R-21

CURRICULUM ESSENTIALS

Handbook on Outcome Based Education

COMPUTER SCIENCE AND TECHNOLOGY

NARULA INSTITUTE OF TECHNOLOGY

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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

1st 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
TOTAL CREDIT								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
TOTAL CREDIT								21

3rd Semester								
Sl. No.	**Category**	**Course Code**	**Course Title**	**Hours per week**				**Credits**
				L	**T**	**P**	**Total**	
A. THEORY								
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. PRACTICAL								
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
C. MANDATORY ACTIVITIES / COURSES								
13	MC	MC 301	Environmental Science	0	0	3	3	3 Units
	TOTAL CREDIT WITHOUT MOOCS COURSES							26
D.MOOCS COURSES**								
14	MOOCS COURSES	HM301	MOOCS COURSE-I	1	3	1	4	4
TOTAL CREDIT WITH MOOCS COURSES								**30**

4th Semester								
Sl. N	**Category**	**Course Code**	**Course Title**	**Hours per week**				**Credits**
				L	**T**	**P**	**Total**	
A. THEORY								
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. PRACTICAL								
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
C. MANDATORY ACTIVITIES / COURSES								
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
	TOTAL CREDIT WITHOUT MOOCS COURSES							24
D.MOOCS								
14	MOOCS COURSES	HM401	MOOCS COURSE-II	3	1	0	4	4
TOTAL CREDIT WITH MOOCS COURSES								**28**

5th Semester								
Sl. No.	**Category**	**Course Code**	**Course Title**	**Hours per week**				**Credits**
				L	**T**	**P**	**Total**	
A. THEORY								
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. PRACTICAL								
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					
C. MANDATORY ACTIVITIES / COURSES								
12	MC	MC 501	Constitution of India	3	0	0	3	3Units
	TOTAL CREDIT WITHOUT MOOCS COURSES							21.5
D. MOOCS								
13	MOOCS	HM501	MOOCS COURSE-III	3	1	0	4	4
TOTAL CREDIT WITH MOOCS COURSES								**25.5**

6th Semester								
Sl. No.	**Category**	**Course Code**	**Course Title**	**Hours per**				**Credits**
				L	**T**	**P**	**Total**	
A. THEORY								
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 Neteworks	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					

6th Semester									
Sl. No	**Category**	**Course Code**	**Course Title**	**Hours per**				**Credits**
				L	**T**	**P**	**Tota**	
B. PRACTICAL								
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
C. MANDATORY ACTIVITIES / COURSES								
12	MC	MC 601	Intellectual Property Right	3	0	0	3	3Unit
	TOTAL CREDIT WITHOUT MOOCS COURSES							23
D.MOOCS								
13	MOOCS COURSES	HM601	MOOCS COURSE-IV	3	1	0	4	4
TOTAL CREDIT WITH MOOCS COURSES								**27**

7th Semester								
Sl No	**Course Code**	**Paper Code**	**Theory**	**Contact Hours /Week**				**Credit Points**
				L	**T**	**P**	**Total**	
A. THEORY								
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					

7th Semester								
Sl No	**Course Code**	**Paper Code**	**Theory**	**Contact Hours /Week**				**Credit Points**
				L	**T**	**P**	**Total**	
B. PRACTICAL								
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
C. MANDATORY ACTIVITIES / COURSES								
10	MC	MC 781	Entrepreneurship & Innovation	3	0	0	3	3 Units
TOTAL CREDIT WITHOUT MOOCS COURSES								18.5
11	MOOCS COURSES	HM701	MOOCS COURSE-V	3	1	0	4	4
TOTAL CREDIT WITH MOOCS COURSES								**22.5**

8th Semester								
Sl No	**Course Code**	**Paper Code**	**Theory**	**Contact Hours**				**Credit Points**
				L	**T**	**P**	**Total**	
A. THEORY								
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. PRACTICAL								
4	PROJECT	PR 891	Major Project-II	0	0	0	12	6
5	PROJECT	PR 892	Grand Viva	0	0	0	0	1
C. MANDATORY ACTIVITIES / COURSES								
6	MC	MC 801	Essence of Indian Knowledge Tradition	0	0	3	3	3 Units
TOTAL								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

CO1	Recall the properties and formula related to matrix algebra, differential calculus,multivariable calculus, vector calculus and infinite series. multivariable calculus, vector calculus and infinite series
CO2	Determine the solutions of the problems related to matrix algebra, differential calculus, multivariable calculus, vector calculus and infinite series.
CO3	Apply the appropriate mathematical tools of matrix algebra, differential calculus, multivariable calculus, vector calculus and infinite series for the solutions of the problems.
CO4	Analyze 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
M101.1	3	2										2
M101.2	3	2										2
M101.3	3	2	2									2
M101.4	2	3	2	2								2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
M101.1	2	2	2
M101.2	2	2	2
M101.3	2	2	2
M101.4	2	2	2
M101.5	2	2	2

Course Name: Physics-I
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

PH101.1	Describe various types of mechanical resonance and its electrical equivalence
PH101.2	Explain basic principles of Laser, Optical fibres and Polarization of light
PH101.3	Apply superposition principle to explain interference and diffraction
PH101.4	Analyze different crystallographic structures according to their co-ordination number and packing factors
PH101.5	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
PH101.1	3											2
PH101.2	3											2
PH101.3	3	2										2
PH101.4	2	3										2
PH101.5	2	3										2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PH101.1	2	2	2
PH101.2	2	2	2
PH101.3	2	2	2
PH101.4	2	2	2
PH101.5	2	2	2

Course Name: Professional Communication
Course Code: HSMC 101
Contact: 2:0:0
Total Contact Hours: 24
Credits: 2

Course Outcomes (COs):

After completion of the course students would be able to

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

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
HSMC 101.1	1						2			3		2
HSMC 101.2	2	3	2			2	2	2		3		3
HSMC 101.3	1	3				3	3	3		3		3
HSMC 101.4						3	3	3		3		3
HSMC 101.5							3	3		3		3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
HSMC 101.1	2	2	2
HSMC 101.2	2	2	2
HSMC 101.3	2	2	2
HSMC 101.4	2	2	2
HSMC 101.5	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

CO1	Describe various types of mechanical resonance and its electrical equivalence
CO2	Explain basic principles of Laser, Optical fibers and Polarization of light
CO3	Analyze and participate as an individual and as a member or leader in groups in laboratory sessions actively.
CO4	Analyze experimental data from graphical representations, and to communicate effectively them in Laboratory reports including innovative experiments.
CO5	Design solutions for real life challenges.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PH191.1	3	2										2
PH191.2	2	2		3								2
PH191.3	2	2							3			2
PH191.4	2	2								3		2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PH191.1	2	2	2
PH191.2	2	2	2
PH191.3	2	2	2
PH191.4	2	2	2

Course Name: Workshop / Manufacturing Practices
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

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

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ME191.1	2	2	2		2	3	2		2	2	2	3
ME191.1	2	2	3	2	2	2	2		3	2	2	3
ME191.1	3	2	2	2	2	2	2	2	2	2	2	3
ME191.1	2	2	3	2	3	3	2		3	3	3	3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
ME191.1	2	2	2
ME191.1	2	2	2
ME191.1	2	2	2
ME191.1	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

CO1	Determine and recall the properties and formula related to ordinary differential equations, improper integral, Laplace transform and numerical techniques.
CO2	Determine the solutions of the problems related to ordinary differential equations, improper integral, Laplace transform and numerical techniques.
CO3	Apply appropriate mathematical tools of ordinary differential equations, improper integral, Laplace transform and numerical techniques for the solutions of the problems.
CO4	Analyze engineering problems 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
M201.1	3	2										2
M201.2	3	2										2
M201.3	3	2	2									2
M201.4	2	3	2	2								2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
M201.1	2	2	2
M201.2	2	2	2
M201.3	2	2	2
M201.4	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

CO1	Able to apply fundamental concepts of thermodynamics in different engineering applications.
CO2	Able to analyze & design simple and technologically advanced electrical and energy storagedevices.
CO3	Able to synthesize nanomaterials, composites, polymers.
CO4	Able to apply the basic concept of Organic Chemistry and knowledge of chemical reactions to industries , and technical fields.
CO5	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
CH201.1	3	2	2	2					2	2	2	2
CH201.2	3	3	3	3					2	2	2	3
CH201.3	3	3	2	2		2	2		2		3	3
CH201.4	3	2	3	2			2		2	2	3	3
CH201.5	3	3	3	3	2	2	2		2		2	3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CH201.1	2	2	2
CH201.2	2	2	2
CH201.3	2	2	2
CH201.4	2	2	2
CH201.5	2	2	2

Course Name: Basic Electrical Engineering
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

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

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EE201.1	1	2	2									1
EE201.2	2	2	2									1
EE201.3		2	2									2
EE201.4		2										1

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
EE201.1	2	2	2
EE201.2	2	2	2
EE201.3	2	2	2
EE201.4	2	2	2
EE201.5	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

CO1	Understand the fundamental concept of Computer and mathematical knowledge and apply them in designing and analyzing solution to engineering problem.
CO2	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.
CO3	Use conditional branching, iteration, recursion and formulate algorithms and programs in solving
CO4	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.
CO5	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

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS201.1	3	3	3
CS201.2	3	2	3
CS201.3	3	3	1
CS201.4	3	3	1
CS201.5	3	2	1

Course Name: Chemistry 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

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

CO-PO Mapping

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CH291.1	2	2	2
CH291.2	2	2	2
CH291.3	2	2	2
CH291.4	2	2	2
CH291.5	2	2	2

Course Name: Basic Electrical Engineering Laboratory
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

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

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EE291.1		2							1			1
EE291.2		2	2	2					2			1
EE291.3		2		2					2			1

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
EE291.1	3	3	2
EE291.2	3	3	3
EE291.3	3	2	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

CO1	Get introduced with Engineering Graphics and visual aspects of design.
CO2	Know and use common drafting tools with the knowledge of drafting standards.
CO3	Be able to apply computer aided drafting techniques to represent line, surface or solidmodels in different Engineering viewpoints.
CO4	Be able to produce part models; carry out assembly operation and show working procedureof a designed project work using animation.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ME 292.1	2	2	3	2	2	2	2		2	2	2	2
ME 292.1	2	2	3	2	2	2	2	2	2	2	2	2
ME 292.1	2	2	3	2	3	2	2		2	2	2	3
ME 292.1	2	2	3	2	3	3	2	2	3	3	2	2

zCO-PSO Mapping

COs	PSO1	PSO2	PSO3
ME 292.1	2	2	2
ME 292.1	2	2	2
ME 292.1	2	2	2
ME 292.1	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

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

CO-PO Mapping

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
HSMC 291.1	2	2	2
HSMC 291.2	2	2	2
HSMC 291.3	2	2	2
HSMC 291.4	2	2	2
HSMC 291.5	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

CO1	Understand the fundamental concepts of Set Theory to Explain or Illustrate and Identify problems where students can Apply the concept appropriately to Solve them.
CO2	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.
CO3	Explain or Illustrate the fundamental Theory of Numbers and Identify problems where students can Use the concept appropriately to Solve them.
CO4	Explain or Illustrate the fundamental principles of Algebraic Structures and Identify problems where students can Apply the concept appropriately to Solve them.
CO5	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
M301.1	3	2										
M301.2	2	3										
M301.3	2	2	3	2								
M301.4	2	2	2	3								
M301.5	2	2	3	3								2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
M301.1	2	2	2
M301.2	2	2	2
M301.3	2	2	2
M301.4	2	2	2
M301.5	2	2	2

Course Name: Analog Electronics
Course Code: ESC 301
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Prerequisite:

Concept of basic electronics devices, basic law of circuit analysis

Course Outcomes:

After completion of the course students will be able to:

CO1	**Understand** the characteristics of ICs, diodes, transistors, FET and **apply** them in **designing** solution to engineering problems
CO2	**Understand** the working principles of RC coupled amplifier, feedback amplifier, voltagegain and current gain in these circuits, handling frequencies and bandwidth related problems and **demonstrate** the solutions leading to mathematical and engineering problems.
CO3	**Analyze** the functioning of OP-AMP, feedback amplifiers, oscillator circuits and **design** different circuits leading to lifelong learning
CO4	**Understand**, **implement** and **evaluate** the performance of different types of analog amplifiers and multi-vibrator circuits
CO5	**Understand** different types of power amplifiers, power supply including ADC and DAC circuits and **compare** their performances and **solve** related problems possibly as a team

CO-PO & PSO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ESC301.1	3	3	3	3	3							
ESC301.2	3	3	3	3	3							
ESC301.3	3	3	3	3	3							3
ESC301.4	3	3	3	3	3							
ESC301.5	3	3	3	3	3				3		2	

CO- PSO Mapping

COs'	PSO1	PSO2	PSO3
ESC301.1	2	3	2
ESC301.2	2	3	2
ESC301.3	2	3	2
ESC301.4	2	3	2
ESC301.5	2	3	2
ESC301.1	2	3	2

Course Name: Digital Electronics
Course Code: ESC 302
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Pre-requisite:

Basic concepts of Logic gates, Truth Tables, Concept of basic components of a digital computer

Course Outcomes:

After completion of the course students will be able to:

CO1	**Understand** Boolean algebra, number system and **execute** and **solve** the problem related to number system conversion, minimization techniques and their application in digital design which **leads** to the solution of engineering problems
CO2	**Understand** the working principles of the logic gates, combinational circuits as well as different components of a digital computer and **demonstrate** the solutions leading to mathematical and engineering problems
CO3	**Analyze** and **design** different sequential circuits like flip flops, registers and countersleading to lifelong learning
CO4	**Understand, implement** and **evaluate** the performance of different types of digitalcircuits
CO5	**Understand** different logic families like TTL, ECL, MOS and CMOS, A/D and D/A conversion Programmable logic Array, programmable Array logic, Sequential Programmable Devices and **compare** their performances and **solve** related problems possibly as a team

CO-PO & PSO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ES302.1	3	3	3	3	3	-	-	-	-	-	-	-
ES302.2	3	3	3	3	3	-	-	-	-	-	-	-
ES302.3	3	3	3	3	3	-	-	-	-	-	-	3
ES302.4	3	3	3	3	3	-	-	-	-	-	-	-
ES302.5	3	3	3	3	3	-	-	-	3	-	2	-

CO- PSO Mapping

COs'	PSO1	PSO2	PSO3
ES302.1	2	3	2
ES302.2	2	3	2
ES302.3	2	3	2
ES302.4	2	3	2
ES302.5	2	3	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

CO1	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.
CO2	Identify and differentiate different types of data structures and implement the appropriate data structure after analyzing complex engineering problem leading to their lifelong
CO3	Understand and implement stack, queue and dequeue by selecting appropriate methods and use it for solving real life and engineering problem choosing appropriate modern
CO4	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.
CO5	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

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PCC-CS302.1	3	3	3
PCC-CS302.2	3	3	3
PCC-CS302.3	3	3	1
PCC-CS302.4	3	3	3
PCC-CS302.5	3	1	3

Course Name: Programming in Python
Course Code: PCC- CS 301
Contact Hours/Week: 3
Credit: 3:0:0
Total Contact Hours: 35L

Course Outcomes (COs):

After attending the course students should be able to

CO1	Demonstrate a thorough understanding of modular programming by designing programs that requires the use of programmer-defined functions.
CO2	Demonstrate a thorough understanding of arrays by designing and implementing programs that search and sort arrays.
CO3	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.
CO4	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.
CO5	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

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PCC-CS301.1	2	3	3
PCC-CS301.2	3	3	3
PCC-CS301.3	3	3	3
PCC-CS301.4	2	2	3
PCC-CS301.5	3	2	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

CO1	Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field
CO2	Identify the multiple ethical interests at stake in a real-world situation or practice
CO3	Articulate what makes a particular course of action ethically defensible
CO4	Assess their own ethical values and the social context of problems
CO5	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
HSMC 303.1	3	2	1		2	1				2	3	3
HSMC 303.2	3	2		1	3	2		1	2		3	3
HSMC 303.3	3	2	2		2	3	1		2	1	3	3
HSMC 303.4	3	1		2						3	3	3
HSMC 303.5	2	1	3	2				2		3	3	3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
HSMC 303.1	2	2	2
HSMC 303.2	2	2	2
HSMC 303.3	2	2	2
HSMC 303.4	2	2	2
HSMC 303.5	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

CO1	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.
CO2	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
CO3	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.
CO4	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.
CO5	Prepare laboratory reports on interpretation of experimental results and analyze it for validating the same maintaining proper ethics of collaboration.

CO-PO Mapping

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PCC-CS391.1	3	3	3
PCC-CS391.2	3	3	3
PCC-CS391.3	3	3	3
PCC-CS391.4	3	3	3
PCC-CS391.5	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

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

CO-PO Mapping

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS392.1	2	2	2
CS392.2	2	2	2
CS392.3	2	2	2
CS392.4	2	2	2
CS392.5	2	2	2

Course Name: Digital Logic Lab
Course Code: ESC391
Contact Hours/Week: 3P
Credit: 1.5

Course Outcomes (COs):

After attending the course students should be able to

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

CO-PO Mapping

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
ESC391.1	2	2	2
ESC391.2	2	2	2
ESC391.3	2	2	2
ESC391.4	2	2	2
ESC391.5	2	2	2

Course Name: Programming with PYTHON Lab
Course Code: PCC-CS301
Contact Hours/Week: 3P
Credit: 1.5

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand the fundamental Python syntax and semantics and be fluent in writing simple Pythonprograms in the appropriate platform.
CO2	Develop proficiency in the handling of strings and be fluent in the use of Python control flow statements.
CO3	Solve different problems while applying the concepts of loops.
CO4	Develop different programming skills while correlating functions.
CO5	Articulate the Object-Oriented Programming concepts such as encapsulation, inheritance andpolymorphism as used in Python.

CO-PO Mapping

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PCC-CS391.1	3	3	3
PCC-CS391.2	3	3	3
PCC-CS391.3	3	3	3
PCC-CS391.4	3	3	3
PCC-CS391.5	3	3	3

Course Name: ENVIORNMENTAL SCIENCE
Course Code: MC301
Total Lectures: 36
Credit: 0

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

CO1	To understand the natural environment and its relationships with human activities.
CO2	To apply the fundamental knowledge of science and engineering to assess environmental and health risk.
CO3	To develop guidelines and procedures for health and safety issues obeying the environmental laws and regulations.
CO4	Acquire skills for scientific problem-solving related to air, water, noise & landpollution.
CO5	Apply the fundamental knowledge of science and engineering to assess environmental and health risk

CO-PO Mapping

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PR391.1	3	3	3
PR391.2	3	3	3
PR391.3	3	3	3
PR391.4	3	3	3
PR391.5	3	3	3

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

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

CO-PO Mapping

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
M(CSE)401.1	2	2	2
M(CSE)401.2	2	2	2
M(CSE)401.3	2	2	2
M(CSE)401.4	2	2	2
M(CSE)401.5	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

CO1	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.
CO2	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.
CO3	Identify the concept of Instruction-Level Parallelism to solve engineering problem.
CO4	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.
CO5	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

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PCC- CS 401.1	3	3	3
PCC- CS 401.2	3	3	3
PCC- CS 401.3	3	3	3
PCC- CS 401.4	3	3	3
PCC- CS 401.5	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

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

CO-PO Mapping

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PCC- CS 402.1	3	3	3
PCC- CS 402.2	3	3	3
PCC- CS 402.3	3	3	3
PCC- CS 402.4	3	3	3
PCC- CS 402.5	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

CO1	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.
CO2	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.
CO3	Understand the fundamental concepts of Context Free Grammar so that they can Design grammar for a specified language and Validate it.
CO4	Explain or Illustrate the fundamental operating principles of Push Down Automata and Use it appropriately to Solve problems.
CO5	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

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PCC- CS 404.1	3	3	3
PCC- CS 404.2	3	3	3
PCC- CS 404.3	3	3	3
PCC- CS 404.4	3	3	3
PCC- CS 404.5	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

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

CO-PO Mapping

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PCC-CS403.1	3	3	3
PCC-CS403.2	3	3	3
PCC-CS403.3	3	3	3
PCC-CS403.4	3	3	3
PCC-CS403.5	3	3	3

Course Name: Gender, Culture and Development
Course Code: HSMC402
Contact Hours/Week: 2:0:0
Credit: 2

Prerequisite: None

Course Outcomes (COs):

After attending the course students should be able to

CO1	Provide an analysis of the location of women in the processes of economic development; to understand what economic development is, the scales or levels at which it occurs, and the
CO2	Examine theoretical and conceptual frameworks for that analysis.
CO3	Reflect upon linkages between the global economy and the gendered macro andmicro process of development and transitions from 'government' to 'governance.'
CO4	Explain the usefulness of a rights based approach to gender justice.
CO5	Provide basis for research, practical action and policy formulation and or evaluating for evaluating directions and strategies for social change from a genderperspective.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
HSMC 402.1	3	3	3	2	3				3			
HSMC 402.2	3	3	3	3	3				3			
HSMC 402.3	3	3	3	3	3				3			
HSMC 402.4	3	3	3	3	3				3			
HSMC 402.5	3	3	3	3	3				3			

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
HSMC 402.1	3	3	3
HSMC 402.2	3	3	3
HSMC 402.3	3	3	3
HSMC 402.4	3	3	3
HSMC 402.5	3	3	3

Course Name: Probability and Statistics
Course Code: M401
Contact Hours/Week: 3
Credit: 3

Prerequisite:

The students to whom this course will be offered must have the concept of (10+2) standard algebra and calculus.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand the basic concepts of Probability and Random Variables to Explainor Illustrate and Identify problems where students can Apply the concept appropriately to Solve them.
CO2	Understand the basic concepts of Two dimensional random variables to Explain or Illustrate and Identify problems where students can Apply the conceptappropriately to Solve
CO3	Understand the basic concepts of Sampling Distribution to Explain or Illustrate and Identify problems where students can Apply the concept appropriately to
CO4	Understand the basic concepts of Parameter Estimation to Explain or Illustrate and Identify problems where students can Apply the concept appropriately to
CO5	Understand the basic concepts of Testing of Hypotheses to Explain or Illustrate and Identify problems where students can Apply the concept appropriately to Solve them.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
M401.1	3	2	3	2					2			
M401.2	2	3	2	3								
M401.3	2	2	3	2								
M401.4	2	2	2	3								
M401.5	2	2	3	3								2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
M401.1	3	3	3
M401.2	3	3	3
M401.3	3	3	3
M401.4	3	3	3
M401.5	3	3	3

Course Name: Computer Organization and Architecture Lab
Course Code: PCC -CS491
Contact Hours/Week: 3
Credit: 2

Prerequisites: Digital Electronics

Course Outcomes (COs):

After attending the course students should be able to

CO1	Interpret and use proper method in an appropriate platform to design and to solveproblems related to Mathematics and Engineering field leading to lifelong learning.
CO2	Use the codes and number systems converting circuits and Compare different types of logic families which are the basic unit of different types of logic gates to design the problem using
CO3	Outline different types of digital electronic circuit using various mapping and logical tools and summarize the techniques to prepare the most simplified circuit using various mapping and mathematical methods for solving the problem as a professional engineering practice as a team.
CO4	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.
CO5	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
PCC-CS491.1	3	3	3	2								
PCC-CS491.2	3	3	3	3	3							
PCC-CS491.3	3	3	3	3				3	3			
PCC-CS491.4	3	3	3	3					3			
PCC-CS491.5												

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PCC-CS491.1	3	3	3
PCC-CS491.2	3	3	3
PCC-CS491.3	3	3	3
PCC-CS491.4	3	3	3
PCC-CS491.5	3	3	3

Course Name: Design and Analysis of Algorithms Lab
Course Code: PCC-CS492
Contact Hours/Week: 3
Credit: 2

Prerequisites: Programming Knowledge

Course Outcomes (COs):

After attending the course students should be able to

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

CO-PO Mapping

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PCC-CS492.1	3	3	3
PCC-CS492.2	3	3	3
PCC-CS492.3	3	3	3
PCC-CS492.4	3	3	3
PCC-CS492.5	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

CO1	Analyze and simulate CPU Scheduling Algorithms like FCFS, Round Robin, SJF, and Priority.
CO2	Understand the concepts of deadlock in operating systems.
CO3	Implement them in Multiprogramming system.
CO4	Create process creation and implement inter process communication
CO5	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
PCC-CS493.1	3	3	3	3								
PCC-CS493.2	3	3	3	3								
PCC-CS493.3	3	3	3	3								3
PCC-CS493.4	3	3	3	3								
PCC-CS493.5	3	3	3	3					2	3		

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PCC-CS493.1	3	3	3
PCC-CS493.2	3	3	3
PCC-CS493.3	3	3	3
PCC-CS493.4	3	3	3
PCC-CS493.5	3	3	3

Course Name: IT Workshop Lab (C++/Python)
Course Code: ESC491
Contact Hours/Week: 3P
Credit: 1.5

Course Outcomes (COs):

After completion of the course students would be able to

CO1	Articulate the basic Object-Oriented Programming concepts such as class and objects as used inPython/C++.
CO2	Illustrate exceptions in Python along with creating their own based on the problems or analyze variousproblems based on the knowledge of classes and abstractions in C++.
CO3	Understand the concept of multithreading in Python or write various programs while applying theconcept of inheritance in C++.
CO4	Use databases in Python or articulate the Object-Oriented Programming concepts such as polymorphismin C++.
CO5	Execute programs while applying the concepts of database connections, transactions etc. in Python or Illustrate exceptions in C++ along with creating their own based on the problems.

CO-PO Mapping

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PR491.1	3	3	3
PR491.2	3	3	3
PR491.3	3	3	3
PR491.4	3	3	3
PR491.5	3	3	3

Course Name: Computer Graphics
Course Code: PEC-CS-A-501
Contact Hours/Week: 3
Credit: 3

Course Outcomes (COs):
After attending the course students should be able to

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

CO-PO Mapping

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS501.1	3	3	3
CS501.2	3	3	3
CS501.3	3	3	3
CS501.4	3	3	3
CS501.5	3	3	3

Course Name: Principles of Management
Course Code: HSMC 501
Contact Hours/Week: 3L
Credit: 2

Course Outcomes (COs):

After attending the course students should be able to

CO1	To recall and identify the relevance of management concepts
CO2	To apply management techniques for meeting current and future managementchallenges faced by the organization
CO3	To compare the management theories and models critically to solve real-life problemsin an organization.
CO4	To apply principles of management in order to execute the role as a manager in an Organization.
CO5	Analysis Quality control and Understand the Functions of Marketing .

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
HSMC 501.1	2			2					3		3	2
HSMC 501.2						2		3	3		3	3
HSMC 501.3	2			2					2		3	3
HSMC 501.4	3					2		2	3		3	
HSMC 501.5	2	2		2					2		3	

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
HSMC 505.1	2	2	2
HSMC 505.2	2	2	2
HSMC 505.3	2	2	2
HSMC 505.4	2	2	2
HSMC 505.5	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

CO1	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.
CO2	Design and analyze algorithms for syntactic or parsing techniques and semantic analysis of the process of designing compilers.
CO3	Develop the parsers and experiment the knowledge of activation tree, activation record and dynamic storage allocation techniques
CO4	Construct the intermediate code representations and generation.
CO5	Apply for various optimization techniques for dataflow analysis.

CO-PO Mapping

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PCC-CS501.1	3	3	3
PCC-CS501.2	3	3	3
PCC-CS501.3	3	3	3
PCC-CS501.4	3	3	3
PCC-CS501.5	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

CO1	To Understand and Describe the basic concepts and utility of Database management system, different data models of Database management system.
CO2	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
CO3	To Analyze and Create the relational database for any real-life applications based on normalization.
CO4	To Apply the query optimization techniques, different file organization techniques and Determine whether the transaction satisfies the ACID properties.
CO5	To Implement and organize the database of an organization as a team.

CO-PO Mapping

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PCC-CS502.1	3	3	3
PCC-CS502.2	3	3	3
PCC-CS502.3	3	3	3
PCC-CS502.4	3	3	3
PCC-CS502.5	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

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

CO-PO Mapping

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PCC-CS503 .1	3	3	3
PCC-CS503 .2	3	3	3
PCC-CS503 3	3	3	3
PCC-CS503 .4	3	3	3
PCC-CS503 .5	3	3	3

Course Name: Microprocessors & Microcontrollers
Course Code: PEC-CS-T-501
Contact Hours/Week: 3
Credit: 3

Course Outcomes (COs):

After attending the course students should be able to

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

CO-PO Mapping

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-T-501.1	3	3	3
PEC-CS-T-501.2	3	3	3
PEC-CS-T-501.3	3	3	3
PEC-CS-T-501.4	3	3	3
PEC-CS-T-501.5	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

CO1	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.
CO2	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.
CO3	Identify the concept of Instruction-Level Parallelism to solve engineering problem.
CO4	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.
CO5	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

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-S-501.1	3	3	3
PEC-CS-S-501.2	3	3	3
PEC-CS-S-501.3	3	3	3
PEC-CS-S-501.4	3	3	3
PEC-CS-S-501.5	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

CO1	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.
CO2	Identify and formulate an engineering problem primarily to fitaState-Space Exploration Framework or an Inferencing Model/Agent Design Framework within the scope of Artificial Intelligence paradigm.
CO3	Explore relevant literature and apply the concept of Heuristic Techniques of Artificial Intelligence to solve problems.
CO4	Develop Inferencing Models for proposing solutions to the problems of Artificial Intelligence.
CO5	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
PEC-CS-A-501.1	3	2										3
PEC-CS-A-501.2	2	3										
PEC-CS-A-501.3	2	2	3	2								
PEC-CS-A-501.2	2	2	2	3								2
PEC-CS-A-501.4	2	2	3	3	2							2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-A-501.1	3	3	3
PEC-CS-A-501.2	3	3	3
PEC-CS-A-501.3	3	3	3
PEC-CS-A-501.4	3	3	3
PEC-CS-A-501.5	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

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

CO-PO Mapping

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PCC-CS591.1	3	3	3
PCC-CS591.2	3	3	3
PCC-CS591.3	3	3	3
PCC-CS591.4	3	3	3
PCC-CS591.5	3	3	3

Course Name: Computer Graphics Lab
Course Code: PEC-CS-A-591
Contact Hours/Week: 3
Credit: 1.5

Course Outcomes (COs):
After attending the course students should be able to

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

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEC-CS-A-591.1	3	3	3	3	2				3			
PEC-CS-A-591.2	3	3	3	3	2				3			
PEC-CS-A-591.3	3	3	3	3	2				3			
PEC-CS-A-591.4	3	3	3	3	2				3			
PEC-CS-A-591.5	3	3	3	3	2				3			

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-A-591.1	3	3	3
PEC-CS-A-591.2	3	3	3
PEC-CS-A-591.3	3	3	3
PEC-CS-A-591.4	3	3	3
PEC-CS-A-591.5	3	3	3

Course Name: Microprocessor &Microcontroller Lab
Course Code: PEC-CS-T-591
Contact Hours/Week:3
Credit: 1.5
Prerequisites: Digital Electronics

Course Outcomes (COs):

After attending the course students should be able to

CO1	**Illustrate** and **use** proper code in appropriate platform using suitable syntax for developing program to **solve** problems related to Mathematics and Engineeringfield
CO2	**Apply** the knowledge of architecture in the computational area to efficient programming codes to design programs, interface with peripherals using modern tools like trainer kits for **solvin**g complex engineering problems.
CO3	**Outline** different types of basic instruction set (data transfer, load/store, arithmetic, logical), subroutine calls and IN/OUT instructions and trainer kits todesign and solve the problem as a professional engineering practice as a team.
CO4	**Analyse** the problem by **applying** the knowledge of microprocessor and microcontroller and implement a new approach for **solving** engineering-related computational problems as a team.
CO5	**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
PEC-CS-T-591.1	3	3	3	3								3
PEC-CS-T-591.2	3	3	3	3	3							
PEC-CS-T-591.3	3	3	3	3				3	3			
PEC-CS-T-591.4	3	3	3	3				3	3			
PEC-CS-T-591.5								3		3		

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-T-591.1	3	3	3
PEC-CS-T-591.2	3	3	3
PEC-CS-T-591.3	3	3	3
PEC-CS-T-591.4	3	3	3
PEC-CS-T-591.5	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

CO1	To Understand and Describe the basic concepts and utility of Database management system, different data models of Database management system.
CO2	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.
CO3	To Analyze and Create the relational database for any real-life applications based on normalization.
CO4	To Apply the query optimization techniques, different file organization techniques and Determine whether the transaction satisfies the ACID properties.
CO5	To Implement and organize the database of an organization as a team.

CO-PO Mapping

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PCC-CS592.1	3	3	3
PCC-CS592.2	3	3	3
PCC-CS592.3	3	3	3
PCC-CS592.4	3	3	3
PCC-CS592.5	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

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

CO-PO Mapping

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PCC-CS593.1	3	2	2
PCC-CS593.2	3	2	2
PCC-CS593.3	3	2	3
PCC-CS593.4	3	2	3
PCC-CS593.5	3	3	3

Course Name: Advanced Computer Architecture
Course Code: PEC-CS-S-591
Contact Hours/Week: 3
Credit: 1.5

Course Outcomes (COs):

After attending the course students should be able to

CO1	Illustrate and use proper syntax in appropriate platform for developing program to solve problems related to Mathematics and Engineering field leading to lifelong learning.
CO2	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.
CO3	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.
CO4	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.
CO5	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
PEC-CS-S-591.1	3	3	3	3								3
PEC-CS-S-591.2	3	3	3	3	3							
PEC-CS-S-591.3	3	3	3	3				3	3			
PEC-CS-S-591.2	3	3	3	3				3	3			
PEC-CS-S-591.4								3		3		

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-S-591.1	3	3	3
PEC-CS-S-591.2	3	3	3
PEC-CS-S-591.3	3	3	3
PEC-CS-S-591.4	3	3	3
PEC-CS-S-591.5	3	3	3

Course Name: Artificial Intelligence Lab
Course Code: PEC-CS-D-591
Contact Hours/Week: 3
Credit: 1.5

Course Outcomes (COs):

After attending the course students should be able to

CO1	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.
CO2	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.
CO3	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.
CO4	Develop ideas and propose expert systems offering solutions to the challenging problems of Artificial Intelligence.
CO5	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

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEC-CS-D-591.1	3	2										3
PEC-CS-D-591.2	2	3										
PEC-CS-D-591.3	2	2	3	2								
PEC-CS-D-591.2	2	2	2	3								2
PEC-CS-D-591.4	2	2	3	3	2	2	2	2	2	2	2	2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-D-591.1	3	2	2
PEC-CS-D-591.2	3	3	3
PEC-CS-D-591.3	3	3	3
PEC-CS-D-591.4	3	2	3
PEC-CS-D-591.5	3	3	3

Course Name: Constitution of India
Course Code: MC501
Contact Hours/Week: 24
Credit: 0

Course Outcomes (COs):

After completion of the course students would be able to

CO1	Develop human values, create a wareness about law ratification and significance of Constitution.
CO2	Comprehend the Fundamental Rights and Fundamental Duties of the Indian Citizenfour plant morality, social values and their social responsibilities.
CO3	Create understanding of their Surroundings, Society, Social problems and their suitable solutions.
CO4	Familiarize with distribution of powers and functions of Local Self Government.
CO5	Realize the National Emergency Financial Emergency and their impact on EconomyOf the country.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
MC501.1	3	3	3	3								
MC501.2	3		2	2	2							
MC501.3	3	2	3			2						
MC501.4	3	3	3	3					3			
MC501.5	3	2	3	2	3				3		3	3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
MC501.1	3	3	3
MC501.2	3	3	3
MC501.3	3	3	3
MC501.4	3	3	3
MC501.5	3	3	3

Course Name: Economics for Engineers
Course Code: HSMC 604
Contact Hours/Week: 3P
Credit: 2

Course Outcomes (COs):

After attending the course students should be able to

CO1	Apply the appropriate engineering economics analysis method(s) for problem solving present worth, annual cost, rate-of-return, payback, break-even, benefit-cost ratio.
CO2	Evaluate the cost effectiveness of individual engineering projects using the methods learned and draw inferences for the investment decisions.
CO3	Compare the life cycle cost of multiple projects using the methods learned, and make a quantitative decision between alternate facilities and/or systems.
CO4	Evaluate the profit of a firm, carry out the break even analysis and employ this tool to make production decision.
CO5	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
HSMC604.1	3		3								2	
HSMC604.2		3		3								
HSMC604.3	2										3	
HSMC604.4	3	2	2						3			
HSMC604.5		3									1	

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
HSMC604.1	2	2	2
HSMC604.2	2	2	2
HSMC604.3	2	2	2
HSMC604.4	2	2	2
HSMC604.5	2	2	2

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

Course Outcomes (COs):

After attending the course students should be able to

CO1	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.
CO2	Understand/analyze different protocol of data link layer and apply them to solve engineering problems.
CO3	Understand/analyze different protocol of Network and Transport Layer and apply them to solve engineering problems.
CO4	Understand/analyze different protocol of session and application layer and apply them to solve engineering problems.
CO5	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
PCC-CS601.1		2		2					2			
PCC-CS601.2		2			2				2			
PCC-CS601.3	2	2			2				2			
PCC-CS601.4	2	2			3	2			2			
PCC-CS601.5	3	3										

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PCC-CS601.1	3	3	3
PCC-CS601.2	3	3	3
PCC-CS601.3	3	3	3
PCC-CS601.4	3	3	3
PCC-CS601.5	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

CO1	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
CO2	Analyze, elicit and specify software requirements through a productive working relationship with various stakeholders of the project
CO3	Design applicable solutions in one or more application domains using software engineering approaches that integrates ethical, social, legal and economic concerns.
CO4	Develop the code from the design and effectively apply relevant standards and perform testing, and quality management and practice team work.
CO5	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
PCC-CS602.1	3	3	3	3								
PCC-CS602.2	3	3	2	2								
PCC-CS602.3	3	3	3	3				3				3
PCC-CS602.4	3	3	3	3					3			
PCC-CS602.5	3	2	3	2	3				3	2	3	3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PCC-CS602.1	3	3	3
PCC-CS602.2	3	3	3
PCC-CS602.3	3	3	3
PCC-CS602.4	3	3	3
PCC-CS602.5	3	3	3

Course Name: Advance Algorithm
Course Code: PEC-CS-T-601
Contact Hours/Week:3L
Credit: 3

Course Outcomes (COs):

After attending the course students should be able to

CO1	Analyze the complexity/performance of different algorithms.
CO2	Determine the appropriate algorithm for solving a particular set of problems.
CO3	Categorize the different problems in various classes according to their complexity.
CO4	Achieve an insight of recent activities in the field of the advanced algorithm.
CO5	Design and build solutions for a real-world problem by applying relevant distributions

CO-PO Mapping

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-T-601.1	3	3	3
PEC-CS-T-601.2	3	3	3
PEC-CS-T-601.3	3	3	3
PEC-CS-T-601.4	3	3	3
PEC-CS-T-601.5	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

CO1	Understand the architecture and classifications of different embedded systems and the related programming knowledge.
CO2	Identify and understand the concepts of embedded systems like I/O, timers, interrupts, interaction with peripheral devices
CO3	Choose case-specific debugging technique for an embedded system.
CO4	Design various real time systems using embedded systems.
CO5	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

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-S-601.1	3	3	3
PEC-CS-S-601.2	3	3	3
PEC-CS-S-601.3	3	3	3
PEC-CS-S-601.4	3	3	3
PEC-CS-S-601.	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

CO1	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.
CO2	Understand the fundamental concepts of regression problems so that they can propose models for predicting values based on exemplary data and Analyze their performances.
CO3	Explain or Illustrate the fundamental strategies of unsupervised machine learning paradigm to solve clustering problems and Analyze their performances.
CO4	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.
CO5	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
PEC-CS-D-601.1	3	2										
PEC-CS-D-601.2	2	3										
PEC-CS-D-601.3	2	2	3	2								
PEC-CS-D-601.4	2	2	2	3								
PEC-CS-D-601.5	2	2	3	3								2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-D-601.1	3	3	3
PEC-CS-D-601.2	3	3	3
PEC-CS-D-601.3	3	3	3
PEC-CS-D-601.4	3	3	3
PEC-CS-D-601.5	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

CO1	To develop interactive web pages using HTML, DHTML, CSS and image map
CO2	To procure the knowledge of information interchange formats like XML
CO3	To validate fields of web pages using scripting languages like JavaScript
CO4	To develop web applications using PHP and ASP.net
CO5	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
PEC-CS-A-601.1	3	3	3	3	3							
PEC-CS-A-601.2	3	3	3	3	2							
PEC-CS-A-601.3	3	3	3	3	2							3
PEC-CS-A-601.4	3	3	3	3	2							
PEC-CS-A-601.5	3	3	3	3	2				3		2	

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-A-601.1	3	3	3
PEC-CS-A-601.2	3	3	3
PEC-CS-A-601.3	3	3	3
PEC-CS-A-601.4	3	3	3
PEC-CS-A-601.5	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

CO1	Understand and explain the basic concept of soft computing and hard computing and apply them in designing solution to engineering problem.
CO2	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.
CO3	Explore relevant literature and apply fuzzy logic and reasoning to handle uncertainty and solving interdisciplinary engineering problems
CO4	Use genetic algorithms to combinatorial optimization problems and recognize the feasibility of applying a soft computing methodology for a particular problem.
CO5	Implement the concept and techniques of designing of soft computing methods in real world problem.

CO-PO Mapping

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-D-602.1	3	3	3
PEC-CS-D-602.2	3	3	3
PEC-CS-D-602.3	3	3	3
PEC-CS-D-602.4	3	3	3
PEC-CS-D-602.5	3	3	3

Course Name: Embedded System
Course Code: PEC-CS-S-602
Contact Hours/Week:3P
Credit: 3
Prerequisite: Knowledge of microprocessor and microcontroller.

Course Outcomes (COs):

After attending the course students should be able to

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

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEC-CS-S-602.1	3	2										3
PEC-CS-S-602.2	3	3										
PEC-CS-S-602.3	2	2	3	2				3	3			
PEC-CS-S-602.4	3	2	2	3				3	3			2
PEC-CS-S-602.5	1	2	3	3	2			3	-	3		2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-S-602.1	3	3	3
PEC-CS-S-602.2	3	3	3
PEC-CS-S-602.3	3	3	3
PEC-CS-S-602.4	3	3	3
PEC-CS-S-602.5	3	3	3

Course Name: PARALLEL AND DISTRIBUTED SYSTEMS
Course Code: PEC-CS-T-602
Contact Hours/Week:3
Credit:3

Prerequisite: The student have the basic knowledge of Computer Organization Architecture,Distributed System and Operating System.

Course Outcomes (COs):
After attending the course students should be able to

CO1	Understand of the parallel architecture and Programming
CO2	Design parallel programs develop CUDA programs for GPU.
CO3	Analyze and apply various parallel algorithms.
CO4	Capable to optimize algorithms for better performance
CO5	Understanding the distributed system

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEC-CS-T-602.1	3	2	2	2	1	2				2	2	2
PEC-CS-T-602.2	2	3	3	2	2	1				1	2	3
PEC-CS-T-602.3	2	2	3	1	3	2	2			1	3	2
PEC-CS-T-602.4	1	3	1	3	2	3	2			3	1	1
PEC-CS-T-602.5	2	1	2	3	2	2	3			1	2	3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-T-602.1	3	3	3
PEC-CS-T-602.2	3	3	3
PEC-CS-T-602.3	3	3	3
PEC-CS-T-602.4	3	3	3
PEC-CS-T-602.5	3	3	3

Course Name: : Human Computer Interaction
Course Code: PCC-CS-A-602
Contact Hours/Week:3
Credit: 3
Prerequisites: Computer Programming Knowledge, Object Oriented Programming

Course Outcomes (COs):
After attending the course students should be able to

CO1	Understand the fundamental concepts of Human Computer Interaction to Explain or Illustrate and Identify problems where students can Apply the concept appropriately to Solve them.
CO2	Understand the fundamental concepts of Interactive Design so that they can Design user interface as per specification and Validate it.
CO3	Understand and Explain the fundamental concepts of HCI Models and Analyse their effectiveness and limitations.
CO4	Explain or Illustrate the fundamental design principles of HCI for mobile platforms and Use it appropriately to Design user interface as per specification.
CO5	Understand the fundamental design principles of Web-interface and Design web-interface as per specification and analyse the effectiveness as well as limitations of them 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
PCC-CS-A-602.1	3	2										
PCC-CS-A-602.2	2	3										
PCC-CS-A-602.3	2	2	3	2								
PCC-CS-A-602.4	2	2	2	3								
PCC-CS-A-602.5	2	2	3	3								2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PCC-CS-A-602.1	3	3	3
PCC-CS-A-602.2	3	3	3
PCC-CS-A-602.3	3	3	3
PCC-CS-A-602.4	3	3	3
PCC-CS-A-602.5	3	3	3

Course Name: Introduction to Internet of Things
Course Code: OEC-CS-601A
Contact Hours/Week:3
Credit: 3

Prerequisite: 1.Fundamental knowledge in computer networking.
2.Basic knowledge of Microcontroller fundamentals

Course Outcome(s):

After completion of the course students will be able to

CO1	Understand and differentiate the fundamental concepts of Internet of Things andthe Internet.
CO2	Demonstrate the concepts of wireless sensor network, Analyze and Identifyappropriate
CO3	Analyze and compare the basic protocols used in different OSI layer of wire lesensor network and IoT.
CO4	Describe IoT architecture and Machine to machine communication.
CO5	Design basic IoT applications and Solve different real life problems in differed domains based upon the concept of IoT and sensor network.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
OEC-CS-601A.1	3	3	3	3	1	1						
OEC-CS-601A.2	3	3	3	3	2	1	1				1	1
OEC-CS-601A.3	3	3	3	2	2	1	-					
OEC-CS-601A.4	3	3	3	2	2	1	1					
OEC-CS-601A.5	3	3	3	3	3	2	2		1	1	2	1

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
OEC-CS-601A.1	3	3	3
OEC-CS-601A.2	3	3	3
OEC-CS-601A.3	3	3	3
OEC-CS-601A.4	3	3	3
OEC-CS-601A .5	3	3	3

Course Name: Bio-informatics
Course Code: OEC-CS- 601B
Contact Hours/Week:3
Credit: 3

Course Outcomes (COs):
After attending the course students should be able to

CO1	Acquire the knowledge of Bioinformatics technologies with the related concept of DNA, RNA and their implications
CO2	Develop idea in Molecular Biology
CO3	Understand the concept and techniques of different types of Data Organization and Sequence Databases with different types of Analysis Tools for Sequence Data Banks
CO4	Acquire the knowledge of the DNA Sequence Analysis
CO5	Analyze the performance of different types of Probabilistic models used in Computational Biology

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
OEC-CS-601B.1	3					1	1					
OEC-CS-601B.2		1	2	1						1		1
OEC-CS-601B.3	1	2		2	2				1			
OEC-CS-601B.4	2					2	2			1	1	
OEC-CS-601B.5		3		1		3		1			2	

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
OEC-CS- 601B.1	3	3	3
OEC-CS- 601B.2	3	3	3
OEC-CS- 601B.3	3	3	3
OEC-CS- 601B.4	3	3	3
OEC-CS- 601B.5	3	3	3

Course Name: Robotics
Course Code: OEC-CS- 601C
Contact Hours/Week:3
Credit: 3

Course Outcomes (COs):
After attending the course students should be able to

CO1	Understand the basic concepts of robotics exploring the characteristics of its various components, motion control, actuator and drive system and the functionsof various sensors in robotics, and robot programming
CO2	Apply the concepts of robotics for machine loading and their kinematics and
CO3	Illustrate concepts of Linear and angularvelocity of links, Velocitypropagation, Manipulator Jacobians for serial and parallel manipulators.
CO4	Understand classical control concepts and use advanced topics in non-linearcontrol of manipulators.
CO5	Develop algorithmic solutions and corresponding robot-programs for designingvarious robotic systems.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
OEC-CS-601C.1	3	3	3	2	1						2	
OEC-CS-601C.2	2	3		1								
OEC-CS-601C.3	2	3	3									
OEC-CS-601C.4	2	2	2	1	1				1			3
OEC-CS-601C.5	3	3	3	3	3	2	2		2		2	2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
OEC-CS-601C.1	3	3	3
OEC-CS-601C.2	3	3	3
OEC-CS-601C.3	3	3	3
OEC-CS-601C.4	3	3	3
OEC-CS-601C.5	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

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

CO-PO Mapping

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PCC-CS692.1	3	3	3
PCC-CS692.2	3	3	3
PCC-CS692.3	3	3	3
PCC-CS692.4	3	3	3
PCC-CS692.5	3	3	3

Course Name: Computer Networks Lab
Course Code: OEC-CS-601C
Contact Hours/Week:3P
Credit: 2

Course Outcomes (COs):

After attending the course students should be able to

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

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
OEC-CS-601C.1	1											
OEC-CS-601C.2		3										
OEC-CS-601C.3									3	2	3	2
OEC-CS-601C.4	2		3			2	2					
OEC-CS-601C.5	1										3	

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
OEC-CS-601C.1	3	3	3
PEC-CS-T-691.2	2	3	3
PEC-CS-T-691.3	3	3	2
PEC-CS-T-691.4	3	2	3
PEC-CS-T-691.5	3	3	3

Course Name: Advanced Algorithms Lab
Course Code: PEC-CS-T-691
Contact Hours/Week: 3
Credit: 1.5

Course Outcomes (COs):

After attending the course students should be able to

CO1	Introduce students to the advanced strategies of designing and analyzing algorithms.
CO2	The student should be able to prefer suitable algorithms and use it for a precise problem.
CO3	To familiarize students with basic paradigms and data structures used to solve advanced algorithmic problems.
CO4	Students should be able to understand different classes of problems concerning their computation difficulties.
CO5	To introduce the students to recent developments in the area of algorithmic design.

CO-PO Mapping

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-T-691.1	3	3	3
PEC-CS-T-691.2	3	3	3
PEC-CS-T-691.3	3	3	3
PEC-CS-T-691.4	3	3	3
PEC-CS-T-691.5	3	3	3

Course Name: Advanced Operating Systems Lab
Course Code: PEC-CS-S-691
Contact Hours/Week: 3
Credit: 1.5

Course Outcomes (COs):

After attending the course students should be able to

CO1	Analyze and simulate CPU Scheduling Algorithms like FCFS, Round Robin, SJF, and Priority.
CO2	Understand the concepts of deadlock in operating systems.
CO3	Implement them in Multiprogramming system.
CO4	Create process creation and implement inter process communication
CO5	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
PEC-CS-S-691.1	3	3	3	3								
PEC-CS-S-691.2	3	3	3	3								
PEC-CS-S-691.3	3	3	3	3								3
PEC-CS-S-691.4	3	3	3	3								
PEC-CS-S-691.5	3	3	3	3					3	3		

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-S-691.1	3	3	3
PEC-CS-S-691.2	3	3	3
PEC-CS-S-691.3	3	3	3
PEC-CS-S-691.4	3	3	3
PEC-CS-S-691.5	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

CO1	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.
CO2	Understand the fundamental concepts of regression problems so that they can propose models for predicting values based on exemplary data and Analyze their performances.
CO3	Explain or Illustrate the fundamental strategies of unsupervised machine learning paradigm to solve clustering problems and Analyze their performances.
CO4	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.
CO5	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
PEC-CS-D-691.1	3	2										3
PEC-CS-D-691.2	2	3										
PEC-CS-D-691.3	2	2	3	2								
PEC-CS-D-691.4	2	2	2	3								2
PEC-CS-D-691.5	2	2	3	3	2	2	2	2	2	2	2	2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-D-691.1	3	3	3
PEC-CS-D-691.2	3	3	3
PEC-CS-D-691.3	3	3	3
PEC-CS-D-691.4	3	3	3
PEC-CS-D-691.5	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

CO1	To develop interactive web pages using HTML, DHTML, CSS and image map
CO2	To procure the knowledge of information interchange formats like XML
CO3	To validate fields of web pages using scripting languages like JavaScript
CO4	To develop web applications using PHP and ASP.net
CO5	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
PEC-CS-A-691.1	3	3	3	3	2							
PEC-CS-A-691.2	3	3	3	3	2							
PEC-CS-A-691.3	3	3	3	3	2							3
PEC-CS-A-691C.4	3	3	3	3	2							
PEC-CS-A-691.5	3	3	3	3	2				3		2	

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-A-691.1	3	3	3
PEC-CS-A-691.2	3	3	3
PEC-CS-A-691.3	3	3	3
PEC-CS-A-691.4	3	3	3
PEC-CS-A-691.5	3	3	3

Course Name Intellectual Property Right
Course Code: MC601
Contact Hours/Week: 3P
Credit: 0

Course Outcomes (COs):

After completion of the course students would be able to

CO1	Explain fundamental aspects of Intellectual property Rights to students
CO2	To disseminate knowledge on patents, patent regime in India and abroad and registration aspects
CO3	To disseminate knowledge on copyrights and its related rights and registration aspects
CO4	To aware about current trends in IPR and Govt. steps in fostering IPR
CO5	To disseminate knowledge on Design, Geographical Indication (GI), Plant Variety and Layout Design Protection and their registration aspects

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
MC601.1	3	3	3	3	2							
MC601.2	3	3	3	3	2							
MC601.3	3	3	3	3	2							3
MC601.4	3	3	3	3	2							
MC601.5	3	3	3	3	2				3		2	

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
MC601.1	3	3	3
MC601.2	3	3	3
MC601.3	3	3	3
MC601.4	3	3	3
MC601.5	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

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

CO-PO Mapping

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-T-701.1	3	3	3
PEC-CS-T-701.2	3	2	3
PEC-CS-T-701.3	3	3	2
PEC-CS-T-701.4	3	2	3
PEC-CS-T-701.5	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

CO1	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.
CO2	Identify and formulate an engineering problem within the scope of Data Mining and Data Warehousing paradigm.
CO3	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.
CO4	Develop ideas for proposing solutions to the challenging problems of Data Mining and Data Warehousing.
CO5	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

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-D-701.1	3	3	3
PEC-CS-D-701.2	3	3	3
PEC-CS-D-701.3	3	3	3
PEC-CS-D-701.4	3	3	3
PEC-CS-D-701.5	3	3	3

Course Name: Cloud Computing
Course Code: PEC-CS-A-701
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Course Outcomes (COs):

After attending the course students should be able to

CO1	Identify the appropriate cloud services for a given application
CO2	Assess the comparative advantages and disadvantages of Virtualization technology
CO3	Analyze authentication, confidentiality and privacy issues in cloud computing
CO4	Identify security implications in cloud computing.
CO5	Understand the importance of protocols and standards in management for cloud services.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEC-CS-A-701.1	3	3	3	3	2							2
PEC-CS-A-701.2	3	3	3	3		2	2					2
PEC-CS-A-701.3	3	3	3	3				2	2			2
PEC-CS-A-701.4	3	3	3	3								2
PEC-CS-A-701.5	3	3	3	3								3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-A- 701.1	3	2	2
PEC-CS-A-701.2	3	2	3
PEC-CS-A-701.3	3	3	2
PEC-CS-A-701.4	3	3	2
PEC-CS-A-701.5	3	3	3

Course Name: Ad-Hoc and Sensor Networks
Course Code: PEC-CS-S-701
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Course Outcomes (COs):

After attending the course students should be able to

CO1	**Understand** and **explain** the Fundamental Concepts and applications of ad- hocand wireless sensor networks
CO2	**Describe** and **analyze** the MAC protocol issues of ad-hoc networks
CO3	**Design** and **develop** routing protocols for ad-hoc wireless networks with respect toTCP design issues
CO4	**Explain** the concepts of network architecture and MAC layer protocol for WSN
CO5	**Develop** and **analyze** the WSN routing issues by considering QoS measurements

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEC-CS-S-701.1	3	2	2	2	2	1	1			3	2	3
PEC-CS-S-701.2	3	3	3	3	2	1	1			3	2	3
PEC-CS-S-701.3	3	3	2	3	2	1	1			3	2	3
PEC-CS-S-701.4	3	3	2	2	2	1	1			3	2	3
PEC-CS-S-701.5	3	3	3	3	2	1	1			3	2	3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-S-701.1	3	2	2
PEC-CS-S-701.2	3	2	3
PEC-CS-S-701.3	3	3	2
PEC-CS-S-701.4	3	3	2
PEC-CS-S-701.5	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

CO1	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.
CO2	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.
CO3	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.
CO4	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.
CO5	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
PEC-CS-T-702.1	3	3	3	3	2							2
PEC-CS-T-702.2	3	3	3	3		2	2					2
PEC-CS-T-702.3	3	3	3	3				2	2			2
PEC-CS-T-702.4	3	3	3	3								2
PEC-CS-T-702.5	3	3	3	3								3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-T-702.1	3	2	2
PEC-CS-T-702.2	3	2	3
PEC-CS-T-702.3	3	3	2
PEC-CS-T-702.4	3	3	2
PEC-CS-T-702.5	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

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

CO-PO Mapping

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-S-702.1	3	3	3
PEC-CS-S-702.2	3	3	3
PEC-CS-S-702.3	2	3	3
PEC-CS-S-702.4	3	3	2
PEC-CS-S-702.5	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

CO1	Analyze and apply the morality and method of Human Languages such as English and other Indian Languages using computers.
CO2	Understand the semantics and pragmatics of English language for text processing
CO3	Create CORPUS linguistics based on digestive approach (Text Corpus method)
CO4	Illustrate, analyze and apply for the modern techniques for statistical approaches to machine translation.
CO5	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

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-D-702.1	3	3	3
PEC-CS-D-702.2	3	3	3
PEC-CS-D-702.3	3	3	3
PEC-CS-D-702.4	3	3	3
PEC-CS-D-702.5	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

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

CO-PO Mapping

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-A-702.1	3	3	3
PEC-CS-A-702.2	3	2	2
PEC-CS-A-702.3	2	2	2
PEC-CS-A-702.4	3	3	3
PEC-CS-A-702.5	3	3	3

Course Name: Optimization Techniques
Course Code: OEC-CS-701C
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Prerequisites: Linear algebra, Probability
Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand Decision making procedure and its applications - Explain orIllustrate and Identify queuing model and simulation in real life scenario.
CO2	Understand the essential features and scope of optimization techniques - Learn and Analyze the properties of objective function and formalization of optimization problem.
CO3	Learn numerical methods to find optimum point and value of a function - Learn to solvethe LPP.
CO4	Explain or Illustrate transportation problems and assignment problems. - Applyin real life situations.
CO5	Learn applications of network models and analyse the model – Learn to use TabuSearch methods in various fields.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
OEC-CS-701C.1	3	2										
OEC-CS-701C.2	2	3										
OEC-CS-701C.3	2	2	3	2								
OEC-CS-701C.4	2	2	2	3								
OEC-CS-701C.5	2	2	3	3								2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
OEC-CS-701C.1	3	3	3
OEC-CS-701C.2	3	3	3
OEC-CS-701C.3	3	3	3
OEC-CS-701C.4	3	3	3
OEC-CS-701C.5	3	3	3

Course Name: Cyber Law and Ethics
Course Code: OEC-CS-702A
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Prerequisites: Familiarity in computer Networking, Basic concepts about network security
Course Outcomes (COs):

After attending the course students should be able to

CO1	To understand the importance of professional practice, Law and Ethics in theirpersonal lives and professional careers.
CO2	To acquire in depth knowledge of information technology act, security policies,and legal framework of right to privacy, data security and data protection
CO3	To develop the understanding of relationship between commerce and cyberspace
CO4	To be familiar with network security threats and countermeasures
CO5	To develop competencies for dealing with frauds and deceptions (ConfidenceTricks, Scams

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
OEC-CS-702A.1	3	3	3	3								2
OEC-CS-702A.2	3	3	3	3								2
OEC-CS-702A.3	3	3	3	3								2
OEC-CS-702A.4	3	3	3	3								2
OEC-CS-702A.5	3	3	3	3								2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
OEC-CS-702A.1	3	3	3
OEC-CS-702A.2	3	3	3
OEC-CS-702A.3	3	3	3
OEC-CS-702A.4	3	3	3
OEC-CS-702A.5	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

CO1	Understand the basic knowledge of Parallel Processing and apply it in solving Complex Engineering Problem.
CO2	Develop and design parallel system with Compute Unified Device Architecture (CUDA) for engineering problem leading to lifelong learning.
CO3	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.
CO4	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.
CO5	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

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
OEC-CS-701A.1	3	3	3
OEC-CS-701A.2	3	3	3
OEC-CS-701A.3	3	3	3
OEC-CS-701A.4	3	3	3
OEC-CS-701A.5	3	3	3

Course Name: VLSI
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

CO1	Understand basic CMOS circuits and properties of CMOS transistors and able to draw stick diagram and layout of CMOS circuits.
CO2	Apply CMOS realization for combinational logic design and analyze the delay models for combinational circuits and understand power dissipation and low power design principles in CMOS circuits.
CO3	Describe fabrication steps of IC and construct stick diagram & layout of CMOS inverter and basic gates based on Layout design rules
CO4	Understand different architectures for address and analyze the speed and area trade off and also understand accumulators, multipliers, dividers and barrel shifters.
CO5	Understand the techniques of chip design using programmable devices like VHDL or Verilog Combinational & Sequential Logic circuit Design

CO-PO Mapping

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
OEC-CS-701B.1	3	3	3
OEC-CS-701B.2	3	3	3
OEC-CS-701B.3	3	3	3
OEC-CS-701B.4	3	3	3
OEC-CS-701B.5	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

CO1	Read basic French and interpret the meaning
CO2	Construct simple sentences in French
CO3	Interact with others and hold simple conversations in French
CO4	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
OEC-CS-702C.1						3	3					
OEC-CS-702C.2						3	3					
OEC-CS-702C.3						3	3					
OEC-CS-702C.4						3	3					
OEC-CS-702C.5						3	3					

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
OEC-CS-702C.1	2	2	2
OEC-CS-702C.2	2	2	2
OEC-CS-702C.3	2	2	2
OEC-CS-702C.4	2	2	2
OEC-CS-702C.5	2	2	2

Course Name: Information Theory and Coding Lab
Course Code: PEC-CS-T-791
Contact: 3:0:0
Total Contact Hours: 36
Credits: 1.5

Prerequisites: Knowledge of C programming and MATLAB

Course Outcomes (COs):

After attending the course students should be able to

CO1	Illustrate and apply proper code in appropriate platform using suitable syntax for developing program to solve problems related to Mathematics and Engineering field leading to lifelong learning.
CO2	Understand the concept of variables, constants, data type, operator, expression, statements, loops, vector, matrix, array, function, file handling and apply this knowledge to design the problem using modern tools for solving complex engineering problems.
CO3	Apply systematic approach to design the programs for solving problems as a professional engineering practice.
CO4	Solve and analyse engineering-related computational problems by applying a variety of common numeric techniques
CO5	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
PEC-CS-T-791.1	3	3	3	3								3
PEC-CS-T-791.2	3	3	3	3								
PEC-CS-T-791.3	3	3	3	3				3				
PEC-CS-T-791.4	3	3	3	3				3		3		
PEC-CS-T-791.5	3	3	3	3				3				

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-T-791.1	2	2	2
PEC-CS-T-791.2	2	2	2
PEC-CS-T-791.3	2	2	2
PEC-CS-T-791.4	2	2	2
PEC-CS-T-791.5	2	2	2

Course Name: Ad-Hoc and Sensor Networks lab
Course Code: PEC-CS-S-791
Contact: 3:0:0
Total Contact Hours: 36
Credits: 1.5

Prerequisites: Basic concept of computer network and communication engineering Basic programming knowledge

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand and explain the Fundamental Concepts and applications of ad-hoc and wireless sensor networks
CO2	Describe and analyze the challenges of designing MAC protocol in mobilead-hoc networks
CO3	Describe and analyze the challenges in designing routing and transportprotocols for mobile ad-hoc networks.
CO4	Describe and analyze the challenges of designing MAC protocol in sensornetworks
CO5	Describe and analyze the challenges in designing routing and transportprotocols for sensor networks.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEC-CS-S-791.1	3	3	3	3								3
PEC-CS- S-791.2	3	3	3	3								
PEC-CS- S-791.3	3	3	3	3								
PEC-CS- S-791.4	3	3	3	3						3		
PEC-CS- S-791.5	3	3	3	3								

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS- S-791.1	2	2	2
PEC-CS-S-791.2	2	2	2
PEC-CS-S-791.3	2	2	2
PEC-CS-S-791.4	2	2	2
PEC-CS-T-791.5	2	2	2

Course Name: Data Mining and Data Warehousing Lab
Course Code: PEC-CS-D-791
Contact: 3:0:0
Total Contact Hours: 36
Credits: 1.5
Prerequisites: Data Structure& Programming, Design and Analysis of Algorithms,Database Management Systems, Statistics, Artificial Intelligence, Python Programming

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand the practical aspects of Data Mining and Data Warehousing through implementation of ideas using proper techniques and tools to recognize their utilitarian importance in current technological context for further exploration leading towards lifelong learning.
CO2	Identify and formulate an engineering problem by exploring contextual data and its characteristics within the scope of Data Mining and Data
CO3	Explore relevant literature and apply the concepts of Data Mining and Data Warehousing by implementing well-known algorithmic solutions to large scale data using proper techniques and tools to solve contextual problems.
CO4	Develop ideas and propose technical solutions to the challenging problems of Data Mining and Data Warehousing.
CO5	Plan and Implement Data Mining based ideas as executable programs (preferably termed as models) by developing suitable algorithms with adequate documentation in collaborative environment for successfully carrying out projects on Data Mining and Data Warehousing and investigate their effectiveness by analyzing the performances using proper techniques and tools.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEC-CS-D-791.1	3	2										3
PEC-CS-D-791.2	2	3										
PEC-CS-D-791.3	2	2	3	2								
PEC-CS-D-791.4	2	2	2	3								2
PEC-CS-D-791.5	2	2	3	3	2	2	2	2	2	2	2	2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-D-791.1	2	2	2
PEC-CS-D-791.2	2	2	2
PEC-CS-D-791.3	2	2	2
PEC-CS-D-791.4	2	2	2

PEC-CS-D-791.5	2	2	2

Course Name: Cloud Computing Lab
Course Code: PEC-CS-A-791
Contact: 3:0:0
Total Contact Hours: 36
Credits: 1.5

Prerequisites: Knowledge of C programming and MATLAB

Course Outcomes (COs):

After attending the course students should be able to

CO1	Illustrate and apply proper code in appropriate platform using suitable syntax for developing program to solve problems related to Mathematics and Engineering field leading to lifelong learning.
CO2	Understand the concept of variables, constants, data type, operator, expression, statements, loops, vector, matrix, array, function, file handling and apply this knowledge to design the problem using modern tools for solving complex engineering problems.
CO3	Apply systematic approach to design the programs for solving problems as a professional engineering practice.
CO4	Solve and analyse engineering-related computational problems by applying a variety of common numeric techniques
CO5	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
PEC-CS-A-791.1	1											
PEC-CS-A-791.2		3										
PEC-CS-A-791.3									3	2	3	2
PEC-CS-A-791.4	2		3			2	2					
PEC-CS-A-791.5	1										3	

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-A-791.1	2	2	2
PEC-CS-A-791.2	2	2	2
PEC-CS-A-791.3	2	2	2
PEC-CS-A-791.4	2	2	2

PEC-CS-A-791.5	2	2	2

Course Name: High Performance Computing Lab
Course Code: OEC-CS-791A
Contact: 3:0:0
Total Contact Hours: 36
Credits: 1.5
Prerequisites: Computer Architecture Lab, Operating System Lab, Compiler design Lab

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand, design and develop effective programs for engineering and mathematical problems applying device Query, Vector Addition, different Matrix Multiplication, different Image processing algorithms using Xeon Phi Programming or modern programming tools leading to lifelong learning.
CO2	Understand, design and develop effective programs for engineering and mathematical problems applying device Query, Vector Addition, different Matrix Multiplication, different Image processing algorithms using OpenMPI programming or modern programming tools leading to lifelong learning.
CO3	Design and develop effective programs for engineering and mathematical problems like DAXPY, Matrix Multiply, Calculation of pi using work sharing and reduction, Producer consumer problem, Molecular dynamics simulation using Open MPI programming possibly as a team maintaining proper ethics of collaboration.
CO4	Implement and analyze program for engineering and mathematical problems like DAXPY, Calculation of π - MPI Bcast and MPI Reduce, Ocean Kernel, and also for different Large Matrices using MPI programming leading to lifelong learning.
CO5	Prepare laboratory reports on interpretation of experimental results and analyze it for validating the same maintaining proper ethics of collaboration.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
OEC-CS-791A.1	3	3	3	3	3							3
OEC-CS-791A.2	3	3	3	3	3							3
OEC-CS-791A.3	3	3	3	3	2			2	2			
OEC-CS-791A.4	3	3	3	3								3
OEC-CS-791A.5								3		3		

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
OEC-CS-791A.1	2	2	2
OEC-CS-791A.2	2	2	2
OEC-CS-791A.3	2	2	2
OEC-CS-791A.4	2	2	2

OEC-CS-791A.5	2	2	2

Course Name: VLSI Lab
Lab Course Code: OEC-CS-791B
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Prerequisites: Concept of courses Solid State Devices; Analog Electronic Circuit; DigitalElectronic and Circuit

Course Outcomes (COs):

After attending the course students should be able to

CO1	Design basic and universal gates, adder and subtractor using VHDL.
CO2	Design multiplexers, demultiplexers, encoders and decoders
CO3	Design code converters, parity generator and comparator using various styles of modeling.
CO4	Design sequential circuits like counters, shift registers and flip-flops.
CO5	Implement digital circuit on FPGA kit.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
OEC-CS-791B.1	2	3	2	2							2	2
OEC-CS-791B.2	3	3	3	3	2						2	2
OEC-CS-791B.3	2	2	3	2							2	2
OEC-CS-791B.4	3	2	2	3							2	2
OEC-CS-791B.5	3	2	2	3		1	1	1		1	2	2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
OEC-CS-791B.1	2	2	2
OEC-CS-791B.2	2	2	2
OEC-CS-791B.3	2	2	2
OEC-CS-791B.4	2	2	2
OEC-CS-791B.5	2	2	2

Course Name: Optimization Techniques Lab
Course Code: OEC-CS- 791C
Contact: 3:0:0
Total Contact Hours: 36
Credits: 1.5

Course Outcomes (COs):

After attending the course students should be able to

CO1	Demonstrate the basic principles and concepts of Python
CO2	Explore the applicability of programming skills in Python
CO3	Summarize various optimization techniques like LPP models.
CO4	Analyse the transportation, inventory and assignment problems.
CO5	Evaluate the concepts of sequencing, game theory and dynamic programming.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
OEC-CS- 791C.1	2	2										
OEC-CS- 791C.2	3	2		2	3							
OEC-CS- 791C.3	3	3										
OEC-CS- 791C.4	1	3		3	3							
OEC-CS- 791C.5	1	3		2	2							

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
OEC-CS- 791C.1	2	2	2
OEC-CS- 791C.2	2	2	2
OEC-CS- 791C.3	2	2	2
OEC-CS- 791C.4	2	2	2
OEC-CS- 791C.5	2	2	2

Course Name: Entrepreneurship & Innovation Skill
Course Code: MC781
Contact: 3:0:0
Total Contact Hours: 36
Credits: 0

Course Outcomes (COs):

After attending the course students should be able to

CO1	Comprehend the role of bounded rationality, framing, causation and effectuation in entrepreneurial decision making.
CO2	Demonstrate an ability to design a business model canvas.
CO3	Evaluate the various sources of raising finance for startup ventures.
CO4	Explain the fundamentals of developing and presenting business pitching to potential investors.
CO5	Implement case study of entrepreneurial venture in your nearby area

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
MC781.1	2	2										
MC781.2	3	2		2	3							
MC781.3	3	3										
MC781.4	1	3		3	3							
MC781.5	1	3		2	2							

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
MC781.1	2	2	2
MC781.2	2	2	2
MC781.3	2	2	2
MC781.4	2	2	2

MC781.5	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

CO1	To understand the basic concept of Graph theory and Graph Algorithm and apply them in designing solution to Computer Science and engineering domain problem.
CO2	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
CO3	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.
CO4	To apply the graph theory principles and concepts to design an efficient algorithm and use suitable data structure for problem solving.
CO5	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

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-T-801.1	3	3	3
PEC-CS-T-801.2	3	3	3
PEC-CS-T-801.3	3	3	3
PEC-CS-T-801.4	3	3	3
PEC-CS-T-801.5	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

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

CO-PO Mapping

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-S-801.1	3	3	3
PEC-CS-S-801.2	3	3	3
PEC-CS-S-801.3	3	3	3
PEC-CS-S-801.4	3	3	3
PEC-CS-S-801.5	3	3	3

Course Name: 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

CO1	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.
CO2	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.
CO3	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.
CO4	Excogitate ideas for proposing solutions to the challenging problems of Big Data Analytics.
CO5	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

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-D-801.1	3	2	2
PEC-CS-D-801.2	3	3	2
PEC-CS-D-801.3	3	2	3
PEC-CS-D-801.4	2	2	3
PEC-CS-D-801.5	2	3	3

Course Name: Image Processing
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

CO1	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.
CO2	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.
CO3	Illustrate the fundamental image restoration strategies and Apply them appropriately to eliminate noise in the image.
CO4	Illustrate various Image Compression Techniques and Apply them to compress theimages and Analyze their performances.
CO5	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 under scoring 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
PEC-CS-A-801.1	3	3	3	3	3							3
PEC-CS-A-801.2	3	3	3	3	3							3
PEC-CS-A-801.3	3	3	3	3	3							3
PEC-CS-A-801.4	3	3	3	3	3							3
PEC-CS-A-801.5	3	3	3	3	3							3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PEC-CS-A-801.1	3	3	3
PEC-CS-A-801.2	3	3	3
PEC-CS-A-801.3	3	3	3

PEC-CS-A-801.4	3	3	3
PEC-CS-A-801.5	3	3	3

Course Name: Human Resource Development and Organizational Behaviour
Course Code: OEC-CS-801A
Credit: 3
No. of Lectures: 36

Course Outcomes (COs):

After attending the course students should be able to

CO1	To understand key functions in management as applied in practice.
CO2	To identify and analyses major practices associated with HRD in modern work andorganizations.
CO3	To evaluate the connections between the HRD process and the contemporary performance management concerns of organizations.
CO4	To assess the potential effects of organizational-level factors (such as structure, culture and change) on organizational behavior.
CO5	To evaluate the potential effects of important developments in the external environment (such as globalization and advances in technology) on organizational behavior.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
OEC-CS-801A.1	3	3	3		1							
OEC-CS-801A.2	3	3		3								3
OEC-CS-801A.3	3	3	3	3	3							
OEC-CS-801A.4	3		3	3	1			2				
OEC-CS-801A.5	3	3	3	3	1							

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
OEC-CS-801A.1	2	2	2
OEC-CS-801A.2	2	2	2
OEC-CS-801A.3	2	2	2
OEC-CS-801A.4	2	2	2

OEC-CS-801A.5	2	2	2

Course Name: Block Chain
Course Code: OEC-CS-801B
Credit: 3
No. of Lectures: 36

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand blockchain terminologies and its properties and the emerging models for blockchain technology
CO2	Familiarize with the functional/operational aspects of crypto currency ecosystem
CO3	Design, code, deploy and execute a smart contract – the computational element of the blockchain technology using Solidity and Remix IDE
CO4	Build private - permissioned blockchain -based applications for enterprises and businesses
CO5	Explore the blockchain decentralization and cryptography concepts.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
OEC-CS-801B.1	3	2	2	2								
OEC-CS-801B.2	2	3										
OEC-CS-801B.3	2	2	3	2								
OEC-CS-801B.4	2	2	2	3								
OEC-CS-801B.5	2	2	3	3								3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
OEC-CS-801B.1	2	2	2
OEC-CS-801B.2	2	2	2
OEC-CS-801B.3	2	2	2
OEC-CS-801B.4	2	2	2

OEC-CS-801B.5	2	2	2

Course Name: Simulation and Modelling
Course Code: OEC-CS-801C
Credit: 3
No. of Lectures: 36

Prerequisites:

1. Programming and Data Structures
2. Discrete Mathematics and Probability theory
3. Game theory
4. Numerical Analysis

Course Outcomes (COs):

After attending the course students should be able to

CO1	Student will be able to summarize the issues in Modeling and Simulation and to explain the System Dynamics & Probability concepts in Simulation.
CO2	Student will be able to solve the Simulation of Queuing Systems
CO3	Student will be able to analyze the Simulation output.
CO4	Student will be able to identify the application area of Modeling and Simulation, andapply them.
CO5	Student will be able to implement new model by applying their knowledge

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
OEC-CS-801C.1	3	3	3	3	1							
OEC-CS-801C.2	3	3	3	3								3
OEC-CS-801C.3	3	3	3	3	3				2			
OEC-CS-801C.4	3	3	3	3	1							
OEC-CS-801C.5	3	3	3	3	1							

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
OEC-CS-801C.1	2	2	2
OEC-CS-801C.2	2	2	2

OEC-CS-801C.3	2	2	2
OEC-CS-801C.4	2	2	2
OEC-CS-801C.5	2	2	2

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

CO1	Understand the core values that shape the ethical behavior of an engineer and Exposed awareness on professional ethics and human values.
CO2	Understand the concept of profession, professional ethics, and various moral issues.
CO3	Understand various social issues, industrial standards, code of ethics and role of professional ethics in engineering field.
CO4	Aware of responsibilities of an engineer for safety and risk benefit analysis, professional rights and responsibilities of an engineer.
CO5	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

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
OEC-CS-802A.1	2	2	2
OEC-CS-802A.2	2	2	2
OEC-CS-802A.3	2	2	2
OEC-CS-802A.4	2	2	2
OEC-CS-802A.5	2	2	2

Course Name: History of Science and Technology in India
Course Code: OEC-CS-802B
Contact: 3L: 0T: 0P
Credit: 3
No. of Lectures: 36

Course Outcomes (COs):

After attending the course students should be able to

CO1	To understand the development of science and technology in ancient India.
CO2	To understand that development is not solo pursuit rather an interactive and collective process.
CO3	To familiarize with the evolution of scientific ideas and technical solution and their linkages with the socio-culture necessities
CO4	To analyse the socio-cultural and philosophical context in which the various scientific
CO5	To apply technological ideas got developed in India. and thereby help in repositioning India's contributions in science and technology

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
OEC-CS-802B.1	3	3	3	3	3							
OEC-CS-802B.2	3	3	3	3	3							
OEC-CS-802B.3	3	3	3	3	3							3
OEC-CS-802B.4	3	3	3	3	3							
OEC-CS-802B.5	3	3	3	3	3				3		2	

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
OEC-CS-802B.1	2	2	2
OEC-CS-802B.2	2	2	2
OEC-CS-802B.3	2	2	2

OEC-CS-802B.4	2	2	2
OEC-CS-802B.5	2	2	2

Course Name: Economic Policies in India
Course Code: OEC-CS-802C
Contact: 3L: 0T: 0P
Credit: 3
No. of Lectures: 36

Course Outcomes (COs):

After attending the course students should be able to

CO1	To understand the basic characteristics of Indian economy, it's potential
CO2	To understand the importance, causes and impact of population growth and its distribution, translate and relate them with economic development
CO3	To understand the importance of planning undertaken by the government of India, have knowledge on the various objectives, failures and achievements as the foundation of the ongoing planning and economic reforms taken by the government
CO4	To analyse the progress and changing nature of different sectors and their contribution to the economy as a whole.
CO5	To analyse the developmental trends of Indian economy.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
OEC-CS-802C.1	3	3	3	3	3							
OEC-CS-802C.2	3	3		3	3							
OEC-CS-802C.3	3	3	3	3	3							3
OEC-CS-802C.4	3		3	3	2							
OEC-CS-802C.5	3	3	3	3	3				3		2	

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
OEC-CS-802C.1	2	2	2
OEC-CS-802C.2	2	2	2

OEC-CS-802C.3	2	2	2
OEC-CS-802C.4	2	2	2
OEC-CS-802C.5	2	2	2

Course Name: Essence of Indian Knowledge Tradition
Course Code: MC801
Contact: 3L: 0T: 0P
Credit: 3
No. of Lectures: 36

Course Outcomes (COs):

After attending the course students should be able to

CO1	Identify the concept of Traditional knowledge and its importance
CO2	Explain the need and importance of protecting traditional knowledge.
CO3	Interpret the concepts of Intellectual property to protect the traditional knowledge.
CO4	Illustrate the various enactments related to the protection of traditional knowledge.
CO5	Explain the importance of Traditional knowledge in Agriculture and Medicine.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
MC801.1	3	3	3	2	3							
MC801.2	3	3	3	3								
MC801.3	3	3	3	3	3						2	3
MC801.4	3	2	3	3								
MC801.5	3	3	3	3	3				3		2	

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
MC801.1	2	2	2
MC801.2	2	2	2
MC801.3	2	2	2
MC801.4	2	2	2
MC801.5	2	2	2

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