Credit: 2**

**Course Outcomes (COs):**

After completion of the course students would be able to

<b>CO1</b>	Understand Engineering Graphics and visual aspects of design.
<b>CO2</b>	Understand and apply common drafting tools with the knowledge of drafting standards.
<b>CO3</b>	Apply computer aided drafting techniques to represent line, surface or solid models in different Engineering viewpoints.
<b>CO4</b>	Create part models; carry out assembly operation and show working procedure of a designed project work using animation.
<b>CO5</b>	Apply common drafting tools with the knowledge of drafting standards and create project work using animation.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>ME191.1</b>	3	3	3	3	3	3						
<b>ME191.1</b>	3	3	3	3	3	3						
<b>ME191.1</b>	3	3	3	3	3	3						
<b>ME191.1</b>	3	3	3	3	3	3						
<b>ME191.1</b>	3	3	3	3	3	3						

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>ME191.1</b>	2	2	2
<b>ME191.1</b>	2	2	2
<b>ME191.1</b>	2	2	2
<b>ME191.1</b>	2	2	2
<b>ME191.1</b>	2	2	2

**Course Name: Theme based Project I**

**Course Code: MC291**

**Contact Hours: 0:0:1**

**Total Contact Hours:**

**Credit: 0.5**

**Course Outcomes (COs):**

After completion of the course students would be able to

<b>CO1</b>	Understand project characteristics and various stages of a project
<b>CO2</b>	Understand the conceptual clarity about project organization and feasibility analyses – Market, Technical, Financial and Economic
<b>CO3</b>	Analyze the learning and understand techniques for Project planning, scheduling and Execution Control.
<b>CO4</b>	Apply the risk management plan and analyse the role of stakeholders
<b>CO5</b>	Understand the contract management, Project Procurement, Service level Agreements and productivity

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>MC291.1</b>	<b>3</b>	<b>3</b>	<b>3</b>									
<b>MC291.2</b>	<b>3</b>	<b>3</b>	<b>3</b>									
<b>MC291.3</b>	<b>3</b>	<b>3</b>	<b>3</b>									
<b>MC291.4</b>	<b>3</b>	<b>3</b>	<b>3</b>									
<b>MC291.5</b>	<b>3</b>	<b>3</b>	<b>3</b>									

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>MC291.1</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>MC291.2</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>MC291.3</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>MC291.4</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>MC291.5</b>	<b>3</b>	<b>3</b>	<b>3</b>

**Course Name: Skill Development I: Soft Skill**

**Course Code: PR192**

**Contact Hours: 0:0:1**

**Total Contact Hours:**

**Credit: 0.5**

**Course Outcomes (COs):**

After completion of the course students would be able to

**Course Outcomes (COs):**

After completion of the course students would be able to

<b>CO1</b>	Able to understand advanced skills of Technical Communication in English through Language Laboratory.
<b>CO2</b>	Able to apply listening, speaking, reading and writing skills in societal and professional life.
<b>CO3</b>	Able to demonstrate the skills necessary to be a competent Interpersonal communicator.
<b>CO4</b>	Able to analyze communication behaviors.
<b>CO5</b>	Able to adapt to multifarious socio-economical and professional arenas with the help of effective communication and interpersonal skills.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PR192.1</b>							2		3	3		2
<b>PR192.2</b>							2		3	3		2
<b>PR192.3</b>							2		3	3		2
<b>PR192.4</b>							2		3	3		2
<b>PR192.5</b>							2		3	3		2

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PR192.1</b>	2	2	2
<b>PR192.2</b>	2	2	2
<b>PR192.3</b>	2	2	2
<b>PR192.4</b>	2	2	2
<b>PR192.5</b>	2	2	2

**Course Name: Mathematics- II**

**Course Code: M 201**

**Contact: 3:1:0**

**Total Contact Hours: 48**

**Credits: 4**

**Course Outcomes (COs):**

After completion of the course students would be able to

<b>CO1</b>	Determine and recall the properties and formula related to ordinary differential equations, improper integral, Laplace transform and numerical techniques.
<b>CO2</b>	Determine the solutions of the problems related to ordinary differential equations, improper integral, Laplace transform and numerical techniques.
<b>CO3</b>	Apply appropriate mathematical tools of ordinary differential equations, improper integral, Laplace transform and numerical techniques for the solutions of the problems.
<b>CO4</b>	Analyze engineering problems by using differential equation, Laplace Transform and Numerical Methods.
<b>CO5</b>	Apply engineering solutions by using differential equation, Laplace Transform and Numerical Methods.

**CO-PO Mapping**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>M201.1</b>	3	3	3	3								2
<b>M201.2</b>	3	3	3	3								2
<b>M201.3</b>	3	3	3	3								2
<b>M201.4</b>	3	3	3	3								2
<b>M201.5</b>	3	3	3	3								2

**CO-PSO Mapping**

COs	PSO1	PSO2	PSO3
<b>M201.1</b>	2	2	2
<b>M201.2</b>	2	2	2
<b>M201.3</b>	2	2	2
<b>M201.4</b>	2	2	2
<b>M201.5</b>	2	2	2

**Course Name: Chemistry-I**  
**Course Code: CH 201**  
**Contact: 3:0:0**  
**Total Contact Hours:**  
**Credits: 4**

**Course Outcomes (COs):**

After completion of the course students would be able to

<b>CO1</b>	Able to apply fundamental concepts of thermodynamics in different engineering applications.
<b>CO2</b>	Able to analyze & design simple and technologically advanced electrical and energy storage devices.
<b>CO3</b>	Able to synthesize nanomaterials, composites, polymers.
<b>CO4</b>	Able to apply the basic concept of Organic Chemistry and knowledge of chemical reactions to industries, and technical fields.
<b>CO5</b>	Able to apply the knowledge of different fuels and corrosion to different industries

**CO-PO Mapping**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CH201.1</b>	3	2	3	2			3					
<b>CH201.2</b>	3	2	3	2			3					
<b>CH201.3</b>	3	2	3	2			3					
<b>CH201.4</b>	3	2	3	2			3					
<b>CH201.5</b>	3	2	3	2			3					

**CO-PSO Mapping**

COs	PSO1	PSO2	PSO3
<b>CH201.1</b>	2	2	2
<b>CH201.2</b>	2	2	2
<b>CH201.3</b>	2	2	2
<b>CH201.4</b>	2	2	2
<b>CH201.5</b>	2	2	2

**Course Name: Basic Electrical Engineering(Gr-B)**

**Course Code: EE 201**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcomes (COs):**

After completion of the course students would be able to

<b>CO1</b>	Understand and analyze basic electric circuits
<b>CO2</b>	Determine and study the working principles of electrical machines.
<b>CO3</b>	Understand the components of low voltage electrical installations
<b>CO4</b>	Design the fundamentals of electrical Power systems and Control Systems
<b>CO5</b>	Analyze and study the fundamentals of electrical Power systems and Control Systems

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>EE201.1</b>	3	3	3	3								
<b>EE201.2</b>	3	3	3	3								
<b>EE201.3</b>	3	3	3	3								
<b>EE201.4</b>	3	3	3	3								
<b>EE201.5</b>	3	3	3	3								

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>EE201.1</b>	2	2	2
<b>EE201.2</b>	2	2	2
<b>EE201.3</b>	2	2	2
<b>EE201.4</b>	2	2	2
<b>EE201.5</b>	2	2	2

**Course Name: Programming for Problem Solving**

**Course Code: CS201**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcomes (COs):**

After completion of the course students would be able to

<b>CO1</b>	Understand the fundamental concept of Computer and mathematical knowledge and apply them in designing and analyzing solution to engineering problem.
<b>CO2</b>	Understand the basic concept of C programming and use of data types/operators/input/output function for developing and implementing complete program leading to solution of mathematical and engineering problem.
<b>CO3</b>	Use conditional branching, iteration, recursion and formulate algorithms and programs in solving
<b>CO4</b>	Understand the concept of arrays, pointers, file and dynamic memory allocation and apply it for problem solving and also create new data types using structure, union and enum.
<b>CO5</b>	Understand how to decompose a problem into functions and assemble into a complete program by means of modular programming possibly as a team.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CS201.1</b>	3	3	3	2	2							
<b>CS201.2</b>	3	2	2	2	2							
<b>CS201.3</b>	3	3	3	2	2							
<b>CS201.4</b>	3	3	3	2	2							
<b>CS201.5</b>	3	3	3	2	2							

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CS201.1</b>	3	3	3
<b>CS201.2</b>	3	3	3
<b>CS201.3</b>	3	3	3
<b>CS201.4</b>	3	3	3
<b>CS201.5</b>	3	3	3

**Course Name: Programming for Problem Solving Lab**

**Course Code: CS 291**

**Contact: 0:0:3**

**Credits: 1.5**

**Course Outcomes (COs):**

After completion of the course students would be able to

<b>CO1</b>	Understand and propose appropriate command or function in running system or developing program for engineering and mathematical problems depending on the platform used even in changed environment leading to their lifelong learning.
<b>CO2</b>	Identify and propose appropriate data type, arithmetic operators, input/output functions and also conditional statements in designing effective programs to solve complex engineering problem using modern tools.
<b>CO3</b>	Design and develop effective programs for engineering and mathematical problems using iterative statements as well as recursive functions using modular programming approach possibly as a team maintaining proper ethics of collaboration.
<b>CO4</b>	Explain and organize data in arrays, strings and structures and manipulate them through programs and also define pointers of different types and use them in defining self-referential structures and also to construct and use files for reading and writing to and from leading to solution of engineering and mathematical problem.
<b>CO5</b>	Prepare laboratory reports on interpretation of experimental results and analyze it for validating the same maintaining proper ethics of collaboration.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CS291.1</b>	3	3	3	3	3							
<b>CS291.2</b>	3	3	2	3	3							
<b>CS291.3</b>	3	3	3	3	3							
<b>CS291.4</b>	3	3	3	3	3							
<b>CS291.5</b>	3	3	3	3	3							

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CS291.1</b>	3	3	3
<b>CS291.2</b>	3	3	3
<b>CS291.3</b>	3	3	3
<b>CS291.4</b>	3	3	3
<b>CS291.5</b>	3	3	3

**Course Name: Chemistry-I Lab**

**Course Code: CH 291**

**Contact: 0:0:3**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcomes (COs):**

After completion of the course students would be able to

<b>CO1</b>	Understand different types of instruments for estimation of small quantities chemicals used in industries and scientific and technical fields.
<b>CO2</b>	Analyze and determine the composition of liquid and solid samples working as an individual and also as a team member.
<b>CO3</b>	Analyze different parameters of water considering environmental issues.
<b>CO4</b>	Synthesize drug and polymer materials.
<b>CO5</b>	Design innovative experiments applying the fundamentals of chemistry.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CH291.1</b>	2	3	3	3	3	2	3					
<b>CH291.2</b>	2	3	3	3	3	2	3					
<b>CH291.3</b>	2	3	3	3	3	2	3					
<b>CH291.4</b>	2	3	3	3	3	2	3					
<b>CH291.5</b>	2	3	3	3	3	2	3					

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CH291.1</b>	2	2	2
<b>CH291.2</b>	2	2	2
<b>CH291.3</b>	2	2	2
<b>CH291.4</b>	2	2	2
<b>CH291.5</b>	2	2	2

**Course Name: Basic Electrical Engineering Lab**

**Course Code: EE 291**

**Contact Hours: 0:0:3**

**Credit: 1.5**

**Course Outcomes (COs):**

After completion of the course students would be able to

<b>CO1</b>	Identify and use common electrical components
<b>CO2</b>	To develop electrical networks by physical connection of various components and analyze the circuit behaviour.
<b>CO3</b>	Apply and analyze the basic characteristics of transformers and electrical machines.
<b>CO4</b>	Illustrate the venin's, Norton's, superposition and maximum power transfer theorem.
<b>CO5</b>	Create resonance condition in R-L-C series and parallel circuit and learn how to draw phasor diagram for the circuit

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>EE291.1</b>	2	2	3	3	3							
<b>EE291.2</b>	3	2	2	3	3							
<b>EE291.3</b>	2	3	2	3	2							
<b>EE291.4</b>	2	2	2	3	2							
<b>EE291.5</b>	2	3	2	3	3							

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>EE291.1</b>	3		2
<b>EE291.2</b>	3		
<b>EE291.3</b>	3	2	3
<b>EE291.4</b>	3	2	3
<b>EE291.5</b>	3		

**Course Name: Engineering Graphics & Design Lab**  
**Course Code: ME 292**  
**Contact Hours: 0:0:1**  
**Total Contact Hours:**  
**Credit: 0.5**

**Course Outcomes (COs):**

After completion of the course students would be able to

<b>CO1</b>	Understand Engineering Graphics and visual aspects of design.
<b>CO2</b>	Understand and apply common drafting tools with the knowledge of drafting standards.
<b>CO3</b>	Apply computer aided drafting techniques to represent line, surface or solid models in different Engineering viewpoints.
<b>CO4</b>	Create part models; carry out assembly operation and show working procedure of a designed project work using animation.
<b>CO5</b>	Apply common drafting tools with the knowledge of drafting standards and create project work using animation.

**CO-PO Mapping**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>ME 292.1</b>	3	3	3	3	3	3						
<b>ME 292.1</b>	3	3	3	3	3	3						
<b>ME 292.1</b>	3	3	3	3	3	3						
<b>ME 292.1</b>	3	3	3	3	3	3						
<b>ME 292.1</b>	3	3	3	3	3	3						

**CO-PSO Mapping**

COs	PSO1	PSO2	PSO3
<b>ME 292.1</b>	2	2	2
<b>ME 292.1</b>	2	2	2
<b>ME 292.1</b>	2	2	2
<b>ME 292.1</b>	2	2	2
<b>ME 292.1</b>	2	2	2

**Course Name: Professional Communication LAB**  
**Course Code: HSMC 291**  
**Contact Hours: 0:0:2**  
**Total Contact Hours:**  
**Credit: 0.5**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Understand and make use of a wide taxonomy of listening skills & sub-skills for comprehending & interpreting data in English
<b>CO2</b>	Speak in English, using appropriate vocabulary and pronunciation in contextualized situations
<b>CO3</b>	Understand and put into effective practice the pragmatics of Group Discussion
<b>CO4</b>	Understand and write a detailed technical report as per organizational needs
<b>CO5</b>	Understand and interact in professional presentations and interviews

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>HSMC 291.1</b>	2	2	2	2			3	3	3	3		3
<b>HSMC 291.2</b>	2	2	2	2			3	3	3	3		3
<b>HSMC 291.3</b>	2	2	2	2			3	3	3	3		3
<b>HSMC 291.4</b>	2	2	2	2			3	3	3	3		3
<b>HSMC 291.5</b>	2	2	2	2			3	3	3	3		3

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>HSMC 291.1</b>	2	2	2
<b>HSMC 291.2</b>	2	2	2
<b>HSMC 291.3</b>	2	2	2
<b>HSMC 291.4</b>	2	2	2
<b>HSMC 291.5</b>	2	2	2

**Course Name: Theme based Project II**

**Course Code: PR 291**

**Contact Hours: 0:0:1**

**Total Contact Hours:**

**Credit: 0.5**

**Course Outcomes (COs):**

After completion of the course students would be able to

**Course Outcomes (COs):**

After completion of the course students would be able to

<b>CO1</b>	Understand project characteristics and various stages of a project
<b>CO2</b>	Understand the conceptual clarity about project organization and feasibility analyses – Market, Technical, Financial and Economic
<b>CO3</b>	Analyze the learning and understand techniques for Project planning, scheduling and Execution Control.
<b>CO4</b>	Apply the risk management plan and analyse the role of stakeholders
<b>CO5</b>	Understand the contract management, Project Procurement, Service level Agreements and productivity

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PR291.1</b>	<b>3</b>	<b>3</b>	<b>3</b>									
<b>PR291.2</b>	<b>3</b>	<b>3</b>	<b>3</b>									
<b>PR291.3</b>	<b>3</b>	<b>3</b>	<b>3</b>									
<b>PR291.4</b>	<b>3</b>	<b>3</b>	<b>3</b>									
<b>PR291.5</b>	<b>3</b>	<b>3</b>	<b>3</b>									

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PR291.1</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>PR291.2</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>PR291.3</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>PR291.4</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>PR291.5</b>	<b>3</b>	<b>3</b>	<b>3</b>

**Course Name: NSS/ Physical Activities/Meditation & Yoga/Photography/ Nature Club**

**Course Code: MC 281**

**Contact Hours: 0:0:1**

**Total Contact Hours:**

**Credit: 0.5**

**Course Outcomes (COs):**

After completion of the course students would be able to

<b>CO1</b>	To increase student awareness about the weaker and unprivileged sections of society
<b>CO2</b>	To expose students to environmental issues and ecological concerns
<b>CO3</b>	To make students self aware about their participatory role in sustaining society and the environment
<b>CO4</b>	Apply and produce small devices of their interest in project or research purpose.
<b>CO5</b>	Apply safety measures with simple components with their own hands.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>MC281.1</b>						3	3	3	3			
<b>MC281.2</b>						3	3	3	3			
<b>MC281.3</b>						3	3	3	3			
<b>MC281.4</b>						3	3	3	3			
<b>MC281.5</b>						3	3	3	3			

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>MC281.1</b>	2	2	2
<b>MC281.2</b>	2	2	2
<b>MC281.3</b>	2	2	2
<b>MC281.4</b>	2	2	2
<b>MC281.5</b>	2	2	2

**Course Name: Discrete Mathematics**

**Course Code: M301**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcome(s):**

After completion of the course students will be able to

<b>CO1</b>	Understand the fundamental concepts of Set Theory to Explain or Illustrate and Identify problems where students can Apply the concept appropriately to Solve them.
<b>CO2</b>	Understand the fundamental concepts of Mathematical Logic and Proof Techniques so that they can Prove theorems using Proof Techniques and Mathematical Logic Frameworks to justify a claim.
<b>CO3</b>	Explain or Illustrate the fundamental Theory of Numbers and Identify problems where students can Use the concept appropriately to Solve them.
<b>CO4</b>	Explain or Illustrate the fundamental principles of Algebraic Structures and Identify problems where students can Apply the concept appropriately to Solve them.
<b>CO5</b>	Develop ideas to Propose solutions to the problems of Graph Theory and Identify problems where students can Apply the concept appropriately and Analyze the effectiveness as well as limitations of solutions making the students aware of its utilitarian importance for further explorations leading towards lifelong learning.

**CO-PO Mapping**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>M301.1</b>	3	3	2									
<b>M301.2</b>	3	3	2	2								
<b>M301.3</b>	3	3	2									
<b>M301.4</b>	3	3	2									
<b>M301.5</b>	3	3	2	3								

**CO-PSO Mapping**

COs	PSO1	PSO2	PSO3
<b>M301.1</b>	2	2	2
<b>M301.2</b>	2	2	2
<b>M301.3</b>	2	2	2
<b>M301.4</b>	2	2	2
<b>M301.5</b>	2	2	2

**Course Name: Data Structures**

**Course Code: PCC-CS 302**

**Contact: 3:0:0**

**Total Contact Hours: 33**

**Credits: 36**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Understand the concept of data structure and create new data structure to propose efficient solution by writing appropriate algorithm and program for engineering and mathematical problem after analyzing the efficiency of the same.
<b>CO2</b>	Identify and differentiate different types of data structures and implement the appropriate data structure after analyzing complex engineering problem leading to their lifelong
<b>CO3</b>	Understand and implement stack, queue and dequeue by selecting appropriate methods and use it for solving real life and engineering problem choosing appropriate modern
<b>CO4</b>	Understand and implement different non-linear data structures by selecting appropriate methods and apply it for solving complex engineering problem and also argue and judge maintaining the professional ethics to validate the same.
<b>CO5</b>	Understand different factors of sorting and searching algorithm and select the appropriate algorithm for solving complex engineering problem and also implement and analyze the algorithm.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PCC-CS302.1</b>	3	3	3	3	2							
<b>PCC-CS302.2</b>	3	3	3	3								3
<b>PCC-CS302.3</b>	3	3	3	3								
<b>PCC-CS302.4</b>	3	3	3	3	2			2				
<b>PCC-CS302.5</b>	3	3	3	3	2							

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PCC-CS302.1</b>	3	3	3
<b>PCC-CS302.2</b>	3	3	3
<b>PCC-CS302.3</b>	3	3	2
<b>PCC-CS302.4</b>	3	3	3
<b>PCC-CS302.5</b>	3	2	3

**Course Name: IT Workshop (SciLab/MATLAB/C++)**

**Course Code: PCC- CS 301**

**Contact Hours/Week: 3**

**Credit: 3:0:0**

**Total Contact Hours: 36L**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Demonstrate a thorough understanding of modular programming by designing programs that require the use of programmer-defined functions.
<b>CO2</b>	Demonstrate a thorough understanding of arrays by designing and implementing programs that search and sort arrays.
<b>CO3</b>	Demonstrate a thorough understanding of the object-oriented programming concepts of encapsulation, data abstraction and composition by designing and implementing classes including the use of overloaded functions and constructors.
<b>CO4</b>	Demonstrate a thorough understanding of the concept of pointers and dynamic memory allocation, the implementation of programmer-defined functions and classes by writing code, performing unit testing and debugging of multiple complex programs.
<b>CO5</b>	Demonstrate an understanding of the differences between C and C++ in the areas of strings, pass by reference/passing pointers, and structs by designing and implementing programs that use C strings, C++

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PCC-CS301.1</b>	3	3	3	2	2				3			
<b>PCC-CS301.2</b>	3	2	2	2	2				3			
<b>PCC-CS301.3</b>	3	3	3	2	2				3			
<b>PCC-CS301.4</b>	3	3	3	2	2				3			
<b>PCC-CS301.5</b>	3	3	3	2	2				3			

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PCC-CS301.1</b>	3	3	3
<b>PCC-CS301.2</b>	3	3	3
<b>PCC-CS301.3</b>	3	3	3
<b>PCC-CS301.4</b>	3	3	3
<b>PCC-CS301.5</b>	3	3	3

**Course Name: Universal Human Values 2: Understanding Harmony**

**Course Code: HSMC 303**

**Contact Hours/Week: 3**

**Credit: 3:0:0**

**Total Contact Hours: 36L**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field
<b>CO2</b>	Identify the multiple ethical interests at stake in a real-world situation or practice
<b>CO3</b>	Articulate what makes a particular course of action ethically defensible
<b>CO4</b>	Assess their own ethical values and the social context of problems
<b>CO5</b>	Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic settings, including focused and interdisciplinary research

**CO-PO Mapping**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>HSMC 303.1</b>		2				2	3	3				3
<b>HSMC 303.2</b>		2				2	3	3				3
<b>HSMC 303.3</b>		2				2	3	3				3
<b>HSMC 303.4</b>		2				2	3	3				3
<b>HSMC 303.5</b>		2				2	3	3				3

**CO-PSO Mapping**

COs	PSO1	PSO2	PSO3
<b>HSMC 303.1</b>	2	2	2
<b>HSMC 303.2</b>	2	2	2
<b>HSMC 303.3</b>	2	2	2
<b>HSMC 303.4</b>	2	2	2
<b>HSMC 303.5</b>	2	2	2

**Course Name: Data Structures Lab**

**Course Code: PCC- CS392**

**Contact Hours/Week: 3P**

**Credit: 2**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Identify and propose appropriate data structures and data types to implement list using array and linked list and design effective programs to solve complex engineering problem using list and modern tools.
<b>CO2</b>	Design and develop effective programs for engineering and mathematical problems using stack, queue and recursive functions after implementing stack and queue using modular programming approach possibly as a team maintaining proper ethics of
<b>CO3</b>	Implement different data structures like binary tree, heap and use them to explain and organize data and manipulate them through programs leading to solution of complex engineering problem.
<b>CO4</b>	Implement different sorting and searching algorithm selecting appropriate data structures and analyze the efficiency of the resulting program using modern engineering tools and methods leading to lifelong learning.
<b>CO5</b>	Prepare laboratory reports on interpretation of experimental results and analyze it for validating the same maintaining proper ethics of collaboration.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PCC-CS391.1</b>	3	3	3	2	3							2
<b>PCC-CS391.2</b>	3	3	3	2	3							2
<b>PCC-CS391.3</b>	3	3	3	2	3							2
<b>PCC-CS391.4</b>	3	3	3	2	3							2
<b>PCC-CS391.5</b>	3	3	3	2	3							2

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PCC-CS391.1</b>	3	3	3
<b>PCC-CS391.2</b>	3	3	3
<b>PCC-CS391.3</b>	3	3	3
<b>PCC-CS391.4</b>	3	3	3
<b>PCC-CS391.5</b>	3	3	3

**Course Name: Numerical Methods Lab**

**Course Code: M (CS)391**

**Contact Hours/Week: 3P**

**Credit: 2**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Describe and explain the theoretical workings of numerical techniques with the help of C
<b>CO2</b>	Compute basic command and scripts in a mathematical programming language
<b>CO3</b>	Apply the programming skills to solve the problems using multiple numerical approaches.
<b>CO4</b>	Analyze if the results are reasonable, and then interpret and clearly communicate the
<b>CO5</b>	Apply the distinctive principles of numerical analysis and the associated error measures.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CS392.1</b>	3	3	2	2	3	2			3			
<b>CS392.2</b>	3	3	2	2	3	2			3			
<b>CS392.3</b>	3	3	2	2	3	2			3			
<b>CS392.4</b>	3	3	2	2	3	2			3			
<b>CS392.5</b>	3	3	2	2	3	2			3			

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CS392.1</b>	2	2	2
<b>CS392.2</b>	2	2	2
<b>CS392.3</b>	2	2	2
<b>CS392.4</b>	2	2	2
<b>CS392.5</b>	2	2	2

**Course Name: Digital and Analog Electronics Lab**

**Course Code: ESC391**

**Contact Hours/Week: 3P**

**Credit: 1.5**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Knowledge of Electronic components such as Resistors, Capacitors, Diodes, Transistors measuring equipment like DC power supply, Multimeter, CRO, Signal generator, DC power supply.
<b>CO2</b>	Analyze the characteristics of Junction Diode, Zener Diode, BJT & FET and different types of Rectifier Circuits.
<b>CO3</b>	Determination of input-offset voltage, input bias current and Slew rate, Common-mode Rejection ratio, Bandwidth and Off-set null of OPAMPs.
<b>CO4</b>	Able to know the application of Diode, BJT & OPAMP.
<b>CO5</b>	Familiarization and basic knowledge of Integrated Circuits

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>ESC391.1</b>	3	3	3	3	3							
<b>ESC391.2</b>	3	3	3	3	3							
<b>ESC391.3</b>	3	3	3	3	3							
<b>ESC391.4</b>	3	3	3	3	3							
<b>ESC391.5</b>	3	3	3	3	3							

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>ESC391.1</b>	2	2	2
<b>ESC391.2</b>	2	2	2
<b>ESC391.3</b>	2		2
<b>ESC391.4</b>	2	2	2
<b>ESC391.5</b>	2	2	2

**Course Name: ITWorkshop Lab (SciLab/MATLAB/C++)**

**Course Code: PCC-CS391**

**Contact Hours/Week: 3P**

**Credit: 1.5**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Demonstrate a thorough understanding of modular programming by designing programs that require the use of programmer-defined functions.
<b>CO2</b>	Demonstrate a thorough understanding of arrays by designing and implementing programs that search and sort arrays.
<b>CO3</b>	Demonstrate a thorough understanding of the object-oriented programming concepts of encapsulation, data abstraction and composition by designing and implementing classes including the use of overloaded functions and constructors.
<b>CO4</b>	Demonstrate a thorough understanding of the concept of pointers and dynamic memory allocation, the implementation of programmer-defined functions and classes by writing code, performing unit testing and debugging of multiple complex programs.
<b>CO5</b>	Demonstrate an understanding of the differences between C and C++ in the areas of strings, pass by reference/passing pointers, and structs by designing and implementing programs that use C strings, C++

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PCC-CS391.1</b>	3	3	3	2	2				3			
<b>PCC-CS391.2</b>	3	2	2	2	2				3			
<b>PCC-CS391.3</b>	3	3	3	2	2				3			
<b>PCC-CS391.4</b>	3	3	3	2	2				3			
<b>PCC-CS391.5</b>	3	3	3	2	2				3			

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PCC-CS391.1</b>	3	3	3
<b>PCC-CS391.2</b>	3	3	3
<b>PCC-CS391.3</b>	3	3	3
<b>PCC-CS391.4</b>	3	3	3
<b>PCC-CS391.5</b>	3	3	3

**Course Name: Theme based Project III**

**Course Code: PR391**

**Contact Hours/Week: 3P**

**Credit: 1.5**

**Course Outcomes (COs):**

After completion of the course students would be able to

**Course Outcomes (COs):**

After completion of the course students would be able to

<b>CO1</b>	Understand project characteristics and various stages of a project
<b>CO2</b>	Understand the conceptual clarity about project organization and feasibility analyses – Market, Technical, Financial and Economic
<b>CO3</b>	Analyze the learning and understand techniques for Project planning, scheduling and Execution Control.
<b>CO4</b>	Apply the risk management plan and analyse the role of stakeholders
<b>CO5</b>	Understand the contract management, Project Procurement, Service level Agreements and productivity

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PR391.1</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>PR391.2</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>PR391.3</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>PR391.4</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>PR391.5</b>	3	3	3	3	3	3	3	3	3	3	3	3

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PR391.1</b>	3	3	3
<b>PR391.2</b>	3	3	3
<b>PR391.3</b>	3	3	3
<b>PR391.4</b>	3	3	3
<b>PR391.5</b>	3	3	3

**Course Name: Skill Development III: Technical Seminar Presentation**

**Course Code: CS392**

**Contact Hours/Week: 3P**

**Credit: 1.5**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Able to understand advanced skills of Technical Communication in English through Language Laboratory.
<b>CO2</b>	Able to apply listening, speaking, reading and writing skills in societal and professional life.
<b>CO3</b>	Able to demonstrate the skills necessary to be a competent Interpersonal communicator.
<b>CO4</b>	Able to analyze communication behaviors.
<b>CO5</b>	Able to adapt to multifarious socio-economical and professional arenas with the help of effective communication and interpersonal skills.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CS392.1</b>							2		3	3		2
<b>CS392.2</b>							2		3	3		2
<b>CS392.3</b>							2		3	3		2
<b>CS392.4</b>							2		3	3		2
<b>CS392.5</b>							2		3	3		2

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CS392.1</b>	2	2	2
<b>CS392.2</b>	2	2	2
<b>CS392.3</b>	2	2	2
<b>CS392.4</b>	2	2	2
<b>CS392.5</b>	2	2	2

**Course Name: Environmental Science**

**Course Code: MC301**

**Contact Hours/Week: 3P**

**Credit: 1.5**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Understand the natural environment and its relationships with human activities.
<b>CO2</b>	Apply the fundamental knowledge of science and engineering to assess environmental and health risk.
<b>CO3</b>	Understand guidelines and procedures for health and safety issues obeying the environmental laws and regulations.
<b>CO4</b>	Develop guidelines and procedures for health and safety issues obeying the environmental laws and regulations. Acquire skills for scientific problem-solving related to air, water, noise & land pollution.
<b>CO5</b>	Develop skills for scientific problem-solving related to air, water, noise & land pollution.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>MC301.1</b>			2			3	3					
<b>MC301.2</b>			2			3	3					
<b>MC301.3</b>			2			3	3					
<b>MC301.4</b>			2			3	3					
<b>MC301.5</b>			2			3	3					

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
MC301.1	2	2	2
MC301.2	2	2	2
MC301.3	2	2	2
MC301.4	2	2	2
MC301.5	2	2	2

**Course Name: Numerical Methods**

**Course Code: M(CSE) 401**

**Contact Hours/Week: 3P**

**Credit: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Recall the distinctive characteristics of various numerical techniques and the associated error measures and Statistics.
<b>CO2</b>	Understand the theoretical workings of various numerical techniques and Statistics
<b>CO3</b>	Understand and put into effective practice the pragmatics of Group Discussion
<b>CO4</b>	Understand and write a detailed technical report as per organizational needs
<b>CO5</b>	Understand and interact in professional presentations and interviews

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>M(CSE)401.1</b>	3	3	2	2								
<b>M(CSE)401.2</b>	3	3	2	2								
<b>M(CSE)401.3</b>	3	3	2	2								
<b>M(CSE)401.4</b>	3	3	2	2								
<b>M(CSE)401.5</b>	3	3	2	2								

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>M(CSE)401.1</b>	2	2	2
<b>M(CSE)401.2</b>	2	2	2
<b>M(CSE)401.3</b>	2	2	2
<b>M(CSE)401.4</b>	2	2	2
<b>M(CSE)401.5</b>	2	2	2

**Course Name: Economics for Engineers**

**Course Code: HSMC604**

**Contact Hours/Week: 3P**

**Credit: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Apply the appropriate engineering economics analysis method(s) for problem solving present worth, annual cost, rate-of-return, payback, break-even, benefit-cost ratio.
<b>CO2</b>	Evaluate the cost effectiveness of individual engineering projects using the methods learned and draw inferences for the investment decisions.
<b>CO3</b>	Compare the life cycle cost of multiple projects using the methods learned, and make a quantitative decision between alternate facilities and/or systems.
<b>CO4</b>	Evaluate the profit of a firm, carry out the break even analysis and employ this tool to make production decision.
<b>CO5</b>	Discuss and solve advanced economic engineering analysis problems including taxation and inflation.

### CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>HSMC604.1</b>							2	3			3	3
<b>HSMC604.2</b>							2	3			3	3
<b>HSMC604.3</b>							2	3			3	3
<b>HSMC604.4</b>							2	3			3	3
<b>HSMC604.5</b>							2	3			3	3

### CO-PSO Mapping

COs	PSO1	PSO2	PSO3
<b>HSMC604.1</b>	2	2	2
<b>HSMC604.2</b>	2	2	2
<b>HSMC604.3</b>	2	2	2
<b>HSMC604.4</b>	2	2	2
<b>HSMC604.5</b>	2	2	2

**Course Name: Computer Organization and Architecture**

**Course Code:PCC- CS 401**

**Contact Hours/Week: 3**

**Credit: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Illustrate the basic concept of computer architecture and its performance measurement, parallel processing, Flynn's classification and Amdahl's law and apply this knowledge in designing solution for real life engineering problem.
<b>CO2</b>	Summarize the basic concept of pipeline, instruction pipeline, arithmetic pipeline hazards detection and prevention and use this knowledge for designing and implementing mathematical and engineering problem leading to lifelong learning.
<b>CO3</b>	Identify the concept of Instruction-Level Parallelism to solve engineering problem.
<b>CO4</b>	Illustrate and Compare concept of Multiprocessor architecture and parallel architecture and apply this knowledge for developing an approach by means of existing and new methods as a team work.
<b>CO5</b>	Understand the concept of message passing architecture and interconnection network and design an optimized model for building a new solution as a professional engineering practice as a team.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PCC- CS 401.1</b>	3	3	3	2								
<b>PCC- CS 401.2</b>	3	3	3	3					2	2	2	3
<b>PCC- CS 401.3</b>	2	2	2	3								
<b>PCC- CS 401.4</b>	3	3	3	3								
<b>PCC- CS 401.5</b>	3	3	3	3								

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PCC- CS 401.1</b>	3	3	3
<b>PCC- CS 401.2</b>	3	3	3
<b>PCC- CS 401.3</b>	3	3	3
<b>PCC- CS 401.4</b>	3	3	3
<b>PCC- CS 401.5</b>	3	3	3

**Course Name: Design and Analysis of Algorithms**

**Course Code: PCC-CS 402**

**Contact Hours/Week: 3**

**Credit: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	To understand and illustrate the concepts of time and space complexity, worst case, average case and best-case complexities and the asymptotic notation.
<b>CO2</b>	To analyze and apply the design principles and concepts to various basic algorithm design viz. dynamic programming, greedy method etc.
<b>CO3</b>	To understand and analyze various string matching and graph algorithms.
<b>CO4</b>	To understand, illustrate and analyze the different complexity classes
<b>CO5</b>	To discuss, implement and analyze, verify the efficiency of the randomized and approximation algorithms.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PCC- CS 402.1</b>	2	2	2	2								2
<b>PCC- CS 402.2</b>	3	3	3	3								2
<b>PCC- CS 402.3</b>	3	3	3	3								2
<b>PCC- CS 402.4</b>	3	3	3	3								2
<b>PCC- CS 402.5</b>	3	3	3	3								2

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PCC- CS 402.1</b>	3	3	3
<b>PCC- CS 402.2</b>	3	3	3
<b>PCC- CS 402.3</b>	3	3	3
<b>PCC- CS 402.4</b>	3	3	3
<b>PCC- CS 402.5</b>	3	3	3

**Course Name: Formal Language and Automata Theory**

**Course Code: PCC-CS 404**

**Contact Hours/Week: 3**

**Credit: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Understand the fundamental concepts of Finite State Automata to Explain or Illustrate and Identify problems where students can Apply the concept appropriately to Solve them.
<b>CO2</b>	Understand the fundamental concepts of Regular Expressions and its relation with DFA so that they can Develop regular expression for a specified language and Validate it.
<b>CO3</b>	Understand the fundamental concepts of Context Free Grammar so that they can Design grammar for a specified language and Validate it.
<b>CO4</b>	Explain or Illustrate the fundamental operating principles of Push Down Automata and Use it appropriately to Solve problems.
<b>CO5</b>	Understand the operating principles of Turing Machine and Design Turing Machines to Propose solutions to the related problems appropriately and validate the effectiveness as well as limitations of computations making the students aware of its utilitarian importance for further explorations leading towards lifelong learning.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PCC- CS 404.1</b>	3	3	3	3								3
<b>PCC- CS 404.2</b>	2	2	2	2								3
<b>PCC- CS 404.3</b>	3	3	3	3								3
<b>PCC- CS 404.4</b>	3	3	3	3								3
<b>PCC- CS 404.5</b>	3	3	3	3					2	2		3

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PCC- CS 404.1</b>	3	3	3
<b>PCC- CS 404.2</b>	3	3	3
<b>PCC- CS 404.3</b>	3	3	3
<b>PCC- CS 404.4</b>	3	3	3
<b>PCC- CS 404.5</b>	3	3	3

**Course Name: Operating System**  
**Course Code: PCC-CS403**  
**Contact Hours/Week: 3**  
**Credit: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Understand the fundamental concepts of Operating System, Protection & Security and differentiate different types of Operating System.
<b>CO2</b>	Understand and implement process & thread; understand, apply, compare different process synchronization algorithm and inter process communication to solve engineering problems.
<b>CO3</b>	Understand/explain/analyze different synchronization techniques, critical section problems and deadlock and apply them to solve engineering problems.
<b>CO4</b>	Understand/explain different memory management techniques including virtual memory management; also able to apply, compare, and implement different page replacement algorithms to solve engineering problems.
<b>CO5</b>	Understand/explain different I/O mechanisms, File structures and disk management techniques and solving engineering problem applying different disk scheduling algorithm.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PCC-CS403.1</b>	3	3	3	3								3
<b>PCC-CS403.2</b>	3	3	3	3								3
<b>PCC-CS403.3</b>	3	3	3	3								3
<b>PCC-CS403.4</b>	3	3	3	3								3
<b>PCC-CS403.5</b>	3	3	3	3								3

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PCC-CS403.1</b>	3	3	3
<b>PCC-CS403.2</b>	3	3	3
<b>PCC-CS403.3</b>	3	3	3
<b>PCC-CS403.4</b>	3	3	3
<b>PCC-CS403.5</b>	3	3	3

**Course Name:** Computer Organization and Architecture Lab

**Course Code:** PCC-PCC-CS491

**Contact Hours/Week:** 3

**Credit:** 2

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Illustrate and use proper syntax in appropriate platform for developing program to solve problems related to Mathematics and Engineering field leading to lifelong learning.
<b>CO2</b>	Apply the knowledge of algorithms in the computational area to efficient programming codes to design the problem using modern tools for solving complex engineering problems.
<b>CO3</b>	Outline different types of digital electronic circuits such as adder, subtract or, encoder, decoder, multiplexer, de-multiplexer, flip-flops, register, counter using various mapping and modern tools to prepare the most simplified circuit and optimize using various mapping and mathematical methods for solving the problem as a professional engineering practice as a team.
<b>CO4</b>	Apply the knowledge of digital electronic circuits to design memory and ALU and analyse the same to solve engineering-related computational problems as a team.
<b>CO5</b>	Interpret the result of the experiments, prepare laboratory reports based on observed output and analyse it to validate professional ethics and responsibilities and norms of the engineering practice.

**CO-PO Mapping**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>PCC-CS491.1</b>	3	3	3	2	3				3			
<b>PCC-CS491.2</b>	3	3	3	3	3				3			
<b>PCC-CS491.3</b>	3	3	3	3	3				3			
<b>PCC-CS491.4</b>	3	3	3	3	3				3			
<b>PCC-CS491.5</b>	3	3	3	3	3				3			

**CO-PSO Mapping**

COs	PSO1	PSO2	PSO3
<b>PCC-CS491.1</b>	3	3	3
<b>PCC-CS491.2</b>	3	3	3
<b>PCC-CS491.3</b>	3	3	3
<b>PCC-CS491.4</b>	3	3	3
<b>PCC-CS491.5</b>	3	3	3

**Course Name: Design and Analysis of Algorithms Lab**

**Course Code: PCC-CS492**

**Contact Hours/Week: 3**

**Credit: 2**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	To identify and prove the correctness and analyze the running time of the basic algorithms for those classic problems in various domains.
<b>CO2</b>	To understand and illustrate methods for analyzing the efficiency and correctness of algorithms (such as exchange arguments, recurrence, induction, and average case analysis)
<b>CO3</b>	To analyze and design algorithms using the dynamic programming, greedy method, Backtracking, Branch and Bound strategy, and recite algorithms that employ this strategy.
<b>CO4</b>	To understand, compare, contrast, and choose appropriate implementation of the algorithmic design techniques to present an algorithm that solves a given problem.
<b>CO5</b>	To Identify and analyze criteria and specifications appropriate to new problems.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PCC-CS492.1</b>	3	3	2	2	3				3			3
<b>PCC-CS492.2</b>	3	3	3	2	3				3			3
<b>PCC-CS492.3</b>	3	3	2	3	3				3			3
<b>PCC-CS492.4</b>	3	3	2	2	3				3			3
<b>PCC-CS492.5</b>	3	3	3	2	3				3			3

**CO-PSO Mapping**

<b><u>COs</u></b>	<b><u>PSO1</u></b>	<b><u>PSO2</u></b>	<b><u>PSO3</u></b>
<b>PCC-CS492.1</b>	3	3	3
<b>PCC-CS492.2</b>	3	3	3
<b>PCC-CS492.3</b>	3	3	3
<b>PCC-CS492.4</b>	3	3	3
<b>PCC-CS492.5</b>	3	3	3

**Course Name: Operating System Lab**  
**Course Code: PCC-CS493**  
**Contact Hours/Week:3**  
**Credit: 2**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Analyze and simulate CPU Scheduling Algorithms like FCFS, Round Robin, SJF, and Priority.
<b>CO2</b>	Understand the concepts of deadlock in operating systems.
<b>CO3</b>	Implement them in Multiprogramming system.
<b>CO4</b>	Create process creation and implement inter process communication
<b>CO5</b>	Analyze the performance of the various page replacement schemes

**CO-PO Mapping**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>PCC-CS493.1</b>	3	3	3	3	3				3			
<b>PCC-CS493.2</b>	3	3	3	3	3				3			
<b>PCC-CS493.3</b>	3	3	3	3	3				3			
<b>PCC-CS493.4</b>	3	3	3	3	3				3			
<b>PCC-CS493.5</b>	3	3	3	3	3				3			

**CO-PSO Mapping**

COs	PSO1	PSO2	PSO3
<b>PCC-CS493.1</b>	3	3	3
<b>PCC-CS493.2</b>	3	3	3
<b>PCC-CS493.3</b>	3	3	3
<b>PCC-CS493.4</b>	3	3	3
<b>PCC-CS493.5</b>	3	3	3

**Course Name: Theme based Project IV**

**Course Code: PR491**

**Contact Hours/Week: 3P**

**Credit: 1.5**

**Course Outcomes (COs):**

After completion of the course students would be able to

<b>CO1</b>	Understand project characteristics and various stages of a project
<b>CO2</b>	Understand the conceptual clarity about project organization and feasibility analyses – Market, Technical, Financial and Economic
<b>CO3</b>	Analyze the learning and understand techniques for Project planning, scheduling and Execution Control.
<b>CO4</b>	Apply the risk management plan and analyse the role of stakeholders
<b>CO5</b>	Understand the contract management, Project Procurement, Service level Agreements and productivity

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PR491.1</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>PR491.2</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>PR491.3</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>PR491.4</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>PR491.5</b>	3	3	3	3	3	3	3	3	3	3	3	3

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PR491.1</b>	3	3	3
<b>PR491.2</b>	3	3	3
<b>PR491.3</b>	3	3	3
<b>PR491.4</b>	3	3	3
<b>PR491.5</b>	3	3	3

**Course Name: Computer Graphics**

**Course Code: CS 501**

**Contact Hours/Week: 3**

**Credit: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Understand the fundamental concept of Computer graphics and mathematical knowledge and explain the foundations of computer graphics and different display technology and devices.
<b>CO2</b>	Demonstrate different scan conversion algorithms, drawing algorithms, polygon filling algorithms, curves and surface drawing algorithms, clipping algorithms, surface removal algorithms using graphics tools.
<b>CO3</b>	Understand the basic concept of graphics programming and implement clipping with the comprehension of windows, view-ports in relation to images display on screen.
<b>CO4</b>	Analyze and compare different drawing algorithms, polygon filling algorithms, curves and surface drawing algorithms hidden surface illumination methods
<b>CO5</b>	Develop the concept of geometric models, mathematical and algorithmic approach necessary for programming computer graphics leading to lifelong learning.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CS501.1</b>	3	3	3	3	3							3
<b>CS501.2</b>	3	3	3	3	3							3
<b>CS501.3</b>	3	3	3	3	3							3
<b>CS501.4</b>	3	3	3	3	3							3
<b>CS501.5</b>	3	3	3	3	3							3

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CS501.1</b>	3	3	3
<b>CS501.2</b>	3	3	3
<b>CS501.3</b>	3	3	3
<b>CS501.4</b>	3	3	3
<b>CS501.5</b>	3	3	3

**Course Name: Principles of Management**

**Course Code: HSMC 505**

**Contact Hours/Week: 3L**

**Credit: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Understand the basic concepts and technologies used in the field of management information systems
<b>CO2</b>	Have the knowledge of the different types of management information systems
<b>CO3</b>	Understand the processes of developing and implementing information systems.
<b>CO4</b>	Be aware of the ethical, social, and security issues of information systems.
<b>CO5</b>	An ability to effectively integrate IT-based solutions into the user environment

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>HSMC 505.1</b>	3	2	2	2							3	
<b>HSMC 505.2</b>	3	2	2	2							3	
<b>HSMC 505.3</b>	3	3	2	2							3	
<b>HSMC 505.4</b>	3	2	2	2							3	
<b>HSMC 505.5</b>	3	2	2	2							3	

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>HSMC 505.1</b>	2	2	2
<b>HSMC 505.2</b>	2	2	2
<b>HSMC 505.3</b>	2	2	2
<b>HSMC 505.4</b>	2	2	2
<b>HSMC 505.5</b>	2	2	2

**Course Name: Compiler Design**  
**Course Code: PCC-CS501**  
**Contact Hours/Week: 3**  
**Credit: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Illustrate the basic concept of compilers and discuss on the components as well as the strengths and weaknesses of various phases of designing a compiler.
<b>CO2</b>	Design and analyze algorithms for syntactic or parsing techniques and semantic analysis of the process of designing compilers.
<b>CO3</b>	Develop the parsers and experiment the knowledge of activation tree, activation record and dynamic storage allocation techniques
<b>CO4</b>	Construct the intermediate code representations and generation.
<b>CO5</b>	Apply for various optimization techniques for dataflow analysis.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PCC-CS501.1</b>	3	3	2	3								3
<b>PCC-CS501.2</b>	3	3	3	3								3
<b>PCC-CS501.3</b>	3	2	2	3								3
<b>PCC-CS501.4</b>	2	2	3	3								3
<b>PCC-CS501.5</b>	3	2	3	3								3

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PCC-CS501.1</b>	3	3	3
<b>PCC-CS501.2</b>	3	3	3
<b>PCC-CS501.3</b>	3	3	3
<b>PCC-CS501.4</b>	3	3	3
<b>PCC-CS501.5</b>	3	3	3

**Course Name: Database Management System**

**Course Code: PCC-CS502**

**Contact Hours/Week:3**

**Credit: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	To Understand and Describe the basic concepts and utility of Database management system, different data models of Database management system.
<b>CO2</b>	To Design an Entity Relationship (E-R) Diagram and relational model for any kind of real-life application and able to Apply relational algebra operations, SQL, Neo4j for solving
<b>CO3</b>	To Analyze and Create the relational database for any real-life applications based on normalization.
<b>CO4</b>	To Apply the query optimization techniques, different file organization techniques and Determine whether the transaction satisfies the ACID properties.
<b>CO5</b>	To Implement and organize the database of an organization as a team.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PCC-CS502.1</b>	3	3	2	2								3
<b>PCC-CS502.2</b>	3	3	2	2								3
<b>PCC-CS502.3</b>	3	3	2	2								3
<b>PCC-CS502.4</b>	3	3	2	2								3
<b>PCC-CS502.5</b>	3	3	2	2								3

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PCC-CS502.1</b>	3	3	3
<b>PCC-CS502.2</b>	3	3	3
<b>PCC-CS502.3</b>	3	3	3
<b>PCC-CS502.4</b>	3	3	3
<b>PCC-CS502.5</b>	3	3	3

**Course Name: Object Oriented Programming using Java**

**Course Code: PCC-CS503**

**Contact Hours/Week: 3**

**Credit: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Design the process of interaction between Objects, classes & methods w.r.t. Object Oriented Programming.
<b>CO2</b>	Acquire a basic knowledge of Object Orientation with different properties as well as different features of Java.
<b>CO3</b>	Analyze various activities of different string handling functions with various I/O
<b>CO4</b>	Discuss basic code reusability feature w.r.t. Inheritance, Package and Interface.
<b>CO5</b>	Implement Exception handling, Multithreading and Applet (Web program in java) programming concept in Java.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PCC-CS503 .1</b>	3	3	2	3	2							
<b>PCC-CS503 .2</b>	3	3	3	3	2							
<b>PCC-CS503 3</b>	3	3	3	3	2							
<b>PCC-CS503 .4</b>	3	3	3	3	2							
<b>PCC-CS503 .5</b>	3	3	3	3	2							

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PCC-CS503 .1</b>	3	3	3
<b>PCC-CS503 .2</b>	3	3	3
<b>PCC-CS503 3</b>	3	3	3
<b>PCC-CS503 .4</b>	3	3	3
<b>PCC-CS503 .5</b>	3	3	3

**Course Name: Advanced Algorithms**

**Course Code: PEC-CS-T-501**

**Contact Hours/Week: 3**

**Credit: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	To understand and illustrate the concepts of time and space complexity, worst case, average case and best-case complexities and the asymptotic notation.
<b>CO2</b>	To analyze and apply the design principles and concepts to various basic algorithm design viz. dynamic programming, greedy method etc.
<b>CO3</b>	To understand and analyze various string matching and graph algorithms.
<b>CO4</b>	To understand, illustrate and analyze the different complexity classes
<b>CO5</b>	To discuss, implement and analyze, verify the efficiency of the randomized and approximation algorithms.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PEC-CS-T-501.1</b>	2	2	2	2								2
<b>PEC-CS-T-501.2</b>	3	3	3	3								2
<b>PEC-CS-T-501.3</b>	3	3	3	3								2
<b>PEC-CS-T-501.4</b>	3	3	3	3								2
<b>PEC-CS-T-501.5</b>	3	3	3	3								2

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PEC-CS-T-501.1</b>	3	3	3
<b>PEC-CS-T-501.2</b>	3	3	3
<b>PEC-CS-T-501.3</b>	3	3	3
<b>PEC-CS-T-501.4</b>	3	3	3
<b>PEC-CS-T-501.5</b>	3	3	3

**Course Name: Advanced Computer Architecture**  
**Course Code: PEC-CS-S-501**  
**Contact Hours/Week: 3**  
**Credit: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Illustrate the basic concept of computer architecture and its performance measurement, parallel processing, Flynn’s classification and Amdahl’s law and apply this knowledge in designing solution for real life engineering problem.
<b>CO2</b>	Summarize the basic concept of pipeline, instruction pipeline, arithmetic pipeline hazards detection and prevention and use this knowledge for designing and implementing mathematical and engineering problem leading to lifelong learning.
<b>CO3</b>	Identify the concept of Instruction-Level Parallelism to solve engineering problem.
<b>CO4</b>	Illustrate and Compare concept of Multiprocessor architecture and parallel architecture and apply this knowledge for developing an approach by means of existing and new methods as a team work.
<b>CO5</b>	Understand the concept of message passing architecture and interconnection network and design an optimized model for building a new solution as a professional engineering practice as a team.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PEC-CS-S-501.1</b>	3	3	3	2								
<b>PEC-CS-S-501.2</b>	3	3	3	3					2	2	2	3
<b>PEC-CS-S-501.3</b>	2	2	2	3								
<b>PEC-CS-S-501.2</b>	3	3	3	3								
<b>PEC-CS-S-501.4</b>	3	3	3	3								

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PEC-CS-S-501.1</b>	3	3	3
<b>PEC-CS-S-501.2</b>	3	3	3
<b>PEC-CS-S-501.3</b>	3	3	3
<b>PEC-CS-S-501.4</b>	3	3	3
<b>PEC-CS-S-501.5</b>	3	3	3

**Course Name: Artificial Intelligence**  
**Course Code: PEC-CS-A-501**  
**Contact Hours/Week: 3**  
**Credit: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Understand and explain the fundamental concepts of Knowledge Representation and Inferencing in Artificial Intelligence and its utilitarian importance in current technological context for further exploration leading towards lifelong learning.
<b>CO2</b>	Identify and formulate an engineering problem primarily to fit a State-Space Exploration Framework or an Inferencing Model/Agent Design Framework within the scope of Artificial Intelligence paradigm.
<b>CO3</b>	Explore relevant literature and apply the concept of Heuristic Techniques of Artificial Intelligence to solve problems.
<b>CO4</b>	Develop Inferencing Models for proposing solutions to the problems of Artificial Intelligence.
<b>CO5</b>	Implement Inferencing Models of Artificial Intelligence through developing feasible algorithms and investigate their effectiveness by analyzing their performances in solving the relevant problems.

**CO-PO Mapping**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>PEC-CS-A-501.1</b>	3	3	2	2			2					3
<b>PEC-CS-A-501.2</b>	3	3	3	3			2					3
<b>PEC-CS-A-501.3</b>	3	3	3	3			2					3
<b>PEC-CS-A-501.2</b>	3	3	3	3			2					3
<b>PEC-CS-A-501.4</b>	3	3	3	3			2					3

**CO-PSO Mapping**

COs	PSO1	PSO2	PSO3
<b>PEC-CS-A-501.1</b>	3	3	3
<b>PEC-CS-A-501.2</b>	3	3	3
<b>PEC-CS-A-501.3</b>	3	3	3
<b>PEC-CS-A-501.4</b>	3	3	3
<b>PEC-CS-A-501.5</b>	3	3	3

**Course Name: Compiler Design Lab**  
**Course Code: PCC-CS591**  
**Contact Hours/Week: 3L**  
**Credit: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Ability to design, develop, and implement a compiler for any language
<b>CO2</b>	Able to use lex and yacc tools for developing a scanner and a parser
<b>CO3</b>	Able to design and implement LL and LR parsers
<b>CO4</b>	To understand syntax directed translation schemes
<b>CO5</b>	To provide hands-on experience on web technologies

**CO-PO Mapping**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>PCC-CS591.1</b>	3	3	3	3	3							
<b>PCC-CS591.2</b>	3	3	3	3	3							
<b>PCC-CS591.3</b>	3	3	3	3	3							
<b>PCC-CS591.4</b>	3	3	3	3	3							
<b>PCC-CS591.5</b>	3	3	3	3	3							

**CO-PSO Mapping**

COs	PSO1	PSO2	PSO3
<b>PCC-CS591.1</b>	3	3	3
<b>PCC-CS591.2</b>	3	3	3
<b>PCC-CS591.3</b>	3	3	3
<b>PCC-CS591.4</b>	3	3	3
<b>PCC-CS591.5</b>	3	3	3

**Course Name: Distributed Algorithms**

**Course Code: CS505C**

**Contact Hours/Week: 3L**

**Credit: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Develop the fundamental knowledge of parallel and distributed models
<b>CO2</b>	Design, development, and performance analysis of parallel and distributed
<b>CO3</b>	Develop and implement parallel and distributed algorithms
<b>CO4</b>	Analyze the performance issues in parallel computing and trade-offs
<b>CO5</b>	Understand the different issues involved in distributed environment

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CS505C.1</b>	3	3	3	3								3
<b>CS505C.2</b>	3	3	2	2								3
<b>CS505C.3</b>	3	2	3	3								3
<b>CS505C.4</b>	3	2	3	3								3
<b>CS505C.5</b>	2	2	2	2								3

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CS505C.1</b>	3	3	3
<b>CS505C.2</b>	2	2	2
<b>CS505C.3</b>	3	3	2
<b>CS505C.4</b>	2	2	3
<b>CS505C.5</b>	3	3	3

**Course Name: Computer Graphics Lab**

**Course Code: CS591**

**Contact Hours/Week: 3**

**Credit: 2**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Understand the fundamental concept of Computer graphics and mathematical knowledge and explain the foundations of computer graphics and different display technology and devices.
<b>CO2</b>	Demonstrate different scan conversion algorithms, drawing algorithms, polygon filling algorithms, curves and surface drawing algorithms, clipping algorithms, surface removal algorithms using graphics tools.
<b>CO3</b>	Understand the basic concept of graphics programming and implement clipping with the comprehension of windows, view-ports in relation to images display on screen.
<b>CO4</b>	Analyze and compare different drawing algorithms, polygon filling algorithms, curves and surface drawing algorithms hidden surface illumination methods
<b>CO5</b>	Develop the concept of geometric models, mathematical and algorithmic approach necessary for programming computer graphics leading to lifelong learning.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CS591.1</b>	3	3	3	3	2				3			
<b>CS591.2</b>	3	3	3	3	2				3			
<b>CS591.3</b>	3	3	3	3	2				3			
<b>CS591.4</b>	3	3	3	3	2				3			
<b>CS591.5</b>	3	3	3	3	2				3			

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CS591.1</b>	3	3	3
<b>CS591.2</b>	3	3	3
<b>CS591.3</b>	3	3	3
<b>CS591.4</b>	3	3	3
<b>CS591.5</b>	3	3	3

**Course Name: Operating System Lab**  
**Course Code: PCC-CS493**  
**Contact Hours/Week:3**  
**Credit: 2**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Analyze and simulate CPU Scheduling Algorithms like FCFS, Round Robin, SJF, and Priority.
<b>CO2</b>	Understand the concepts of deadlock in operating systems.
<b>CO3</b>	Implement them in Multiprogramming system.
<b>CO4</b>	Create process creation and implement inter process communication
<b>CO5</b>	Analyze the performance of the various page replacement schemes

**CO-PO Mapping**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>PCC-CS493.1</b>	3	3	3	3	3				3			
<b>PCC-CS493.2</b>	3	3	3	3	3				3			
<b>PCC-CS493.3</b>	3	3	3	3	3				3			
<b>PCC-CS493.4</b>	3	3	3	3	3				3			
<b>PCC-CS493.5</b>	3	3	3	3	3				3			

**CO-PSO Mapping**

COs	PSO1	PSO2	PSO3
<b>PCC-CS493.1</b>	3	3	3
<b>PCC-CS493.2</b>	3	3	3
<b>PCC-CS493.3</b>	3	3	3
<b>PCC-CS493.4</b>	3	3	3
<b>PCC-CS493.5</b>	3	3	3

**Course Name: Data Base Management System Lab**

**Course Code: PCC-CS592**

**Contact Hours/Week: 3**

**Credit: 2**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	To Understand and Describe the basic concepts and utility of Database management system, different data models of Database management system.
<b>CO2</b>	To Design an Entity Relationship (E-R) Diagram and relational model for any kind of real-life application and able to Apply relational algebra operations, SQL, Neo4j for solving query.
<b>CO3</b>	To Analyze and Create the relational database for any real-life applications based on normalization.
<b>CO4</b>	To Apply the query optimization techniques, different file organization techniques and Determine whether the transaction satisfies the ACID properties.
<b>CO5</b>	To Implement and organize the database of an organization as a team.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PCC-CS592.1</b>	3	2	2	2	2				3			3
<b>PCC-CS592.2</b>	3	2	2	2	2				3			3
<b>PCC-CS592.3</b>	3	3	2	2	2				3			3
<b>PCC-CS592.4</b>	3	2	2	2	2				3			3
<b>PCC-CS592.5</b>	3	2	2	2	2				3			3

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PCC-CS592.1</b>	3	3	3
<b>PCC-CS592.2</b>	3	3	3
<b>PCC-CS592.3</b>	3	3	3
<b>PCC-CS592.4</b>	3	3	3
<b>PCC-CS592.5</b>	3	3	3

**Course Name: Object Oriented Programming Lab**  
**Course Code PCC-CS593**  
**Contact Hours/Week: 3**  
**Credit: 2**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Create the procedure of communication between Objects, classes & methods.
<b>CO2</b>	Understand the elementary facts of Object Orientation with various characteristics as well as several aspects of Java.
<b>CO3</b>	Analyze distinct features of different string handling functions with various I/O
<b>CO4</b>	Discuss simple Code Reusability notion w.r.t. Inheritance, Package and Interface.
<b>CO5</b>	Apply Exception handling, Multithreading and Applet (Web program in java) programming concept in Java.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PCC-CS593.1</b>	3	3	2	3	2				3			2
<b>PCC-CS593.2</b>	3	3	3	3	2				3			2
<b>PCC-CS593.3</b>	3	3	3	3	2				3			2
<b>PCC-CS593.4</b>	3	3	3	3	3				3			2
<b>PCC-CS593.5</b>	3	3	3	3	3				3			2

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PCC-CS593.1</b>	3	2	2
<b>PCC-CS593.2</b>	3	2	2
<b>PCC-CS593.3</b>	3	2	3
<b>PCC-CS593.4</b>	3	2	3
<b>PCC-CS593.5</b>	3	3	3

**Course Name: Advanced Algorithms Lab**

**Course Code: PEC-CS-T-591**

**Contact Hours/Week: 3**

**Credit: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Illustrate and use proper syntax in appropriate platform for developing program to solve problems related to Mathematics and Engineering field leading to lifelong learning.
<b>CO2</b>	Apply the knowledge of algorithms in the computational area to efficient programming codes to design the problem using modern tools for solving complex engineering problems.
<b>CO3</b>	Outline different types of digital electronic circuits such as adder, subtract or, encoder, decoder, multiplexer, de-multiplexer, flip-flops, register, counter using various mapping and modern tools to prepare the most simplified circuit and optimize using various mapping and mathematical methods for solving the problem as a professional engineering practice as a team.
<b>CO4</b>	Apply the knowledge of digital electronic circuits to design memory and ALU and analyse the same to solve engineering-related computational problems as a team.
<b>CO5</b>	Interpret the result of the experiments, prepare laboratory reports based on observed output and analyse it to validate professional ethics and responsibilities and norms of the engineering practice.

**CO-PO Mapping**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>PEC-CS-T-591.1</b>	3	3	3	2	3				3			
<b>PEC-CS-T-591.2</b>	3	3	3	3	3				3			
<b>PEC-CS-T-591.3</b>	3	3	3	3	3				3			
<b>PEC-CS-T-591.4</b>	3	3	3	3	3				3			
<b>PEC-CS-T-591.5</b>	3	3	3	3	3				3			

**CO-PSO Mapping**

COs	PSO1	PSO2	PSO3
<b>PEC-CS-T-591.1</b>	3	3	3
<b>PEC-CS-T-591.2</b>	3	3	3
<b>PEC-CS-T-591.3</b>	3	3	3
<b>PEC-CS-T-591.4</b>	3	3	3
<b>PEC-CS-T-591.5</b>	3	3	3

**Course Name: Advanced Computer Architecture**

**Course Code: PEC-CS-S-591**

**Contact Hours/Week: 3**

**Credit: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Illustrate and use proper syntax in appropriate platform for developing program to solve problems related to Mathematics and Engineering field leading to lifelong learning.
<b>CO2</b>	Apply the knowledge of algorithms in the computational area to efficient programming codes to design the problem using modern tools for solving complex engineering problems.
<b>CO3</b>	Outline different types of digital electronic circuits such as adder, subtract or, encoder, decoder, multiplexer, de-multiplexer, flip-flops, register, counter using various mapping and modern tools to prepare the most simplified circuit and optimize using various mapping and mathematical methods for solving the problem as a professional engineering practice as a team.
<b>CO4</b>	Apply the knowledge of digital electronic circuits to design memory and ALU and analyse the same to solve engineering-related computational problems as a team.
<b>CO5</b>	Interpret the result of the experiments, prepare laboratory reports based on observed output and analyse it to validate professional ethics and responsibilities and norms of the engineering practice.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PEC-CS-S-591.1</b>	3	3	3	2	3				3			
<b>PEC-CS-S-591.2</b>	3	3	3	3	3				3			
<b>PEC-CS-S-591.3</b>	3	3	3	3	3				3			
<b>PEC-CS-S-591.2</b>	3	3	3	3	3				3			
<b>PEC-CS-S-591.4</b>	3	3	3	3	3				3			

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PEC-CS-S-591.1</b>	3	3	3
<b>PEC-CS-S-591.2</b>	3	3	3
<b>PEC-CS-S-591.3</b>	3	3	3
<b>PEC-CS-S-591.4</b>	3	3	3
<b>PEC-CS-S-591.5</b>	3	3	3

**Course Name: Artificial Intelligence**

**Course Code: PEC-CS-A-591**

**Contact Hours/Week: 3**

**Credit: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Acquire foundational knowledge of PROLOG to implement an Artificial Intelligent Agent as an executable computer program for Knowledge Representation and Inferencing and understand the working principle of the agent and assess its utilitarian importance in current technological context leading towards lifelong learning.
<b>CO2</b>	Identify and formulate an engineering problem by analyzing its characteristics to fit a State-Space Exploration Framework or an Inferencing Agent Formulation Framework of Artificial Intelligence.
<b>CO3</b>	Explore relevant literature and apply the concepts of Artificial Intelligence to solve a problem by implementing well-known Artificial Intelligence strategies using proper techniques and tools of PROLOG.
<b>CO4</b>	Develop ideas and propose expert systems offering solutions to the challenging problems of Artificial Intelligence.
<b>CO5</b>	Plan and Implement Artificial Intelligence based ideas as executable PROLOG programs through developing intelligent heuristic strategies or expert systems with adequate documentation in collaborative environment for successfully carrying out projects on Artificial Intelligence Problems and investigate their effectiveness by analyzing the performances using proper techniques and tools.

#### **CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PEC-CS-A-591.1</b>	3	3	2	2	3				3			3
<b>PEC-CS-A-591.2</b>	3	2	2	3	3				3			3
<b>PEC-CS-A-591.3</b>	3	3	2	2	3				3			3
<b>PEC-CS-A-591.2</b>	3	3	3	3	3				3			3
<b>PEC-CS-A-591.4</b>	3	3	3	3	3				3			3

#### **CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PEC-CS-A-591.1</b>	3	2	2
<b>PEC-CS-A-591.2</b>	3	3	3
<b>PEC-CS-A-591.3</b>	3	3	3
<b>PEC-CS-A-591.4</b>	3	2	3
<b>PEC-CS-A-591.5</b>	3	3	3

**Course Name: Minor Project I**  
**Course Code: PR591**  
**Contact Hours/Week: 3P**  
**Credit: 1.5**

**Course Outcomes (COs):**

After completion of the course students would be able to

<b>CO1</b>	Understand project characteristics and various stages of a project
<b>CO2</b>	Understand the conceptual clarity about project organization and feasibility analyses – Market, Technical, Financial and Economic
<b>CO3</b>	Analyze the learning and understand techniques for Project planning, scheduling and Execution Control.
<b>CO4</b>	Apply the risk management plan and analyse the role of stakeholders
<b>CO5</b>	Understand the contract management, Project Procurement, Service level Agreements and productivity

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PR591.1</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>PR591.2</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>PR591.3</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>PR591.4</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>PR591.5</b>	3	3	3	3	3	3	3	3	3	3	3	3

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PR591.1</b>	3	3	3
<b>PR591.2</b>	3	3	3
<b>PR591.3</b>	3	3	3
<b>PR591.4</b>	3	3	3
<b>PR591.5</b>	3	3	3

**Course Name: Economics for Engineers**  
**Course Code: HSMC 604**  
**Contact Hours/Week: 3P**  
**Credit: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Apply the appropriate engineering economics analysis method(s) for problem solving present worth, annual cost, rate-of-return, payback, break-even, benefit-cost ratio.
<b>CO2</b>	Evaluate the cost effectiveness of individual engineering projects using the methods learned and draw inferences for the investment decisions.
<b>CO3</b>	Compare the life cycle cost of multiple projects using the methods learned, and make a quantitative decision between alternate facilities and/or systems.
<b>CO4</b>	Evaluate the profit of a firm, carry out the break even analysis and employ this tool to make production decision.
<b>CO5</b>	Discuss and solve advanced economic engineering analysis problems including taxation and inflation.

**CO-PO Mapping**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>HSMC604.1</b>							2	3			3	3
<b>HSMC604.2</b>							2	3			3	3
<b>HSMC604.3</b>							2	3			3	3
<b>HSMC604.4</b>							2	3			3	3
<b>HSMC604.5</b>							2	3			3	3

**CO-PSO Mapping**

COs	PSO1	PSO2	PSO3
<b>HSMC604.1</b>	2	2	2
<b>HSMC604.2</b>	2	2	2
<b>HSMC604.3</b>	2	2	2
<b>HSMC604.4</b>	2	2	2
<b>HSMC604.5</b>	2	2	2

**Course Name: Computer Networks**  
**Course Code: PCC-PCC-CS601**  
**Contact Hours/Week:3**  
**Credit: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Understand basics of computer network and different architecture and topologies of computer network and analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies.
<b>CO2</b>	Understand/analyze different protocol of data link layer and apply them to solve engineering problems.
<b>CO3</b>	Understand/analyze different protocol of Network and Transport Layer and apply them to solve engineering problems.
<b>CO4</b>	Understand/analyze different protocol of session and application layer and apply them to solve engineering problems.
<b>CO5</b>	Develop Analyze, specify and design the topological and routing strategies using socket programming.

**CO-PO Mapping**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>PCC-CS601.1</b>	3	3	2	2	2				2	2		3
<b>PCC-CS601.2</b>	3	3	3	3	3				2	2		3
<b>PCC-CS601.3</b>	3	3	3	3	3				2	2		3
<b>PCC-CS601.4</b>	3	3	3	3	3				2	2		3
<b>PCC-CS601.5</b>	2	3	3	3	3				2	2		3

**CO-PSO Mapping**

COs	PSO1	PSO2	PSO3
<b>PCC-CS601.1</b>	3	3	3
<b>PCC-CS601.2</b>	3	3	3
<b>PCC-CS601.3</b>	3	3	3
<b>PCC-CS601.4</b>	3	3	3
<b>PCC-CS601.5</b>	3	3	3

**Course Name: Software Engineering**

**Course Code:PCC-CS602**

**Contact Hours/Week:3L**

**Credit: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Understand the basic concept of Software Engineering and mathematical knowledge and apply them in designing solution to engineering problem including the specification, design, implementation, and testing of software systems that meet specification, performance, maintenance and quality requirements
<b>CO2</b>	Analyze, elicit and specify software requirements through a productive working relationship with various stakeholders of the project
<b>CO3</b>	Design applicable solutions in one or more application domains using software engineering approaches that integrates ethical, social, legal and economic concerns.
<b>CO4</b>	Develop the code from the design and effectively apply relevant standards and perform testing, and quality management and practice team work.
<b>CO5</b>	Identify and Use modern engineering tools necessary for software project management time management and software reuse, and an ability to engage in life-long learning.

**CO-PO Mapping**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>PCC-CS602.1</b>	3	3	3	2								3
<b>PCC-CS602.2</b>	3	3	3	2								3
<b>PCC-CS602.3</b>	3	3	3	2								3
<b>PCC-CS602.4</b>	3	3	3	2								3
<b>PCC-CS602.5</b>	3	3	3	2								3

**CO-PSO Mapping**

COs	PSO1	PSO2	PSO3
<b>PCC-CS602.1</b>	3	3	3
<b>PCC-CS602.2</b>	3	3	3
<b>PCC-CS602.3</b>	3	3	3
<b>PCC-CS602.4</b>	3	3	3
<b>PCC-CS602.5</b>	3	3	3

**Course Name: Software Engineering**

**Course Code: PCC-CS602**

**Contact Hours/Week:3L**

**Credit: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Understand the basic concept of Software Engineering and mathematical knowledge and apply them in designing solution to engineering problem including the specification, design, implementation, and testing of software systems that meet specification, performance, maintenance and quality requirements
<b>CO2</b>	Analyze, elicit and specify software requirements through a productive working relationship with various stakeholders of the project
<b>CO3</b>	Design applicable solutions in one or more application domains using software engineering approaches that integrates ethical, social, legal and economic concerns.
<b>CO4</b>	Develop the code from the design and effectively apply relevant standards and perform testing, and quality management and practice team work.
<b>CO5</b>	Identify and Use modern engineering tools necessary for software project management time management and software reuse, and an ability to engage in life-long learning.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PCC-CS602.1</b>	3	3	3	2								3
<b>PCC-CS602.2</b>	3	3	3	2								3
<b>PCC-CS602.3</b>	3	3	3	2								3
<b>PCC-CS602.4</b>	3	3	3	2								3
<b>PCC-CS602.5</b>	3	3	3	2								3

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PCC-CS602.1</b>	3	3	3
<b>PCC-CS602.2</b>	3	3	3
<b>PCC-CS602.3</b>	3	3	3
<b>PCC-CS602.4</b>	3	3	3
<b>PCC-CS602.5</b>	3	3	3

**Course Name: Microprocessor and Microcontroller**

**Course Code: PEC-CS-T-601**

**Contact Hours/Week:3**

**Credit: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	To acquire the knowledge of hardware details of 8085 and 8086 microprocessor AND 8051 microcontroller with the related signals and their implications.
<b>CO2</b>	To develop skill in assembly Language programming of 8085
<b>CO3</b>	To understand the concept and techniques of designing and implementing interfacing of microprocessor with memory and peripheral chips involving system design.
<b>CO4</b>	To analyze the performance of computers and its architecture to real-life applications
<b>CO5</b>	Analyze the data transfer information through serial & parallel ports.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PEC-CS-T-601.1</b>	3	3	3	2								
<b>PEC-CS-T-601.2</b>	3	3	3	2								
<b>PEC-CS-T-601.3</b>	3	3	3	2								
<b>PEC-CS-T-601.4</b>	3	3	3	2								
<b>PEC-CS-T-601.5</b>	3	3	3	2								

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PEC-CS-T-601.1</b>	3	3	3
<b>PEC-CS-T-601.2</b>	3	3	3
<b>PEC-CS-T-601.3</b>	3	3	3
<b>PEC-CS-T-601.4</b>	3	3	3
<b>PEC-CS-T-601.5</b>	3	3	3

**Course Name: Advanced Operating Systems**

**Course Code: PEC-CS-S-601**

**Contact Hours/Week: 3**

**Credit: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Understand the architecture and classifications of different embedded systems and the related programming knowledge.
<b>CO2</b>	Identify and understand the concepts of embedded systems like I/O, timers, interrupts, interaction with peripheral devices
<b>CO3</b>	Choose case-specific debugging technique for an embedded system.
<b>CO4</b>	Design various real time systems using embedded systems.
<b>CO5</b>	Understand the working principles of microcontroller and apply this knowledge for developing an approach by means of existing and new methods as a team work.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PEC-CS-S-601.1</b>	3	3	3	3	2							3
<b>PEC-CS-S-601.2</b>	3	3	3	3	2							3
<b>PEC-CS-S-601.3</b>	3	3	3	3	2							3
<b>PEC-CS-S-601.4</b>	3	3	3	3	2							3
<b>PEC-CS-S-601.5</b>	3	3	3	3	2							3

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PEC-CS-S-601.1</b>	3	3	3
<b>PEC-CS-S-601.2</b>	3	3	3
<b>PEC-CS-S-601.3</b>	3	3	3
<b>PEC-CS-S-601.4</b>	3	3	3
<b>PEC-CS-S-601.5</b>	3	3	3

**Course Name: Machine Learning**  
**Course Code: PEC-CS-D-601**  
**Contact Hours/Week: 3**  
**Credit: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Understand the fundamental concepts of basics of machine learning to Explain or Illustrate and Identify problems where students can Apply the concept appropriately to Solve them.
<b>CO2</b>	Understand the fundamental concepts of regression problems so that they can propose models for predicting values based on exemplary data and Analyze their performances.
<b>CO3</b>	Explain or Illustrate the fundamental strategies of unsupervised machine learning paradigm to solve clustering problems and Analyze their performances.
<b>CO4</b>	Explain or Illustrate the concepts of Mining Frequent Patterns, Associations and Data Streams and Apply them to solve the relevant problems and Analyse their performances.
<b>CO5</b>	Develop ideas to Propose solutions to the problems of supervised learning and Identify problems where students can Apply the concept appropriately and Analyze the effectiveness as well as limitations of solutions making the students aware of its utilitarian importance for further explorations leading towards lifelong learning.

**CO-PO Mapping**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>PEC-CS-D-601.1</b>	3	3	3	3								3
<b>PEC-CS-D-601.2</b>	3	3	3	3								3
<b>PEC-CS-D-601.3</b>	3	3	3	3								3
<b>PEC-CS-D-601.4</b>	3	3	3	3								3
<b>PEC-CS-D-601.5</b>	3	3	3	3								3

**CO-PSO Mapping**

COs	PSO1	PSO2	PSO3
<b>PEC-CS-D-601.1</b>	3	3	3
<b>PEC-CS-D-601.2</b>	3	3	3
<b>PEC-CS-D-601.3</b>	3	3	3
<b>PEC-CS-D-601.4</b>	3	3	3
<b>PEC-CS-D-601.5</b>	3	3	3

**Course Name: Web and Internet Technology**

**Course Code: PEC-CS-A-601**

**Contact Hours/Week: 3**

**Credit: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	To develop interactive web pages using HTML, DHTML, CSS and image map
<b>CO2</b>	To procure the knowledge of information interchange formats like XML
<b>CO3</b>	To validate fields of web pages using scripting languages like JavaScript
<b>CO4</b>	To develop web applications using PHP and ASP.net
<b>CO5</b>	To acquire the server side programming concepts using servlet, JSP

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PEC-CS-A-601.1</b>	3	3	3	3								3
<b>PEC-CS-A-601.2</b>	3	3	3	3								3
<b>PEC-CS-A-601.3</b>	3	3	3	3								3
<b>PEC-CS-A-601.4</b>	3	3	3	3								3
<b>PEC-CS-A-601.5</b>	3	3	3	3								3

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PEC-CS-A-601.1</b>	3	3	3
<b>PEC-CS-A-601.2</b>	3	3	3
<b>PEC-CS-A-601.3</b>	3	3	3
<b>PEC-CS-A-601.4</b>	3	3	3
<b>PEC-CS-A-601.5</b>	3	3	3

**Course Name: Soft Computing**  
**Course Code: PEC-CS-D-602**  
**Contact Hours/Week: 3**  
**Credit: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Understand and explain the basic concept of soft computing and hard computing and apply them in designing solution to engineering problem.
<b>CO2</b>	Identify and formulate learning rules for each of the architectures and learn several neural network paradigms and its applications to solving engineering and other problems.
<b>CO3</b>	Explore relevant literature and apply fuzzy logic and reasoning to handle uncertainty and solving interdisciplinary engineering problems
<b>CO4</b>	Use genetic algorithms to combinatorial optimization problems and recognize the feasibility of applying a soft computing methodology for a particular problem.
<b>CO5</b>	Implement the concept and techniques of designing of soft computing methods in real world problem.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PEC-CS-D-602.1</b>	3	3	3	3	3	2	2		2			3
<b>PEC-CS-D-602.2</b>	3	3	3	3	3	2	2		2			3
<b>PEC-CS-D-602.3</b>	3	3	3	3	3	2	2		2			3
<b>PEC-CS-D-602.4</b>	3	3	3	3	3	2	2		2			3
<b>PEC-CS-D-602.5</b>	3	3	3	3	3	2	2		2			3

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PEC-CS-D-602.1</b>	3	3	3
<b>PEC-CS-D-602.2</b>	3	3	3
<b>PEC-CS-D-602.3</b>	3	3	3
<b>PEC-CS-D-602.4</b>	3	3	3
<b>PEC-CS-D-602.5</b>	3	3	3

**Course Name: Computer Network Lab**  
**Course Code: PCC-CS691**  
**Contact Hours/Week:3P**  
**Credit: 2**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	To design and implement small size network and to understand various networking commands.
<b>CO2</b>	To provide the knowledge of various networking tools and their related concepts.
<b>CO3</b>	To understand various application layer protocols for its implementation in client/server environment
<b>CO4</b>	Understand the TCP/IP configuration for Windows and Linux
<b>CO5</b>	Learn the major software and hardware technologies used on computer networks

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PCC-CS691.1</b>	3	3	3	2	3							2
<b>PCC-CS691.2</b>	3	3	3	3	3							2
<b>PCC-CS691.3</b>	3	3	3	3	3							2
<b>PCC-CS691.4</b>	3	3	3	3	3							2
<b>PCC-CS691.5</b>	2	3	2	2	3							2

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PCC-CS691.1</b>	3	3	3
<b>PCC-CS691.2</b>	3	3	3
<b>PCC-CS691.3</b>	3	3	3
<b>PCC-CS691.4</b>	3	3	3
<b>PCC-CS691.5</b>	3	3	3

**Course Name: Software Engineering Lab**

**Course Code: PCC-CS692**

**Contact Hours/Week:3**

**Credit: 2**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Understand the basic knowledge of how to apply Software Engineering and mathematical knowledge and designing solution to software engineering problem including the specification.
<b>CO2</b>	Analyze the cost-benefit trade-off.
<b>CO3</b>	Design solutions to the one or more application domains using software engineering approaches that integrates ethical.
<b>CO4</b>	Develop the code from the design and effectively apply relevant standards and perform testing .
<b>CO5</b>	Identify and use of modern software engineering tools necessary for software project management.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PCC-CS692.1</b>	3	3	3	3	3				3			3
<b>PCC-CS692.2</b>	3	3	3	3	3				3			3
<b>PCC-CS692.3</b>	3	3	3	3	3				3			3
<b>PCC-CS692.4</b>	3	3	3	3	3				3			3
<b>PCC-CS692.5</b>	3	3	3	3	3				3			3

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PCC-CS692.1</b>	3	3	3
<b>PCC-CS692.2</b>	3	3	3
<b>PCC-CS692.3</b>	3	3	3
<b>PCC-CS692.4</b>	3	3	3
<b>PCC-CS692.5</b>	3	3	3

**Course Name: Microprocessor and Microcontroller Lab**  
**Course Code: PEC-CS-T-691**  
**Contact Hours/Week:3P**  
**Credit: 2**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	To understand and apply the fundamentals of assembly level programming of microprocessors and Microcontroller.
<b>CO2</b>	To work with standard microprocessor real time interfaces including GPIO, serial ports, digital-to-analog converters and analog-to-digital converters.
<b>CO3</b>	To troubleshoot interactions between software and hardware.
<b>CO4</b>	To analyze abstract problems and apply a combination of hardware and software to address the problem

**CO-PO Mapping**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>PEC-CS-T-691.1</b>	3	3	3	2	3				3			
<b>PEC-CS-T-691.2</b>	3	3	3	2	3				3			
<b>PEC-CS-T-691.3</b>	3	3	3	2	3				3			
<b>PEC-CS-T-691.4</b>	3	3	3	2	3				3			
<b>PEC-CS-T-691.5</b>	3	3	3	2	3				3			

**CO-PSO Mapping**

COs	PSO1	PSO2	PSO3
<b>PEC-CS-T-691.1</b>	3	3	3
<b>PEC-CS-T-691.2</b>	2	3	3
<b>PEC-CS-T-691.3</b>	3	3	2
<b>PEC-CS-T-691.4</b>	3	2	3
<b>PEC-CS-T-691.5</b>	3	3	3

**Course Name: Advanced Operating Systems Lab**  
**Course Code: PEC-CS-S-691**  
**Contact Hours/Week: 3**  
**Credit: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Analyze and simulate CPU Scheduling Algorithms like FCFS, Round Robin, SJF, and Priority.
<b>CO2</b>	Understand the concepts of deadlock in operating systems.
<b>CO3</b>	Implement them in Multiprogramming system.
<b>CO4</b>	Create process creation and implement inter process communication
<b>CO5</b>	Analyze the performance of the various page replacement schemes

**CO-PO Mapping**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>PEC-CS-S-691.1</b>	3	3	3	3	3				3			
<b>PEC-CS-S-691.2</b>	3	3	3	3	3				3			
<b>PEC-CS-S-691.3</b>	3	3	3	3	3				3			
<b>PEC-CS-S-691.4</b>	3	3	3	3	3				3			
<b>PEC-CS-S-691.5</b>	3	3	3	3	3				3			

**CO-PSO Mapping**

COs	PSO1	PSO2	PSO3
<b>PEC-CS-S-691.1</b>	3	3	3
<b>PEC-CS-S-691.2</b>	3	3	3
<b>PEC-CS-S-691.3</b>	3	3	3
<b>PEC-CS-S-691.4</b>	3	3	3
<b>PEC-CS-S-691.5</b>	3	3	3

**Course Name: Machine Learning Lab**

**Course Code: PEC-CS-D-691**

**Contact Hours/Week: 3**

**Credit: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Understand the fundamental concepts of basics of machine learning to Explain or Illustrate and Identify problems where students can Apply the concept appropriately to Solve them.
<b>CO2</b>	Understand the fundamental concepts of regression problems so that they can propose models for predicting values based on exemplary data and Analyze their performances.
<b>CO3</b>	Explain or Illustrate the fundamental strategies of unsupervised machine learning paradigm to solve clustering problems and Analyze their performances.
<b>CO4</b>	Explain or Illustrate the concepts of Mining Frequent Patterns, Associations and Data Streams and Apply them to solve the relevant problems and Analyse their performances.
<b>CO5</b>	Develop ideas to Propose solutions to the problems of supervised learning and Identify problems where students can Apply the concept appropriately and Analyze the effectiveness as well as limitations of solutions making the students aware of its utilitarian importance for further explorations leading towards lifelong learning.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PEC-CS-D-691.1</b>	3	3	3	3	3							3
<b>PEC-CS-D-691.2</b>	3	3	3	3	3							3
<b>PEC-CS-D-691.3</b>	3	3	3	3	3							3
<b>PEC-CS-D-691.4</b>	3	3	3	3	3							3
<b>PEC-CS-D-691.5</b>	3	3	3	3	3							3

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PEC-CS-D-691.1</b>	3	3	3
<b>PEC-CS-D-691.2</b>	3	3	3
<b>PEC-CS-D-691.3</b>	3	3	3
<b>PEC-CS-D-691.4</b>	3	3	3
<b>PEC-CS-D-691.5</b>	3	3	3

**Course Name: Web and Internet Technology Lab**  
**Course Code: PEC-CS-A-691**  
**Contact Hours/Week: 3**  
**Credit: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	To develop interactive web pages using HTML, DHTML, CSS and image map
<b>CO2</b>	To procure the knowledge of information interchange formats like XML
<b>CO3</b>	To validate fields of web pages using scripting languages like JavaScript
<b>CO4</b>	To develop web applications using PHP and ASP.net
<b>CO5</b>	To acquire the server side programming concepts using servlet, JSP

**CO-PO Mapping**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>PEC-CS-A-691.1</b>	3	3	3	3	3				2			3
<b>PEC-CS-A-691.2</b>	3	3	3	3	3				2			3
<b>PEC-CS-A-691.3</b>	3	3	3	3	3				2			3
<b>PEC-CS-A-691C.4</b>	3	3	3	3	3				2			3
<b>PEC-CS-A-691.5</b>	3	3	3	3	3				2			3

**CO-PSO Mapping**

COs	PSO1	PSO2	PSO3
<b>PEC-CS-A-691.1</b>	3	3	3
<b>PEC-CS-A-691.2</b>	3	3	3
<b>PEC-CS-A-691.3</b>	3	3	3
<b>PEC-CS-A-691.4</b>	3	3	3
<b>PEC-CS-A-691.5</b>	3	3	3

**Course Name Minor Project II**

**Course Code: PR691**

**Contact Hours/Week: 3P**

**Credit: 1.5**

**Course Outcomes (COs):**

After completion of the course students would be able to

<b>CO1</b>	Understand project characteristics and various stages of a project
<b>CO2</b>	Understand the conceptual clarity about project organization and feasibility analyses – Market, Technical, Financial and Economic
<b>CO3</b>	Analyze the learning and understand techniques for Project planning, scheduling and Execution Control.
<b>CO4</b>	Apply the risk management plan and analyse the role of stakeholders
<b>CO5</b>	Understand the contract management, Project Procurement, Service level Agreements and productivity

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PR691.1</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>PR691.2</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>PR691.3</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>PR691.4</b>	3	3	3	3	3	3	3	3	3	3	3	3
<b>PR691.5</b>	3	3	3	3	3	3	3	3	3	3	3	3

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PR691.1</b>	3	3	3
<b>PR691.2</b>	3	3	3
<b>PR691.3</b>	3	3	3
<b>PR691.4</b>	3	3	3
<b>PR691.5</b>	3	3	3

**Course Name: Information Theory and Coding**

**Course Code: PEC-CS-T-701**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Illustrate the basic concept of information and apply this knowledge to design solution for real life engineering problem.
<b>CO2</b>	Illustrate the basic concept of coding theory and use this knowledge to design and solve mathematical and engineering problem leading to lifelong learning.
<b>CO3</b>	Interpret the concept of channel models to find amount of mutual information in the channels.
<b>CO4</b>	Compare the existing error detection techniques and design a model for building a new solution as a professional engineering practice as a team.
<b>CO5</b>	Understand how convolutional theory works and develop an approach by means of existing and new methods as a team work.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PEC-CS-T-701.1</b>	3	3	2	-								
<b>PEC-CS-T-701.2</b>	3	3	3	3								
<b>PEC-CS-T-701.3</b>	3	3	3	3								
<b>PEC-CS-T-701.4</b>	3	3	3	3								
<b>PEC-CS-T-701.5</b>	3	3	3	3								

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PEC-CS-T-701.1</b>	3	3	3
<b>PEC-CS-T-701.2</b>	3	2	3
<b>PEC-CS-T-701.3</b>	3	3	2
<b>PEC-CS-T-701.4</b>	3	2	3
<b>PEC-CS-T-701.5</b>	3	2	3

**Course Name: Data Mining and Data Warehousing**

**Course Code: PEC-CS-D-701**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Understand and explain the fundamental concepts of the evolving technologies in Data Mining (such as Mining Frequent Patterns and Data Streams, Associations, Supervised and Unsupervised Learning Graph Mining, Web Mining etc.) and Data Warehousing (such as Data Cube and OLAP) recognizing their utilitarian importance in current technological context for further exploration leading towards lifelong learning.
<b>CO2</b>	Identify and formulate an engineering problem within the scope of Data Mining and Data Warehousing paradigm.
<b>CO3</b>	Explore relevant literature and apply the concepts of Data Mining and Data Warehousing to solve problems of making automated decisions dealing with large scale data.
<b>CO4</b>	Develop ideas for proposing solutions to the challenging problems of Data Mining and Data Warehousing.
<b>CO5</b>	Implement ideas of Data Mining and Data Warehousing through developing feasible algorithms or frameworks and investigate their effectiveness in solving the relevant problems by analyzing the performances using proper techniques.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PEC-CS-D-701.1</b>	3	2	2	2								3
<b>PEC-CS-D-701.2</b>	3	2	2	2								
<b>PEC-CS-D-701.3</b>	3	3	2	2								
<b>PEC-CS-D-701.4</b>	3	2	2	2								
<b>PEC-CS-D-701.5</b>	3	2	2	2								

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PEC-CS-D-701.1</b>	3	3	3
<b>PEC-CS-D-701.2</b>	3	3	3
<b>PEC-CS-D-701.3</b>	3	3	3
<b>PEC-CS-D-701.4</b>	3	3	3
<b>PEC-CS-D-701.5</b>	3	3	3

**Course Name: Quantum Computing**

**Course Code: PEC-CS-T-702**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Understand the basic idea of quantum computing including background of mathematics and physics required for developing and solving complex engineering problem in the domain of quantum computing possibly using modern engineering tools.
<b>CO2</b>	Understand and explain the concept of quantum circuits using single and multiple qubit gates and also designing of quantum circuits for solving engineering problem including societal and environmental issues.
<b>CO3</b>	Compare between classical and quantum information theory and explain and apply Bell states, Quantum teleportation, Quantum Cryptography and no cloning theorem in solving engineering problem possibly in a team maintain proper ethics of professional collaboration.
<b>CO4</b>	Understand, explain and apply different quantum algorithms including classical computation on quantum computers like Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor factorization, Grover search and also relate between quantum and classical complexity classes for solving engineering problem.
<b>CO5</b>	Understand noise and error correction including graph states and codes, quantum error correction, fault-tolerant computation and apply it in designing and solving complex engineering problems leading to their lifelong learning.

**CO-PO Mapping**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>PEC-CS-T-702.1</b>	3	3	3	3	2	-	-	-	-	-	-	2
<b>PEC-CS-T-702.2</b>	3	3	3	3	-	2	2	-	-	-	-	2
<b>PEC-CS-T-702.3</b>	3	3	3	3	-	-	-	2	2	-	-	2
<b>PEC-CS-T-702.4</b>	3	3	3	3	-	-	-	-	-	-	-	2
<b>PEC-CS-T-702.5</b>	3	3	3	3	-	-	-	-	-	-	-	3

**CO-PSO Mapping**

COs	PSO1	PSO2	PSO3
<b>PEC-CS-T-702.1</b>	3	2	2
<b>PEC-CS-T-702.2</b>	3	2	3
<b>PEC-CS-T-702.3</b>	3	3	2
<b>PEC-CS-T-702.4</b>	3	3	2
<b>PEC-CS-T-702.5</b>	3	3	3

**Name of the Paper: Mobile Computing**

**Paper Code: PEC-CS-S-702**

**Contact: 3L/Week**

**Credit Point: 3**

**No. of Lectures: 36**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Illustrate the concepts and working of modern communication technologies.
<b>CO2</b>	Demonstrate the various routing algorithms for both infrastructure based and ad hoc networks.
<b>CO3</b>	Develop mobility and bandwidth management in cellular network
<b>CO4</b>	Design and build an energy efficient and secure mobile computing environment using heterogeneous wireless technologies
<b>CO5</b>	Predict the technical issues related to recent mobile computing environment.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PEC-CS-S-702.1</b>	3	3	3	3								
<b>PEC-CS-S-702.2</b>	3	3	3	3								
<b>PEC-CS-S-702.3</b>	3	3	3	3								
<b>PEC-CS-S-702.4</b>	3	3	3	3								
<b>PEC-CS-S-702.5</b>	3	3	3	3								

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PEC-CS-S-702.1</b>	3	3	3
<b>PEC-CS-S-702.2</b>	3	3	3
<b>PEC-CS-S-702.3</b>	2	3	3
<b>PEC-CS-S-702.4</b>	3	3	2
<b>PEC-CS-S-702.5</b>	3	3	3

**Paper Name: Natural Language Processing**

**Paper Code: PEC-CS-D-702**

**Contact (Periods/Week): 3L/Week**

**Credit Point: 3**

**No. of Lectures: 35**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Analyze and apply the morality and method of Human Languages such as English and other Indian Languages using computers.
<b>CO2</b>	Understand the semantics and pragmatics of English language for text processing
<b>CO3</b>	Create CORPUS linguistics based on digestive approach (Text Corpus method)
<b>CO4</b>	Illustrate, analyze and apply for the modern techniques for statistical approaches to machine translation.
<b>CO5</b>	Analyze and apply the POS tagging for a given natural language and select a suitable language modeling technique based on the structure of the language.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PEC-CS-D-702.1</b>	3	3	3	3								
<b>PEC-CS-D-702.2</b>	3	3	3	3								
<b>PEC-CS-D-702.3</b>	3	3	3	3								
<b>PEC-CS-D-702.4</b>	3	3	3	3								
<b>PEC-CS-D-702.5</b>	3	3	3	3								

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PEC-CS-D-702.1</b>	3	3	3
<b>PEC-CS-D-702.2</b>	3	3	3
<b>PEC-CS-D-702.3</b>	3	3	3
<b>PEC-CS-D-702.4</b>	3	3	3
<b>PEC-CS-D-702.5</b>	3	3	3

**Course Name: Cryptography and Network Security**

**Course Code: PEC-CS-A-702**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO</b>	Understand cryptography and network security concepts and application.
<b>CO</b>	Apply security principles to system design.
<b>CO</b>	Identify and investigate network security threat
<b>CO</b>	Analyze and design network security protocols.
<b>CO</b>	Conduct research in network security.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PEC-CS-A-702.1</b>	3	3	3	2	2							
<b>PEC-CS-A-702.2</b>	3	2	2	2	2							
<b>PEC-CS-A-702.3</b>	2	3	2	2	3							
<b>PEC-CS-A-702.4</b>	2	2	3	2	3							
<b>PEC-CS-A-702.5</b>	3	2	2	2	2							

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PEC-CS-A-702.1</b>	3	3	3
<b>PEC-CS-A-702.2</b>	3	2	2
<b>PEC-CS-A-702.3</b>	2	2	2
<b>PEC-CS-A-702.4</b>	3	3	3
<b>PEC-CS-A-702.5</b>	3	3	3

**Course Name: High Performance Computing**

**Course Code: OEC-CS-701A**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Prerequisites:**

Computer Architecture Lab, Operating System Lab, Compiler design Lab

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Understand the basic knowledge of Parallel Processing and apply it in solving Complex Engineering Problem.
<b>CO2</b>	Develop and design parallel system with Compute Unified Device Architecture (CUDA) for engineering problem leading to lifelong learning.
<b>CO3</b>	Differentiate and analyze different Design Issues in Parallel Computing and apply the knowledge in solving Complex Engineering Problem including the problem in societal and environmental contexts.
<b>CO4</b>	Understand the limitation of Parallel Computing and apply the knowledge to create and select appropriate techniques, resources, and modern engineering and IT tools to complex engineering problem.
<b>CO5</b>	Understand and distinguish different Power-Aware Computing and Communication system and also different elements of cloud computing services leading to developing new computing system and analyzing of existing one.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>OEC-CS-701A.1</b>	3	3	3	3	2							
<b>OEC-CS-701A.2</b>	3	3	3	3	2							
<b>OEC-CS-701A.3</b>	3	3	3	3	2							
<b>OEC-CS-701A.4</b>	3	3	3	3	2							
<b>OEC-CS-701A.5</b>	3	3	3	3	2							

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>OEC-CS-701A.1</b>	3	3	3
<b>OEC-CS-701A.2</b>	3	3	3
<b>OEC-CS-701A.3</b>	3	3	3
<b>OEC-CS-701A.4</b>	3	3	3
<b>OEC-CS-701A.5</b>	3	3	3

**Course Name: Image Processing**  
**Course Code: OEC-CS-701B**  
**Contact: 3:0:0**  
**Total Contact Hours: 36**  
**Credits: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Understand the basic concepts of digital image processing to Explain or Illustrate and Identify problems where students can Apply the concept appropriately to Solve them.
<b>CO2</b>	Understand the fundamental concepts of image enhancement strategies and Identify the scope of enhancement where students can Apply the appropriate strategy and Analyze the performance.
<b>CO3</b>	Illustrate the fundamental image restoration strategies and Apply them appropriately to eliminate noise in the image.
<b>CO4</b>	Illustrate various Image Compression Techniques and Apply them to compress the images and Analyze their performances.
<b>CO5</b>	Understand and Develop ideas to Propose solutions to the problems of Morphological Image Processing and Image Segmentation and Analyze the effectiveness as well as limitations of solutions underscoring its utilitarian importance for further explorations leading towards lifelong learning.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>OEC-CS-701B.1</b>	3	2	2	2								
<b>OEC-CS-701B.2</b>	3	3	2	3								
<b>OEC-CS-701B.3</b>	3	3	2	2								
<b>OEC-CS-701B.4</b>	3	2	3	2								
<b>OEC-CS-701B.5</b>	3	2	2	2								

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>OEC-CS-701B.1</b>	3	3	3
<b>OEC-CS-701B.2</b>	3	3	3
<b>OEC-CS-701B.3</b>	3	3	3
<b>OEC-CS-701B.4</b>	3	3	3
<b>OEC-CS-701B.5</b>	3	3	3

**Course Name: Foreign  
 Language Course Code:  
 OEC-CS-702C Contact:  
 3:0:0  
 Total Contact Hours: 36  
 Credits: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Read basic French and interpret the meaning
<b>CO2</b>	Construct simple sentences in French
<b>CO3</b>	Interact with others and hold simple conversations in French
<b>CO4</b>	Demonstrate a basic knowledge of French culture, manners, geography and world view

**CO-PO Mapping**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>OEC-CS-702C.1</b>						3	3					
<b>OEC-CS-702C.2</b>						3	3					
<b>OEC-CS-702C.3</b>						3	3					
<b>OEC-CS-702C.4</b>						3	3					
<b>OEC-CS-702C.5</b>						3	3					

**CO-PSO Mapping**

COs	PSO1	PSO2	PSO3
<b>OEC-CS-702C.1</b>	2	2	2
<b>OEC-CS-702C.2</b>	2	2	2
<b>OEC-CS-702C.3</b>	2	2	2
<b>OEC-CS-702C.4</b>	2	2	2
<b>OEC-CS-702C.5</b>	2	2	2

**Course Name: Advanced Graph Algorithms**

**Course Code: PEC-CS-T-801**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	To understand the basic concept of Graph theory and Graph Algorithm and apply them in designing solution to Computer Science and engineering domain problem.
<b>CO2</b>	To demonstrate the basic concept of graph implementation programming and use of data structure to represent graph for developing the solution to the graph based problems in computer science domain
<b>CO3</b>	To formulate graph algorithms and programs in solving Computer science and engineering problem leading to lifelong learning and Analyze the efficiency of algorithms using time and space complexity.
<b>CO4</b>	To apply the graph theory principles and concepts to design an efficient algorithm and use suitable data structure for problem solving.
<b>CO5</b>	To develop better algorithm in compare to some existing algorithm and create new efficient data structures for solving many graph based real life problem in Computer science domain.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PEC-CS-T-801.1</b>	2	2	2	2								2
<b>PEC-CS-T-801.2</b>	3	3	3	3								2
<b>PEC-CS-T-801.3</b>	3	3	3	3								2
<b>PEC-CS-T-801.4</b>	3	3	3	3								2
<b>PEC-CS-T-801.5</b>	3	3	3	3								2

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PEC-CS-T-801.1</b>	3	3	3
<b>PEC-CS-T-801.2</b>	3	3	3
<b>PEC-CS-T-801.3</b>	3	3	3
<b>PEC-CS-T-801.4</b>	3	3	3
<b>PEC-CS-T-801.5</b>	3	3	3

**Course Name: Real Time Systems**

**Course Code: PEC-CS-S-801**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credit: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Understand the concepts of Real-Time systems
<b>CO2</b>	Recognize the characteristics of a real-time system
<b>CO3</b>	Understand and develop document on an architectural design of a real-time system.
<b>CO4</b>	Develop and document Task scheduling, resource management, real-time operating systems and fault tolerance applications of real-time systems.
<b>CO5</b>	Apply the basics of RTOS in interpretation of real time systems.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PEC-CS-S-801.1</b>	3	3	3	3	2							3
<b>PEC-CS-S-801.2</b>	3	3	3	3	2							3
<b>PEC-CS-S-801.3</b>	3	3	3	3	2							3
<b>PEC-CS-S-801.4</b>	3	3	3	3	2							3
<b>PEC-CS-S-801.5</b>	3	3	3	3	2							3

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PEC-CS-S-801.1</b>	3	3	3
<b>PEC-CS-S-801.2</b>	3	3	3
<b>PEC-CS-S-801.3</b>	3	3	3
<b>PEC-CS-S-801.4</b>	3	3	3
<b>PEC-CS-S-801.5</b>	3	3	3

**Course Name: Big Data Analytics**

**Course Code: PEC-CS-D-801**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Understand and explain the fundamental concepts of the Big Data Analytics which are primarily explored for making automated decisions using machine learning strategies on analyzing large scale structured as well as unstructured data distributed across multiple locations (Map Reduce, Hadoop and No SQL Framework) underscoring the utilitarian importance in current technological context for further exploration leading towards lifelong learning.
<b>CO2</b>	Identify and formulate an engineering problem of analyzing large scale data distributed across multiple locations to make automated meaningful decisions within the scope of Big Data Analytics Frameworks.
<b>CO3</b>	Explore relevant literature and apply the concepts of Big Data Analytics to solve problems of making automated decisions dealing with large scale structured as well as unstructured data using Map Reduce, Hadoop and advanced SQL Frameworks.
<b>CO4</b>	Excogitate ideas for proposing solutions to the challenging problems of Big Data Analytics.
<b>CO5</b>	Implement ideas of Big Data Analytics through developing feasible algorithms or frameworks and investigate their effectiveness in solving the relevant problems by analyzing the performances using proper techniques.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PEC-CS-D-801.1</b>	3	2	2	1								3
<b>PEC-CS-D-801.2</b>	3	3	3	2								3
<b>PEC-CS-D-801.3</b>	3	3	2	3								3
<b>PEC-CS-D-801.4</b>	2	3	2	2								3
<b>PEC-CS-D-801.5</b>	3	2	2	3								3

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PEC-CS-D-801.1</b>	3	2	2
<b>PEC-CS-D-801.2</b>	3	3	2
<b>PEC-CS-D-801.3</b>	3	2	3
<b>PEC-CS-D-801.4</b>	2	2	3
<b>PEC-CS-D-801.5</b>	2	3	3

**Course Name: Computer Graphics**

**Course Code: PEC-CS-A-801**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Understand the fundamental concept of Computer graphics and mathematical knowledge and explain the foundations of computer graphics and different display technology and devices.
<b>CO2</b>	Demonstrate different scan conversion algorithms, drawing algorithms, polygon filling algorithms, curves and surface drawing algorithms, clipping algorithms, surface removal algorithms using graphics tools.
<b>CO3</b>	Understand the basic concept of graphics programming and implement clipping with the comprehension of windows, view-ports in relation to images display on screen.
<b>CO4</b>	Analyze and compare different drawing algorithms, polygon filling algorithms, curves and surface drawing algorithms hidden surface illumination methods
<b>CO5</b>	Develop the concept of geometric models, mathematical and algorithmic approach necessary for programming computer graphics leading to lifelong learning.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>PEC-CS-A-801.1</b>	3	3	3	3	3							3
<b>PEC-CS-A-801.2</b>	3	3	3	3	3							3
<b>PEC-CS-A-801.3</b>	3	3	3	3	3							3
<b>PEC-CS-A-801.4</b>	3	3	3	3	3							3
<b>PEC-CS-A-801.5</b>	3	3	3	3	3							3

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>PEC-CS-A-801.1</b>	3	3	3
<b>PEC-CS-A-801.2</b>	3	3	3
<b>PEC-CS-A-801.3</b>	3	3	3
<b>PEC-CS-A-801.4</b>	3	3	3
<b>PEC-CS-A-801.5</b>	3	3	3

**Course Name: Values and Ethics in Profession**

**Course Code: OEC-CS-802A**

**Contact: 3L: 0T: 0P**

**Credit: 3**

**No. of Lectures: 34**

**Course Outcomes (COs):**

After attending the course students should be able to

<b>CO1</b>	Understand the core values that shape the ethical behavior of an engineer and Exposed awareness on professional ethics and human values.
<b>CO2</b>	Understand the concept of profession, professional ethics, and various moral issues.
<b>CO3</b>	Understand various social issues, industrial standards, code of ethics and role of professional ethics in engineering field.
<b>CO4</b>	Aware of responsibilities of an engineer for safety and risk benefit analysis, professional rights and responsibilities of an engineer.
<b>CO5</b>	Acquire knowledge about various roles of engineers in variety of global issues and able to apply ethical principles to resolve situations that arise in their professional lives.

**CO-PO Mapping**

<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>OEC-CS-802A.1</b>		2				2	3	3				3
<b>OEC-CS-802A.2</b>		2				2	3	3				3
<b>OEC-CS-802A.3</b>		2				2	3	3				3
<b>OEC-CS-802A.4</b>		2				2	3	3				3
<b>OEC-CS-802A.5</b>		2				2	3	3				3

**CO-PSO Mapping**

<b>COs</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>OEC-CS-802A.1</b>	2	2	2
<b>OEC-CS-802A.2</b>	2	2	2
<b>OEC-CS-802A.3</b>	2	2	2
<b>OEC-CS-802A.4</b>	2	2	2
<b>OEC-CS-802A.5</b>	2	2	2

# NARULA INSTITUTE OF TECHNOLOGY



81, Nilgunj Rd, Agarpara, Kolkata, West Bengal 700109  
www.nit.ac.in | 033 2563 8888