R-18

CURRICULUM ESSENTIALS

Handbook on Outcome Based Education

ELECTRONICS & COMMUNICATION ENGINEERING

NARULA INSTITUTE OF TECHNOLOGY

WWW.NIT.AC.IN

Institute Vision

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

Institute Mission

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

Institute Quality Policy

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

Department Vision

To develop self-motivated, creative & Ethical Skilled Engineers and Researchers to meet the Social Commitment.

Department Mission

DM1: To impart State-of-Art Technical Education.
DM2: To encourage the students for professional ethics & social responsibilities.

DM3: To inculcate team work & leadership qualities to make the students industry ready & employable.

DM4: To carry out research leading to the realization of knowledge and intellectual property.

DM5: To facilitate graduates to become an entrepreneur.

Program Educational Objectives (PEOs)

PEO1: Graduates will be able to pursue their professional careers independently and in a team in Electronics & Communication Engineering and relevants for local & global needs.

PEO2: Graduates will be able to pursue their higher study, research work in the multidisciplinary area, and upgrade their professional skills.

PEO3: Graduates will be able to identify & formulate and apply professional skills & ethics to solve societal & environmental issues.

PEO4: Graduates will be able to communicate efficiently while working as a member or leader in a group and as an entrepreneur.

Program Specific Outcomes (PSOs)

PSO1: Ability to Identify, Formulate & Solve problems of basics of Electronics & Communication Engineering and to apply them to various areas like Analog & digital Circuits, Signal & systems, Communication, VLSI, Embedded System etc.

PSO2: Ability to design the systems of Electronics & Communication Engineering using advanced hardware and software tools with analytical skills to achieve the Societal needs.

PSO3: Based on the knowledge of Electronics & Communication Engineering, social & environmental awareness along with ethical responsibility able to build a successful career that addresses the real-world applications as a researcher & as an entrepreneur.

Program outcomes (POs)

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.

Department: Electronics & Communication Engineering

Curriculum Structure

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L – Lecture; T- Tutorial; P- Practical [1L=1Cr, 1T=1Cr, 1P =0.5 Cr]

Under Autonomy (GR A: ECE, EE, EIE, BME; GR B: CSE, IT, ME, CE, FT)

First Year First Semester

Sl. No.	Course Code	Paper Code	Theory	Hours per Week				Credits
				L	T	P	Total	
A. THEORY								
1	BS	CH101/ PH101	Chemistry (Gr. A)/ Physics-I (Gr. B)	3	0	0	3	3
2	BS	M101	Mathematics-I	3	1	0	4	4
3	ES	EE101/ EC101	Basic Electrical Engineering (Gr. A)/ Basic Electronics Engineering (Gr. B)	3	0	0	3	3
4	ES	HU101	English	2	0	0	2	2
PRACTICAL								
5	BS	CH191/ PH191	Chemistry lab (Gr. A)/ Physics-I lab(Gr. B)	0	0	3	3	1.5
6	ES	EE191/ EC191	Basic Electrical Engineering lab (Gr. A)/ Basic Electronics Engineering lab(Gr. B)	0	0	3	3	1.5
7	ES	ME191/ ME192	Engineering Graphics & Design Lab (Gr. A)/ Workshop/ Manufacturing Practices (Gr. B)	0	0	3	3	1.5
8	PROJ	PR191	Project -IA	0	0	1	1	0.5
9	PROJ	PR192	Project -IB	0	0	1	1	0.5
MANDATORY ACTIVITIES/ COURSES								
10	MC	MC181	Induction Program	0	0	0	0	
	Total Theory, Practical & Mandatory Activities/ Courses						**23**	**17.5**

First Year 2nd Semester

Sl. No.	Course Code	Paper Code	Theory	Hours per Week				Credits
				l	t	p	Total	
THEORY								
1	BS	PH201/ CH201	Chemistry (Gr. B)/ Physics-I (Gr. A)	3	0	0	3	3
2	BS	M201	Mathematics-II	3	1	0	4	4
3	ES	CS201	Programming for Problem Solving	3	0	0	3	3
4	ES	EE201/ EC201	Basic Electrical Engineering (Gr. B) / Basic Electronics Engineering (Gr. A)	3	0	0	3	3
5	ES	ME201	Engineering Mechanics	3	0	0	3	3
PRACTICAL								
6	ES	CS291	Programming for Problem Solving Lab	0	0	3	3	1.5
7	BS	CH291/ PH291	Chemistry Lab (Gr. B) / Physics - I Lab (Gr. A)	0	0	3	3	1.5
8	ES	EE 291/ EC 291	Basic Electrical Engineering Lab (Gr. B) / Basic Electronics Engineering Lab (Gr. A)	0	0	3	3	1.5
9	ES	ME291/ ME 292	Engineering Graphics & Design (Gr B) / Workshop/Manufacturing Practice (Gr-A)	0	0	3	3	1.5
10	HS	HU291	Language Lab	0	0	2	2	1
11	PROJ	PR291	Project II	0	0	1	1	0.5
12	PROJ*	PR292	Innovative Activities I	0	0	0	0	0.5
MANDATORY ACTIVITIES/ COURSES								
13	MC	MC281	NSS/ Physical Activities / Meditation & Yoga / Photography/ Nature Club	0	0	0	3	
	Total Theory, Practical & Mandatory Activities/ Courses						**34**	**24**

* Inter/ Intra Institutional Activities viz; Training with higher Institutions; Soft skill training organized by Training and Placement Cell of the respective institutions; contribution at incubation/ innovation /entrepreneurship cell of the institute; participation in conferences/ workshops/ competitions etc.; Learning at Departmental Lab/ Tinkering Lab/ Institutional workshop; Working in all the activities of Institute's Innovation Council for eg: IPR workshop/Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc. (evaluation by Programme Head through certification)

Innovative activities to be evaluated by the Programme Head/ Event coordinator based on the viva voce and submission of necessary certificates as evidence of activities.

Second Year 1st Semester(3rd Semester)

Sl. No.	Course Code	Paper Code	Theory	Hours per Week				Credits
				L	T	P	Total	
THEORY								
1	BS	M301	Mathematics-III	3	1	0	4	4
2	ES	M(CS)301	Numerical Methods	3	0	0	3	3
3	PC	EC301	Solid State Devices	3	0	0	3	3
4	PC	EC302	Circuit Theory & Networks	3	0	0	3	3
5	ES	EC303	Data Structure	3	0	0	3	3
6	HS	HU301	Values & Ethics in Profession	2	0	0	2	2
PRACTICAL								
7	ES	M(CS)391	Numerical Methods Lab	0	0	3	3	1.5
8	PC	EC 392	Circuit Theory & Networks Lab	0	0	3	3	1.5
9	ES	EC 393	Data Structure Lab	0	0	3	3	1.5
10	PROJ	PR391	Project-III	0	0	2	2	1
11	PROJ*	PR392	Innovative activities-II	0	0	0	1	0.5
MANDATORY ACTIVITIES/ COURSES								
13	MC	MC281	Behavioural & Interpersonal skills	0	0	3	3	
	Total Theory, Practical & Mandatory Activities/ Courses						**33**	**24**

*Students may choose either to work on participation in all the activities of Institute's Innovation Council for ex: IPR workshop/ Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.

Innovative activities to be evaluated by the Programme Head/ Event coordinator based on the viva voce and submission of necessary certificates as evidence of activities.

Second Year 2nd Semester(4th Semester)

Sl. No.	Course Code	Paper Code	Theory	Hours per Week				Credits
				L	T	P	Total	
THEORY								
1	BS	PH(ECE)401	Physics II	3	0	0	3	3
2	PC	EC401	Signals & Systems	3	0	0	3	3
3	PC	EC402	Analog Electronic Circuits	3	0	0	3	3
4	PC	EC403	Digital Electronic Circuits	3	0	0	3	3
5	PC	EC404	Antenna & wave propagation	3	0	0	3	3
PRACTICAL								
6	BS	PH(ECE)491	Physics II Lab	0	0	3	3	1.5
7	PC	EC492	Analog Electronic Circuits Lab	0	0	3	3	1.5
8	PC	EC493	Digital Electronic Circuits Lab	0	0	3	3	1.5
9	PC	EC494	Antenna & wave propagation Lab	0	0	3	3	1.5
10	PROJ	PR491	Project-IV	0	0	2	2	1
11	PROJ*	PR492	Innovative activities-III	0	0	0	0	0.5
MANDATORY ACTIVITIES/ COURSES								
12	MC	MC401	Environmental Science	3	0	0	3	
	Total Theory, Practical & Mandatory Activities/ Courses						**32**	**22.5**

*Students may choose either to work on participation in all the activities of Institute's Innovation Council for ex: IPR workshop/ Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.

Innovative activities to be evaluated by the Programme Head/ Event coordinator based on the viva voce and submission of necessary certificates as evidence of activities.

Third Year 1st Semester(5th Semester)

Sl. No.	Course Code	Paper Code	Theory	Hours per Week				Credits
				L	T	P	Total	
THEORY								
1	HS	HU502	Economics for Engineers	2	0	0	2	2
2	PC	EC501	Analog & Digital Communication Systems	3	0	0	3	3
3	PC	EC502	Microprocessor & Micro Controller	3	0	0	3	3
4	PC	EC503	Digital Signal Processing	3	0	0	3	3
5	PE	EC504	A. Information Theory & Coding B. Renewable Energy Sources & Applications C. Nano Electronics	3	0	0	3	3
PRACTICAL								
6	PC	EC 591	Analog & Digital Communication Systems Lab	0	0	3	3	1.5
7	PC	EC 592	Microprocessor & Micro Controller Lab	0	0	3	3	1.5
8	PC	EC 593	Digital Signal Processing Lab	0	0	3	3	1.5
9	PROJ	PR591	Project-V	0	0	2	2	1
10	PROJ*	PR592	Innovative activities-IV	0	0	0	0	0.5
MANDATORY ACTIVITIES/ COURSES								
11	MC	MC501	Constitution of India	3	0	0	3	
	Total Theory, Practical & Mandatory Activities/ Courses						**31**	**20**

Students may choose either to work on participation in Hackathons etc. Development of new product/ Business Plan/ registration of start-up.

Students may choose to undergo Internship / Innovation / Entrepreneurship related activities. Students may choose either to work on innovation or entrepreneurial activities resulting in start-up or undergo internship with industry/ NGO's/ Government organizations/ Micro/ Small/ Medium enterprises to make themselves ready for the industry/ Long Term goals under rural Internship. (Duration 4-6 weeks)

Innovative activities to be evaluated by the Programme Head/ Event coordinator based on the viva voce and submission of necessary certificates as evidence of activities.

Third Year 2nd Semester(6th Semester)

Sl. No.	Course Code	Paper Code	Theory	Hours per Week				Credits
				L	T	P	Total	
THEORY								
1	PC	EC601	VLSI & Microelectronics	3	0	0	3	3
2	PC	EC602	Control System	3	0	0	3	3
3	PC	EC603	RF & Microwave Engineering	3	0	0	3	3
4	PE	EC604	A. Mobile Communication & Network	3	0	0	3	3
			B. Advanced Microprocessor & Microcontroller					
			C. Introduction to Python					
5	OE	EC605	A. Object Oriented Programming using JAVA	3	0	0	3	3
			B. Renewable Energy Sources & Applications					
			C. Nano Electronics					
PRACTICAL								
6	PC	EC 691	VLSI & Microelectronics Lab	0	0	3	3	1.5
7	PC	EC 692	Control System Lab	0	0	3	3	1.5
8	PC	EC 693	RF & Microwave Engineering Lab	0	0	3	3	1.5
9	PE	EC 694	A. Mobile Communication & Network Lab	0	0	3	3	1.5
			B. Advanced Microprocessor & Microcontroller Lab					
			C. Python Programming Lab					
10	OE	EC 695	A. Object Oriented Programming using JAVA Lab	0	0	3	3	1.5
			B. Computer Communication & Network Security Lab					
			C. Artificial Intelligence & Robotics Lab					
11	PROJ	PR691	Project-VI	0	0	2	2	1
12	PROJ*	PR692	Innovative activities-V	0	0	0	0	0.5
MANDATORY ACTIVITIES/ COURSES								
13	MC	MC681	Technical Lecture Presentation & Group Discussion-I	0	0	3	3	
	Total Theory, Practical & Mandatory Activities/ Courses						**32**	**24**

*Students may choose either to work on participation in all the activities of Institute's Innovation Council for ex: IPR workshop/ Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.

Innovative activities to be evaluated by the Programme Head/ Event coordinator based on the viva voce and submission of necessary certificates as evidence of activities.

Fourth Year 1st Semester(7th Semester)

Sl. No.	Course Code	Paper Code	Theory	Hours per Week				Credits
				L	T	P	Total	
THEORY								
1	HS	HU704	Principles of Management	2	0	0	2	2
2	PE	EC701	A. Satellite & Optical Communication	3	0	0	3	3
			B. Digital Image & Video Processing					
			C. Remote Sensing & GIS					
3	OE	EC702	A. Data Base Management Systems	3	0	0	3	3
			B. Machine Learning					
			C. Internet of Things (IOT)					
PRACTICAL								
4	PE	EC 791	A. Satellite & Optical Communication Lab	0	0	3	3	1.5
			B. Digital Image & Video Processing Lab					
			C. Remote Sensing & GIS Lab					
5	OE	EC 792	A. Data Base Management Systems Lab	0	0	3	3	1.5
			B. Machine Learning Lab					
			C. Internet of Things (IOT) Lab					
6	PROJ	PR791	Project-VII	0	0	0	6	3
7	PROJ*	PR792	Innovative activities-VI	0	0	0	0	0.5
MANDATORY ACTIVITIES/ COURSES								
8	MC	MC781	Technical Lecture Presentation & Group Discussion-II	0	0	3	3	
	Total Theory, Practical & Mandatory Activities/ Courses						**23**	**14.5**

*Students may choose either to work on participation in Hackathons etc. Development of new product/ Business Plan/ registration of start-up.

Students may choose to undergo Internship / Innovation / Entrepreneurship related activities. Students may choose either to work on innovation or entrepreneurial activities resulting in start-up or undergo internship with industry/ NGO's/ Government organizations/ Micro/ Small/ Medium enterprises to make themselves ready for the industry/ Long Term goals under rural Internship. (Duration 4-6 weeks)

Fourth Year 2nd Semester(8th Semester)

Sl. No.	Course Code	Paper Code	Theory	Hours per Week				Credits
				L	T	P	Total	
THEORY								
1	PE	EC801	A. Adaptive Signal Processing	3	0	0	3	3
			B. Wireless Sensor Network					
			C. Embedded System					
2	OE	EC802	A. Cloud Computing	3	0	0	3	3
			B. Data Science					
			C. Block Chain					
3	OE	EC803	A. Biomedical Electronics & Imaging	3	0	0	3	3
			B. Automotive Electronics					
			C. Physical Design, Verification & Testing					
PRACTICAL								
4	PE	EC 891	A. Adaptive Signal Processing Lab	0	0	3	3	1.5
			B. Wireless Sensor Network Lab					
			C. Embedded System Lab					
5	PROJ	PR891	Project-VIII	0	0	0	6	3
MANDATORY ACTIVITIES/ COURSES								
6	MC	MC801	Essence of Indian Knowledge Tradition	3	0	0	3	
	Total Theory, Practical & Mandatory Activities/ Courses						**21**	**13.5**

Mandatory Credit Point=160

For Honors additional 20 Credit Point is to be earned (1st Sem to 8th Sem) through MOOCs courses. All the Certificates received by the students across all semesters for MOOCs Courses from approved organization (Appendix A) is to be submitted to CoE office prior to 8th Semester Examination.

Course Name: Mathematics –I
Course Code: M101
Total Contact Hours:40
Credits: 4

Course Outcomes (COs):

After completion of the course students would be able to

COs	DESCRIPTIONS
CO1	Understand and recall the properties and formula related to matrix algebra, differential calculus, integral calculus and vector calculus. 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, Integral Calculus, multivariable calculus, vector calculus and infinite series for the solutions of the related problems.
CO4	Analyze different engineering problems linked with matrix algebra, differential calculus, Integral Calculus, multivariable calculus, vector calculus,
CO5	Apply different engineering problems linked with matrix algebra, differential calculus, Integral Calculus, multivariable calculus, vector calculus.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
M101.1	3	3	2	-	-	-	-	-	-	-	-	2
M101.2	3	3	3	3	-	-	-	-	-	-	-	2
M101.3	3	3	3	3	-	-	-	-	-	-	-	2
M101.4	3	3	3	3	-	-	-	-	-	-	-	2
M101.5	3	3	3	3	-	-	-	-	-	-	-	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:
Chemistry

Course Code: CH101
Total Contact Hours: 40
Credits: 4

Course Outcomes (COs):

After completion of the course students would be able to

COs	DESCRIPTIONS
CO1	Describe the fundamental properties of atoms & molecules, atomic structure and the periodicity of elements in the periodic table
CO2	Apply fundamental concepts of thermodynamics in different engineering applications.
CO3	Apply the knowledge of water quality parameters, corrosion control & polymers to different industries.
CO4	Determine the structure of organic molecules using different spectroscopic techniques.
CO5	Evaluate theoretical and practical aspects relating to the transfer of the production of chemical products from laboratories to the industrial scale, in accordance with environmental considerations.

Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CH101.1	3	2	2	2	-	-	-	-	-	-	-	2
CH101.2	3	3	3	3	-	-	-	-	-	-	-	2
CH101.3	3	3	2	2	-	-	-	-	-	-	-	2
CH101.4	3	2	3	2	-	-	-	-	-	-	-	2
CH101.5	3	3	3	3	-	-	-	-	-	-	-	2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CH101.1	-	-	2
CH101.2	-	-	2
CH101.3	-	-	2
CH101.4	-	-	2
CH101.5	-	-	2

Course Name: Basic Electrical EngineeringCourse Code: EE101
Total Contact Hours: 41
Credits: 4

Course Outcomes (COs):

After completion of the course students would be able to

COs	DESCRIPTIONS
EE 101.1	Understand and analyze basic electric and magnetic circuits.
EE 101.2	Understand and analyze basic electric and magnetic circuits.
EE 101.3	Understand and analysis transient and steady-state response of any electrical circuit/network by applying different circuit analysis methods. To understand and analyze basic electric and magnetic circuits.
EE 101.4	Understand the single-phase transformer using EMF equation, No Load no load and on load operation, phasor diagram and equivalent circuit, losses of a transformer.
EE 101.5	Understand 3-phase induction motor using Slip and Frequency, rotor emf and current, Equivalent circuit and phasor diagram, Torque Slip characteristics torque-speed characteristics Starting of induction motor by star delta starter.

CO-PO Mapping

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

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
EE 101.1	3	3	-
EE 101.2	3	3	-
EE 101.3	3	3	-
EE 101.4	3	3	-
EE 101.5	3	3	-

Course Name:
Communicative English
Course Code: HU101
Total Contact Hours:26
Credits: 2

Course Outcomes (COs):

After completion of the course students would be able to

CO1	Understand and communicate in English in a globalized workplace scenario.
CO2	Understand and apply the basic grammatical skills of the English language and develop reading and comprehension skills.
CO3	Acquire a working knowledge of writing strategies, formats and templates of professional writing.
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
HU101.1	-	-	-	-	-	-	2	-	3	3	-	3
HU101.2	-	-	-	-	-	-	2	-	3	3	-	3
HU101.3	-	-	-	-	-	-	2	-	3	3	-	3
HU101.4	-	-	-	-	-	-	2	-	3	3	-	3
HU101.5	-	-	-	-	-	-	2	-	3	3	-	3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
HU101.1	2	2	2
HU101.2	2	2	2
HU101.3	2	2	2
HU101.4	2	2	2
HU101.5	2	2	2

Course Name: Chemistry Lab
Course Code: CH191
Contact Hours: 36
Credit: 2

Course Outcomes (COs):

After completion of the course students would be

COs	DESCRIPTIONS
CO1	Able to operate different types of instruments for estimation of small quantities chemicals used inindustries and scientific and technical fields.
CO2	Able to analyse and determine the composition of liquid and solid samples working as anindividual and also as an team member.
CO3	Able to analyse different parameters of water considering environmental issues
CO4	Able to synthesize drug and polymer materials
CO5	Capable to design innovative experiments applying the fundamentals of chemistry

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CH191.1	1	1	3	2	-	2	3	-	-	-	-	2
CH191.2	2	2	1	2	-	-	-	-	-	-	-	2
CH191.3	-	-	-	-	-	-	-	-	3	3	2	2
CH191.4	2	2	2	2	-	-	-	-	-	-		2
CH191.5	3	3	3	3	-	-	-	-	-	-	2	3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CH191.1	-	-	2
CH191.2	-	-	2
CH191.3	-	-	2
CH191.4	-	-	2
CH191.5	-	-	2

Course Name: Basic Electrical Engineering
LabCourse Code: EE 191
Total Contact
Hours: 36
Credit: 2

Course Outcomes (COs):

After completion of the course students would be able to

COs	DESCRIPTIONS
EE 191.1	Identify common electrical components and their ratings.
EE 191.2	Make Circuit connection by wires of appropriate ratings.
EE 191.3	Understand the basic characteristics of transformers and electrical machines.
EE 191.4	Design Open circuit and short circuit test of a single-phase Transformer
EE 191.5	Design DC shunt motor and analyse single phase Energy Meter

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EE 191.1	2	2	3	3	-	-	-	-	3	3	-	2
EE 191.2	3	3	2	3	-	-	-	-	3	3	-	3
EE 191.3	2	3	3	2	-	-	-	-	2	3	-	2
EE 191.4	2	3	3	3	-	-	-	-	3	3	-	2
EE 191.5	2	3	3	3	-	-	-	-	3	3	-	2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
COs	**PSO1**	**PSO2**	**PSO3**
EE 191.1	3	3	-
EE 191.2	3	3	-
EE 191.3	3	3	-
EE 191.4	3	3	-

Course Name: Engineering Drawing &Graphics
Course Code: ME 191
Total Contact Hours: 36
Credit: 2

Course Outcomes (COs):

After completion of the course students would be able to

COs	DESCRIPTIONS
CO1	Understand the basics of drafting.
CO2	Understand the use of drafting tools which develops the fundamental skills of industrial drawings.
CO3	Apply the concept of engineering scales, dimensioning and various geometric curves necessary to understand design of machine elements.
CO4	Analyze the concept of projection of line, surface and solids to create the knowledge base of orthographic and isometric view of structures and machine parts.
CO5	Evaluate the design model to different sections of industries as well as for research & development.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	2	-	-	-	-	-	-	-	-
CO2	2	-	-	2	-	-	-	-	-	-	-	-
CO3	3	-	-	2	-	-	-	-	-	-	-	-
CO4	3	-	-	3	-	-	-	-	-	-	-	-
CO5	3	2	-	3	2	-	-	-	-	-	-	-

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
ME191.1	2	-	-
ME191.2	2	-	-
ME191.3	2	-	-
ME191.4	2	-	-
ME191.5	2	-	-

Course Name: Mathematics- II

Course Code: M 201
Total Contact Hours:40
Credits: 4

Course Outcomes (COs):

After completion of the course students would be able to

COs	DESCRIPTIONS
CO1	Determine and recall the properties and formula related to Ordinary differential equations, Multiple integral, vector integral and Laplace transform.
CO2	Determine the solutions of the problems related to Ordinary differential equations, Multiple integral, vector integral and Laplace transform.
CO3	Apply appropriate mathematical tools of Ordinary differential equations, Multiple integral, vector integral and Laplace transform.
CO4	Analyze engineering problems on Ordinary differential equations, Multiple integral, vector integral and Laplace transform.
CO5	Apply engineering solutions by using Ordinary differential equations, Multiple integral, vector integral and Laplace transform.

CO-PO Mapping

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

Course Name: Physics -I
Course Code: PH 201
Total Contact Hours: 41
Credits: 4

Course Outcomes (COs):

After completion of the course students would be able to

COs	DESCRIPTIONS
PH201.1	Describe different types of mechanical resonance and its electrical equivalence
PH201.2	Explain basic principles of Laser, Optical fibers and Polarization of light
PH201.3	Apply superposition principle to explain the phenomena of interference and diffraction
PH201.4	Analyze different crystallographic structures according to their co-ordination number and packing factors
PH201.5	Determine and justify the need of a quantum mechanics as remedy to overcome limitations imposed by classical physics

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PH201.1	3	3	2	2	-	-	-	-	-	-	-	-
PH201.2	3	3	2	2	-	-	-	-	-	-	-	-
PH201.3	3	3	2	2	-	-	-	-	-	-	-	-
PH201.4	3	3	2	2	-	-	-	-	-	-	-	-
PH201.5	3	3	2	2	-	-	-	-	-	-	-	-

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
PH201.1	2	2	2
PH201.2	2	2	2
PH201.3	2	2	2
PH201.4	2	2	2
PH201.5	2	2	2

Course Name: Basic Electronics Engineering

Course Code: EC 201
Total Contact Hours:40
Credits: 3

Course Outcomes (COs):

After completion of the course students would be able to

COs	DESCRIPTIONS
CO1	Able to illustrate the electrical properties of conductor, semiconductor (Intrinsic & Extrinsic) and insulator with the help of energy band diagram & Fermi level.
CO2	Able to demonstrate the working principle of rectifier, voltage regulator, clipper, clamper circuit limited to 15V based on the concept of electrical characteristics of PN junction diode and Zener diode.
CO3	Able to explain biasing circuit of BJT, JFET & MOSFET based on the concept of current flow mechanism and electrical characteristics within the biasing voltage 15V for the application in switching and amplification.
CO4	Able to describe the concept of feedback to design amplifier & oscillator circuit and construct inverting, non-inverting amplifier, voltage follower, adder, subtractor, basic differentiator & integrator circuit using OPAMP within the output voltage range (-15V to +15V).
CO5	Able to demonstrate the working principle of CRO to measure voltage, frequency & phase.

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	-	-	-	-	3	-	-	3
CO2	2	3	2	-	-	-	-	-	2	-	-	2
CO3	2	2	3	-	-	-	-	-	3	-	-	3
CO4	3	2	2	-	-	-	-	-	2	-	-	2
CO5	3	3	2	-	-	-	-	-	2	-	-	2

CO-PSO Mapping

COs/POs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Course Name: Programming for Problem Solving

Course Code: CS201
Total Contact Hours:36
Credits: 3

Course Outcomes (COs):

After completion of the course students would be

CO1	Able to **understand** the fundamental working principle of a computer by knowing the classification of computers, Basic structure of Computer System, Primary & Secondary Memory, Processing Unit, Input & Output devices, Number System, Representation of signed and unsigned numbers.
CO2	Able to **write** basic C program by knowing variable and data Types, identifiers, operators & expressions and standard input and output.
CO3	Able to **apply** branching, looping and functions to check the condition, realize repetition of a task and to analyse the program by dividing in sub module respectively.
CO4	Able to **apply** arrays and pointers to store data in memory and access it in terms of memory address with dynamic memory allocation.
CO5	Able to **formulate** a data structures in which different types of data can be accommodated using structures, union and enum and **use** files to store data.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	-	-	-	-	-	-	-	2
CO2	3	3	3	2	-	-	-	-	-	-	-	3
CO3	2	3	3	2	-	-	-	-	-	-	-	3
CO4	3	3	3	2	-	-	-	-	-	-	-	3
CO5	3	3	3	2	-	-	-	-	-	-	-	3

CO-PSO Mapping

COs/POs	PSO1	PSO2	PSO3
CO1	**3**	**3**	**3**
CO2	**3**	**3**	**3**
CO3	**3**	**3**	**3**
CO4	**3**	**3**	**3**
CO5	**3**	**3**	**3**

Course Name: Engineering Mechanics
Course Code: ME201
Total Contact Hours:36
Credits: 3

Course Outcomes (COs):

After completion of the course students would be able to

COs	DESCRIPTIONS.
CO1	To understand representation of force, moments for drawing free-body diagrams and analyze friction-based systems in static condition.
CO2	To locate the centroid of an area and calculate the moment of inertia of a section.
CO3	Apply of conservation of momentum & energy principle for particle dynamics and rigid body kinetics.
CO4	Understand and apply the concept of virtual work, rigid body dynamics and systems under vibration.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	2	-	-	-	-	-	-	-	2
CO2	3	3	-	2	-	-	-	-	-	-	-	2
CO3	3	2	-	2	-	-	-	-	-	-	-	2
CO4	3	3	-	3	-	-	-	-	-	-	-	2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
ME201.1	-	-	-
ME201.2	-	-	-
ME201.3	-	-	-
ME201.4	-	-	-

Course Name:
Programming for Problem Solving Lab
Course Code: CS 291
Contact: 0:0:3
Credits: 1.5

Course Outcomes (COs):

After completion of the course students would be able to

CO1	Learn the concept of DOS system commands and editor.
CO2	To formulate the algorithms for simple problems and to translate given algorithms to a working and correct program.
CO3	To be able to identify and correct syntax errors / logical errors as reported during compilation time and run time.
CO4	To be able to write iterative as well as recursive programs.
CO5	Learn the concept of programs with Arrays, Pointers, Structures, Union and Files.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	-	-	-	-	3	-	-	3
CO2	3	3	3	2	-	-	-	-	3	-	-	3
CO3	3	3	3	2	-	-	-	-	3	-	-	3
CO4	3	3	3	2	-	-	-	-	3	-	-	3
CO5	2	3	3	3	-	-	-	-	3	-	-	3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CS291.1	3	3	3
CS291.2	3	3	3
CS291.3	3	3	3
CS291.4	3	3	3
CS291.5	3	3	3

Course Name:Physics I Lab
Course Code: PH 291
Total Contact Hours:40
Credits: 4

Course Outcomes (COs):

After completion of the course students would be able to

COs	DESCRIPTIONS
CO1	Demonstrate experiments allied to their theoretical concepts
CO2	Conduct experiments using LASER, Optical fibre, Torsional pendulum, Spectrometer
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	Develop critical thinking skills to solve for real life challenges.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PH291.1	2	3	2	3	3	-	-	-	-	-	-	-
PH291.2	2	3	2	3	3	-	-	-	-	-	-	-
PH291.3	2	3	2	3	3	-	-	-	-	-	-	-
PH291.4	2	3	2	3	3	-	-	-	-	-	-	-
PH291.5	2	3	2	3	2	-	-	-	-	-	-	-

CO-PSO Mapping

COs/POs	PSO1	PSO2	PSO3
CO1	3	3	2
CO2	3	3	2
CO3	3	3	2
CO4	3	3	2
CO5	3	3	2

Course Name: Basic Electronics Engineering Lab
Course Code: EC 291

Total Contact Hours: 36
Credit: 2

Course Outcomes (COs):

After completion of the course students would be able to

COs	DESCRIPTIONS
CO1	Able to Identify and Relate given passive & active electronic components such as Resistance, Capacitor, Inductor, Fuse, Diode, LED, Transistor, and their characteristics to compute, study the required parameters and specification.
CO2	Able to Demonstrate and Apply the concept behind the operation of analog and digital measuring instruments such as DC Power Supply, Function Generator, Digital Multimeter, and Oscilloscopes for the measurement of electrical quantities.
CO3	Able to Recognize and Define concepts related to Diode, LED, Transistor (BJTs and MOSFETs), OP-Amp, Logic Gate and study their characteristics and applications.
CO4	Able to Analyze and Illustrate given basic digital electronic components (AND, OR, NOT, NAND & NOR Gates) and their circuits to compute, study the required parameters and specification.
CO5	Able to Construct and Assemble an application-based circuit using analog/digital electronics components with soldering technique and simulation software.

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	-	-	-	-	3	2	-	2
CO2	3	3	2	-	-	-	-	-	3	3	-	2
CO3	3	3	2	-	-	-	-	-	3	2	-	2
CO4	3	3	2	-	-	-	-	-	3	2	-	2
CO5	3	3	2	-	-	-	-	-	3	2	-	2

CO-PSO Mapping

COs/POs	PO1	PO2	PO3
CO1	3	3	2
CO2	3	3	2
CO3	3	3	2
CO4	3	3	2
CO5	3	3	2

Course Name: Workshop/Manufacturing Practices
Course Code: ME 292
Contact: 0:0:3
Credit: 1.5

Course Outcomes (COs):

After completion of the course students would be able to

COs	DESCRIPTIONS
CO1	Fabricate components with their own hands.
CO2	Get practical knowledge of the dimensional accuracies and tolerances applicable for different manufacturing processes.
CO3	Produce small devices of their interest in project or research purpose.

CO-PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	-	-	-	2	-	2	2	-	2
CO2	3	3	2	-	-	-	2	-	2	2	-	2
CO3	3	2	2	-	-	-	2	-	2	2	-	2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
ME 292.1	-	-	-
ME 292.2	-	-	-
ME 292.3	-	-	-

Course Name: Language Lab
Course Code: HU291
Contact Hours: 0:0:2
Credit: 1

Course Outcomes (COs):

After attending the course students should be able to

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

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
HU291.1	-	-	-	-	-	-	2	-	3	3	-	2
HU291.2	-	-	-	-	-	-	2	-	3	3	-	2
HU291.3	-	-	-	-	-	-	2	-	3	3	-	2
HU291.4	-	-	-	-	-	-	2	-	3	3	-	2
HU291.5	-	-	-	-	-	-	3	-	3	3	-	2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
HU291.1	2	2	2
HU291.2	2	2	2
HU291.3	2	2	2
HU291.4	2	2	2
HU291.5	2	2	2

Course Name:Mathematics-III
Course Code: M301
Total Contact Hours:44
Credits: 4

Course Outcome(s):

After completion of the course students will be able to

COs	DESCRIPTIONS
CO1	Recall the underlying principle and properties of Fourier series, Fourier transform, probability distribution of a random variable, calculus of complex variable, partial differential equation and ordinary differential equation
CO2	Exemplify the variables, functions, probability distribution and differential equations and find their distinctive measures using the underlying concept of Fourier series, Fourier transform, probability distribution of a random variable, calculus of complex variable, partial differential equation and ordinary differential equation.
CO3	Apply Cauchy's integral theorem and the residue theorem to find the value of complex integration, and compute the probability of real world uncertain phenomena by identifying probability distribution that fits the phenomena.
CO4	Solve partial differential equation using method of separation of variables and ordinary differential equation using techniques of series solution and special function (Legendre's and Bessel's).
CO5	Find the Fourier series and Fourier transform of functions by organizing understandings of underlying principles and also evaluate the integral using Parseval's identity.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
M 301.1	3	3	-	1	-	-	-	-	2	-	-	3
M 301.2	3	3	-	-	-	-	-	-	2	-	-	3
M 301.3	3	3	-	-	-	-	-	-	2	-	-	3
M 301.4	3	3	-	-	-	-	-	-	2	-	-	3
M 301.5	3	3	-	-	-	-	-	-	2	-	-	3

CO-PSO Mapping

COs/POs	PSO1	PSO2	PSO3
M 301.1	3	3	3
M 301.2	3	3	3
M 301.3	3	3	3
M 301.4	3	3	3
M 301.5	3	3	3

Course Name:
Numerical Methods
Course Code: M(CS)301
Total Contact Hours:32
Credits: 3

Course Outcomes (COs):

After completion of the course students would be able to

CO1	Recall the distinctive characteristics of various numerical techniques and the associated error measures.
CO2	Understand the theoretical workings of various numerical techniques and to solve the engineering problems.
CO3	Apply the principles of various numerical techniques to solve various problems.
CO4	Apply Newton Cotes formula, Trapezoidal rule, Simpson's 1/3 rule, Weddle's Rule to evaluate the integrated value of a function.
CO5	Analyze the numerical solution of a system using Gauss elimination method, Tridiagonal matrix algorithm, LU Factorization method, Gauss-Seidel iterative method, Successive over Relaxation method.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	-	-	-	-	2	-	-	2
CO2	3	3	2	3	-	-	-	-	2	-	-	2
CO3	3	3	2	3	-	-	-	-	2	-	-	2
CO4	3	3	2	3	-	-	-	-	2	-	-	2
CO5	3	3	2	3	-	-	-	-	2	-	-	2

CO-PSO Mapping

COs/POs	PSO1	PSO2	PSO3
CO1	**-**	**2**	**3**
CO2	**-**	**2**	**3**
CO3	**-**	**2**	**3**
CO4	**-**	**2**	**3**
CO5	**-**	**2**	**3**

Course Name: SOLID STATE DEVICES
Course Code: EC301
Contact: 3P
Lectures: 33
Credits: 3

Course Outcomes (COs):

After completion of the course students would be able to

COs	DESCRIPTIONS
CO1	Able to explain charge carrier transport phenomenon and generation-recombination process of intrinsic and extrinsic semiconductor materials with the help of energy band diagram & Fermi-Dirac distribution function.
CO2	Able to illustrate electrical characteristics of rectifier diodes, Zener diode, varactor diode, PIN diode, Gunn diode, IMPATT diode, Tunnel diode, & LED based on properties of PN junction and understand the usages of solar cell as a renewable energy source for societal & environmental benefit.
CO3	Able to explain formation of Ohmic & non-Ohmic contact in metal semiconductor junction and 2D Electron Gas in Heterojunction based on energy band diagram.
CO4	Able to illustrate current flow mechanism, electrical characteristics, and electrical equivalent model of BJT with the help of energy band diagram at forward & reverse biased PN junction.
CO5	Able to determine drain current in linear & saturation region for JFET & MOSFET, MOS capacitances in accumulation, depletion & inversion stages, Pinch off voltage of JFET and threshold voltage of MOSFET with the help of mathematical expressions.

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	-	-	-	2	-	-	2
CO2	3	3	3	3	-	-	2	-	2	-	-	3
CO3	3	3	2	3	-	-	-	-	2	-	-	3
CO4	3	2	3	2	-	-	-	-	2	-	-	2
CO5	3	3	3	3	-	-	-	-	2	-	-	3

CO-PSO Mapping

COs/POs	PSO1	PSO2	PSO3
CO1	2	2	2
CO2	2	2	2
CO3	2	2	2
CO4	3	2	2
CO5	2	2	2

Course Name: Circuit Theory & Networks

Course Code: EC 302

Contact: (3L+1T)/Week

Total Contact Hours: 42 Credits: 4

Course Outcomes (COs):

After attending the course students should be able to

COs	DESCRIPTIONS
CO1	Able to analyses series and parallel resonance circuit based on parameters: resonance frequency, band-width, upper & lower cut-off frequency , quality factor and impedance for the designing of single tuned circuit
CO2	Able to determine current, voltage and power at different branch for DC and AC circuit using networks theorems-superposition, Thevenin's, Norton's, Millman's, Maximum Power Transfer , compensation, and methods- mesh analysis, node analysis, KCL, KVL, Star-Delta transformation.
CO3	Able to solve branch current and branch voltage with the help of planner graph of a circuit using cut-set and tie set matrix.
CO4	Able to apply Laplace Transform technique for the determination of current, voltage and power in a magnetically coupled and transient circuit- RL, RC and RLC.
CO5	Able to estimate parameters of two port network through open circuit & short circuit test for the development of the model of the circuit and conclude whether the circuit is symmetrical or reciprocal or both.

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	-	-	-	2	-	-	3
CO2	3	3	3	3	-	-	-	-	-	-	-	3
CO3	3	3	3	2	-	-	-	-	-	-	-	2
CO4	3	3	3	3	-	-	-	-	-	-	-	3
CO5	3	3	3	3	-	-	-	-	2	-	-	3

CO-PSO Mapping

COs/POs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	2
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Course Name: Data Structure

Course Code: EC303
Contact: 3
Credit: 3
Total Contact Hours: 36

Course Outcomes (COs):

After attending the course students should be able to

COs	DESCRIPTIONS
CO1	Able to understand the Big-O notation and apply arrays and linked list to represent the row major, column major and sparse matrix.
CO2	Able to interpret stack and queue to classify the infix to postfix and prefix notations.
CO3	Able to design binary search tree, threaded binary tree, max & min heap, AVL tree and greedy algorithm to represent and access the data from memory.
CO4	Able to evaluate data using BFS, DFS, Prim's and Kruskal's algorithms.
CO5	Able to apply searching and sorting on the data using Bubble sort, Insertion sort, Selection sort, Quick sort, Merge sort, Radix sort, Sequential search, Binary search and Interpolation Search.

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	-	-	-	-	2	-	-	2
CO2	3	3	3	3	-	-	-	-	2	-	-	3
CO3	3	3	3	2	-	-	-	-	2	-	-	3
CO4	3	3	3	3	-	-	-	-	2	-	-	3
CO5	3	3	3	3	-	-	-	-	2	-	-	2

CO-PSO Mapping

COs/POs	PSO1	PSO2	PSO3
CO1	-	2	3
CO2	-	2	3
CO3	-	2	3
CO4	-	2	3
CO5	-	2	3

Course Name: Value and Ethics in Profession
Course Code: HU301
Contact: 2
Credit: 2
Total Contact Hours: 24
Course Outcomes (COs):

After attending the course students should be able to

COs	DESCRIPTIONS
CO1	Discuss real-world controversies in a sophisticated fashion, using critical thinking and argument analysis.
CO2	Identify the strengths and weaknesses of philosophical principles applied to everyday moral problems.
CO3	Analyse the coherence in the dynamic relationship between moral principles and moral facts.
CO4	Read, comprehend, and criticize philosophical analyses of the central problems in environmental ethics (including the proper boundaries of moral concern, the scarcity of natural resources, the policy options available to regulators and legislators, etc.).

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	1	2	-	-	-	-	-	-	2
CO2	3	3	3	3	2	-	3	-	-	-	-	2
CO3	3	3	2	3	2	-	-	3	-	-	-	3
CO4	3	3	3	2	3	-	-	-	-	3	-	2

CO-PSO Mapping

COs/PSOs	PSO1	PSO2	PSO3
CO1	-	-	2
CO2	-	-	2
CO3	-	-	2
CO4	-	-	2

Course Name: Numerical Methods Lab
Course Code: M(CS)391
Contact: 3
Credit: 2

Course Outcomes (COs):

After completion of the course students would be able to

COs	DESCRIPTIONS
CO1	Apply the Newton forward /backward, Lagrange's interpolation, Sterling & Bessel's Interpolation formula, Newton's divided difference Interpolation method to analyse data numerically.
CO2	Analyze the Trapezoidal rule, Simpson's 1/3 rule, Weddle's rule, Gauss elimination, Tridiagonal matrix algorithm, Gauss-Seidel iterations. Successive over Relaxation (SOR) method, LU Factorization method to find the integration of a function.
CO3	Apply Bisection method, Regula- Falsi method, Secant Method, Newton-Raphson method to find the numerical solution of a function.
CO4	Apply Euler's method, Euler's modified method, Runge-Kutta methods, Taylor series method and Predictor-Corrector method to analyse the differential equation.
CO5	Apply Finite Difference method, Crank–Nicolson method to analyse the partial differential equation solutions for real life challenges.

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	2	-	-	-	2	-	-	2
CO2	3	3	2	3	2	-	-	-	2	-	-	2
CO3	3	3	2	3	2	-	-	-	2	-	-	2
CO4	3	3	2	3	2	-	-	-	2	-	-	2
CO5	3	3	2	3	2	-	-	-	2	-	-	2

CO-PSO Mapping

COs/POs	PSO1	PSO2	PSO3
CO1	2	2	2
CO2	2	2	2
CO3	2	2	2
CO4	2	2	2
CO5	2	2	2

Course Name: Circuit Theory and Networks Lab
Course Code: EC392
Contact: 3P/Week
Credit: 2

Course Outcomes (COs):

After completion of the course students would be able to

COs	DESCRIPTIONS
CO1	Students able to analyze characteristic of series & parallel resonance circuit and transient response in RC, RL and RLC circuit using MATLAB tools
CO2	Students are able to validate network theorems using Proteus Simulation tools.
CO3	Students are able to measure Z, Y parameters of a two-port network following open circuit and short circuit test and conclude whether the network is symmetrical or reciprocal or both using Proteus Simulation tools.
CO4	Students are able to determine Laplace transform of different time domain functions and partial fraction expansion in s domain using MATLAB tools.
CO5	Students able to originate periodic, exponential, sinusoidal, damped sinusoidal, step, impulse, and ramp signals using MATLAB.

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	-	-	-	3	-	-	2
CO2	3	3	3	3	3	-	-	-	3	-	-	2
CO3	3	3	3	3	3	-	-	-	3	-	-	2
CO4	3	3	3	3	3	-	-	-	3	-	-	2
CO5	3	3	3	3	3	-	-	-	3	-	-	2

CO-PSO Mapping

COs/POs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Course Name: Data Structure Lab
Course Code: EC392
Contact: 3
Credit: 2

Course Outcomes (COs):

After attending the course students should be able to

CO1	Apply single and double linked list to represent data
CO2	Apply stack and queue to analyze infix and postfix notation.
CO3	Create binary search tree to represent data for manipulation
CO4	Implement different sorting and searching algorithm selecting appropriate data structures and Realize the insertion, merge, quick, selection sort to implement sorting technique to analyze data sequence.
CO5	Apply the linear and binary search on a sequence to find the location of a data.

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	-	-	-	2	-	-	3
CO2	3	3	3	3	2	-	-	-	2	-	-	3
CO3	3	3	3	3	2	-	-	-	2	-	-	3
CO4	3	3	3	3	2	-	-	-	2	-	-	3
CO5	3	3	3	3	2	-	-	-	2	-	-	3

CO-PSO Mapping

COs/POs	PSO1	PSO2	PSO3
CO1	-	2	3
CO2	-	2	3
CO3	-	2	3
CO4	-	2	3
CO5	-	2	3

Course Name: Behavioral & Interpersonal Skills

Course Code: MC381

Contact: 0:0:3

Course Outcomes (COs):

After attending the course students should be able to

CO1	It will equip the student to handle workplace interpersonal communication in an effective manner.
CO2	To enable students with strong oral and written interpersonal communication skills.
CO3	To prepare students to critically analyze workplace situations and take appropriate decisions.
CO4	To make students campus ready through proper behavioral and interpersonal grooming.
CO5	Integration of enhanced skill set to design and frame team based Project Report and Presentation,

CO-PO Mapping

COs\POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	3	-	2
CO2	-	-	-	-	-	-	-	-	-	3	-	2
CO3	-	-	-	-	-	-	-	-	-	3	-	2
CO4	-	-	-	-	-	-	-	-	-	3	-	2
CO5	-	-	-	-	-	-	-	-	-	3	-	2

CO-PSO Mapping

COs\POs	PSO1	PSO2	PSO3
CO1	-	-	2
CO2	-	-	2
CO3	-	-	2
CO4	-	-	2
CO5	-	-	2

Course Name: Physics-II

Course Code: PH(ECE) 401

Contact: 3:0:0

Total Contact Hours: 36

Credit: 3

Course Outcomes (COs):

After attending the course students should be able to

CO1	Able to understand basic laws of electromagnetism using vector calculus.
CO2	Able to explain the behavior of electromagnetic waves.
CO3	Able to apply Schrodinger equation to solve quantum mechanical problems.
CO4	Able to differentiate between different statistics.
CO5	Able to categorize different types of organic semiconductors and nanomaterials.

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	2	-	-	3
CO2	3	2	-	-	-	-	-	-	2	-	-	3
CO3	3	2	-	-	-	-	-	-	2	-	-	3
CO4	3	2	-	-	-	-	-	-	2	-	-	3
CO5	3	2	-	-	-	-	-	-	2	-	-	3

CO-PSO Mapping

COs/POs	PSO1	PSO2	PSO3
CO1	3	3	2
CO2	3	3	2
CO3	3	3	2
CO4	3	3	2
CO5	3	3	2

Course Name: Signal & Systems
Course Code: EC 401
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Course Outcomes (COs):

After attending the course students should be able to

COs	DESCRIPTIONS
CO1	Able to analyze the signals, systems, sampling and aliasing in continuous and digital time domain using different category of signals, systems.
CO2	Able to compute the output of the system in time domain using linear convolution technique.
CO3	Able to explain systems in the frequency domain using Fourier analysis tools like fourier series, CTFT, DTFT.
CO4	Able to analyze discrete time systems in frequency domain and their region of convergence using Z Transforms.
CO5	Able to describe Random Signal and variables in time domain Probability Distributions, standard Deviation, mean, variance

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	-	-	-	2	-	-	3
CO2	3	3	3	3	-	-	-	-	2	-	-	3
CO3	3	3	3	3	-	-	-	-	2	-	-	3
CO4	3	3	3	3	-	-	-	-	2	-	-	3
CO5	3	3	3	3	-	-	-	-	2	-	-	3

CO-PSO Mapping

COs/POs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Course Name: Analog Electronic Circuits
Course Code: EC 402
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Course Outcomes (COs):

After attending the course students should be able to

COs	DESCRIPTIONS
CO1	Students will be able to design, construct and analyse transistor amplifier circuit in audio frequency range with the help of h-parameter model.
CO2	Students will be able to understand concept of feedback in amplifier and classify amplifiers based on feedback topology.
CO3	Students will be able to design, construct and analyse signal generator circuit in both audio frequency and radio frequency range using transistor.
CO4	Student will be able to design, construct and analyse power amplifier circuit in audio frequency range.
CO5	Students will be able to design, construct and analyse linear and nonlinear electronic circuits using OPAMP (I.C-741).

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	-	-	-	2	-	-	2
CO2	3	3	3	2	-	-	-	-	2	-	-	2
CO3	3	3	3	3	-	-	-	-	2	-	-	2
CO4	3	3	3	3	-	-	-	-	2	-	-	2
CO5	3	3	3	3	-	-	-	-	2	-	-	2

CO-PSO Mapping

COs/POs	PSO 1	PSO 2	PSO 3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Course Name: Digital Electronic & Circuits
Course Code: EC 403
Contacts: 3:0:0
Total Contact Hours: 36
Credit: 3

Course Outcomes (COs):

After attending the course students should be able to

COs	DESCRIPTIONS
CO1	Able to acquire knowledge about solving problems related to number systems conversions and Boolean algebra and design logic circuits using logic gates to their simplest forms using De Morgan's Theorems; Karnaugh Maps.
CO2	Able to design the combinational circuits like adder, subtractor, decoder, multiplexer based on the concept of logic gates (NAND, NOR, AND, OR, NOT).
CO3	Able to analyze the timing properties (input setup and hold times, minimum clock period, output propagation delays) and design sequential circuits – flip flop, register, counter using the concept of combinational circuits.
CO4	Able to demonstrate the working of ADC and DAC with the help of number system, resolution, speed of response up to 4 bits length data.
CO5	Able to illustrate the equivalent circuits of logic family - TTL, ECL, MOS and CMOS to realize logic function based on the concept of BJT and MOSFET.

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	-	-	-	2	-	-	3
CO2	3	3	3	3	-	-	-	-	2	-	-	3
CO3	3	3	3	3	-	-	-	-	2	-	-	3
CO4	3	3	3	3	-	-	-	-	2	-	-	3
CO5	3	3	3	3	-	-	-	-	2	-	-	3

CO-PSO Mapping

COs/POs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Course Name: Antenna & Wave Propagation

Course Code: EC 404

Contacts: 3:0:0
Total Contact Hours: 36
Credit: 3
Course Outcomes (COs):

After attending the course students should be able to

COs	DESCRIPTIONS
CO1	To understand in-depth study of transmission lines which play an important role in high- speed digital design and signal integrity of PCBs.
CO2	To analyze the fundamentals of antenna theory.
CO3	Understand the different types of antennas and the radiation mechanism.
CO4	Identify the atmospheric and terrestrial effects on radio wave propagation.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	-	-	-	-	-	-	-	-	1
CO2	3	2	-	-	-	-	-	-	-	-	-	2
CO3	2	3	-	-	-	-	-	-	-	-	-	1
CO4	-	-	1	-	-	-	-	-	1	1	-	1

CO-PSO Mapping

COs/POs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3

Course Name: Physics-II Lab

Course Code: PH(ECE)491
Contact: 0:0:3
Credit: 1.5

Course Outcomes (COs):

After attending the course students should be able to

COs	DESCRIPTIONS
CO1	Able to understand the motion of electrons in crossed electric and magnetic field.
CO2	Compute Able to explain the hysteresis curve for ferromagnetic materials.
CO3	Able to demonstrate the Hall effect in conductors and semi-conductors.
CO4	Able to distinguish between the conductors and semiconductors on the basis of band gap.
CO5	Able to interpret the characteristics of solar cell.

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	2	2	-	3
CO2	3	2	-	-	-	-	-	-	2	2	-	3
CO3	3	2	-	-	-	-	-	-	2	2	-	3
CO4	3	2	-	-	-	-	-	-	2	2	-	3
CO5	3	2	-	-	-	-	-	-	2	2	-	3

CO-PSO Mapping

COs/POs	PSO1	PSO2	PSO3
CO1	3	3	2
CO2	3	3	2
CO3	3	3	2
CO4	3	3	2
CO5	3	3	2

Course Name:

Analog Electronic Circuits Lab
Course Code: ECE492
Contact: 0:0:3
Credit: 1.5

Course Outcomes (COs):

After attending the course students should be able to

COs	DESCRIPTIONS
CO1	Able to design single stage R-C coupled voltage amplifier, differential amplifier using BJT at audio frequency range.
CO2	Able to design class A and Class B power amplifier circuit using BJT at audio frequency range.
CO3	Able to structure RC oscillator-Wien bridge and phase shift oscillator circuit using BJT for the generatior of signal at audio frequency range.
CO4	Able to construct multivibrator circuit at astable and mono-stable mode using IC 555 timer.
CO5	Able to design Integrator, differentiator circuit for the generation of function and low pass, high pass.

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	-	-	-	3	-	-	2
CO2	3	3	3	3	3	-	-	-	3	-	-	2
CO3	3	3	3	3	3	-	-	-	3	-	-	2
CO4	3	3	3	3	3	-	-	-	3	-	-	2
CO5	3	3	3	3	3	-	-	-	3	-	-	2

CO-PSO Mapping

COs/POs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Course Name:

Digital Electronic Circuits Lab

Course Code: ECE493
Contact: 0:0:3
Credit: 1.5

Course Outcomes (COs):

After attending the course students should be able to

COs	DESCRIPTIONS
CO1	Able to understand the fundamental concepts and techniques used in digital electronics.
CO2	Able to understand and examine the structure of various number systems, De-Morgan's law, Boolean algebra and its application in digital design.
CO3	Able to understand, analyse the timing properties (input setup and hold times, minimum clock period, output propagation delays) and design various combinational and sequential circuits using various metrics: switching speed, throughput/latency, gate count and area, energy dissipation and power.
CO4	Able to understand different digital circuits using Programmable Logic Devices.
CO5	Able to know how to interface digital circuits with ADC & DAC.

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	-	-	-	3	-	-	2
CO2	3	3	3	3	3	-	-	-	3	-	-	2
CO3	3	3	3	3	3	-	-	-	3	-	-	2
CO4	3	3	3	3	3	-	-	-	3	-	-	2
CO5	3	3	3	3	3	-	-	-	3	-	-	2

CO-PSO Mapping

COs/POs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Course Name:
Antenna & Wave Propagation Lab
Course Code: EC494
Contact: 0:0:3
Credit: 1.5

Course Outcomes (COs):

After completion of the course students would be able to

COs	DESCRIPTIONS
CO1	To understand theory of transmission lines in which EM wave propagates.
CO2	To analyze the fundamentals of antenna theory.
CO3	Understand the different types of antennas and the radiation mechanism.
CO4	Identify the different signals in hardware setup.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	1	-	-	-	1	-	-	-	1
CO2	3	2	-	1	-	-	-	-	-	-	-	2
CO3	2	3	-	-	1	-	1	-	-	-	-	1
CO4	-	-	1	-	-	-	-	-	1	1	-	1

CO-PSO Mapping

COs/POs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3

Course Name:

Environmental Science

Course Code: MC 401
Contact: 3:0:0
Credit: 0

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

COs	DESCRIPTIONS
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 & land pollution.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	3	-	-	-	-	2
CO2	-	-	-	-	-	-	3	-	-	-	-	2
CO3	-	-	-	-	-	-	3	-	-	-	-	2
CO4	-	-	-	-	-	-	3	-	-	-	-	2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CO1	-	-	2
CO2	-	-	2
CO3	-	-	2
CO4	-	-	2

Course Name: Economics for Engineers
Course Code: HU 502
Contact: 2:0:0
Contact Hours: 24
Credit: 2

Course Outcome:
CO1 : To Identify various uses for scares resources
CO2 : To understand key economic concepts and implement in real world problems
CO3 :To apply critical thinking skills to analyze financial data and their impacts.
CO4 :To evaluate business performance through cost accounting principles

CO-PO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	3	-	-	-	-	-	-	-	-	2	-
CO2		-		-	-	-	3	-	-	-	2	
CO3	-	-	-	2	2	3	-	-	-	-	2	2
CO4	-	-	-	3		-	-	-	-	-	3	2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CO1	-	-	2
CO2	-	-	2
CO3	-	-	2
CO4	-	-	2
CO5	-	-	2

Course Name: Analog & Digital Communication Systems
Course Code: EC 501
Contact: 3:0:0
Total Contact Hours:
36 Credit: 3

Course Outcome:

CO1	Able to analyse the amplitude modulation and frequency modulation techniques and determine the effect of modulation index.
CO2	Able to apply the knowledge of probability and statistical calculations to analyse the performance of a digital communication system.
CO3	Able to analyse the concepts of sampling, Pulse Modulation techniques and their comparison.
CO4	Able to analyze signal vector representation of various digitally modulated signals by creating the signal constellation.
CO5	Able to analyze various digital modulation techniques and compute the bit error performance and compare their advantages and limitations.

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	-	-	-	2	-	-	3
CO2	3	3	3	3	-	-	-	-	2	-	-	3
CO3	3	3	3	3	-	-	-	-	2	-	-	3
CO4	3	3	3	3	-	-	-	-	2	-	-	3
CO5	3	3	3	3	-	-	-	-	2	-	-	3

CO-PSO Mapping

COs/POs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Course Name: Microprocessor and Microcontroller
Course Code: EC 502
Contact: 3:0:0
Total Contact Hours:
36 Credit: 3
Prerequisites: Knowledge in Digital Electronics

Course Outcome:

CO1	Able to demonstrate the architecture of 8085 Microprocessor considering the function of each pin for compiling Assembly language programs and interfacing with peripheral devices.
CO2	Able to write Machine language programming with the help of mnemonic- Opcode & Operand using8085 Microprocessor for arithmetical, logical,data transfer, branching and machine control operation.
CO3	Able to organize peripheral operation based on the concept of the microprocessor 8085 block diagram,pin details, modes of operation and control word format of 8255,8253 and 8251.
CO4	Able to illustrate the architecture of microprocessor 8086 considering pin diagram, memory segmentation,addressing mode and simulate assembly language program for arithmetical ,logical, data transfer, branching and machine control operation.
CO5	Based on the concept of architecture of 8051, it is able to write assembly language programs for data transfer operation,logical operation, arithmetic operation, JUMP operation, and Interrupt operation.

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	-	-	-	2	-	-	2
CO2	3	3	3	3	-	-	-	-	2	-	-	2
CO3	3	3	3	3	-	-	-	-	2	-	-	2
CO4	3	3	3	3	-	-	-	-	2	-	-	2
CO5	3	3	3	3	-	-	-	-	2	-	-	2

CO-PSO Mapping

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Paper Name: Digital Signal Processing

Course Code: EC503

Contacts: 3:0:0

Contact Hours: 36

Credits: 3

Course Outcomes:

CO1	Able to determine and describe signals in frequency domain using DFT and IDFT, Twiddle factors, circular convolution concentric method and matrix method, DFT/IDFT using matrix methods, filtering of long data sequences using Overlap-Save and Overlap-Add methods.
CO2	Able to compute signals in frequency domain using FFT, Butterflies, Bit reversal, Radix-2 algorithm, Decimation-In-Time, Decimation-In-Frequency algorithms and signal flow graphs.
CO3	Able to analyze signal error quality using quantization error, product quantization error, quantization error, Zero- input Limit cycle Oscillations and limit cycle Oscillations.
CO4	Able to design and implement nth order IIR and FIR filters using impulse invariant and bilinear transforms, approximation method, analogue Butterworth filter, linear phase FIR filters, Rectangular and Hamming and Blackman windows.
CO5	Able to apply digital signal processing techniques in speech analysis in a group using DSP processor.

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	-	-	-	2	-	-	3
CO2	3	3	3	3	-	-	-	-	2	-	-	3
CO3	3	3	3	3	-	-	-	-	2	-	-	3
CO4	3	3	3	3	-	-	-	-	2	-	-	3
CO5	3	3	3	3	-	-	-	-	2	-	-	3

CO-PSO Mapping

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Course Name: Information Theory & Coding Course Code: EC 504A
Contacts: 3:0:0
Contact hours: 36
Credits: 3

Course outcome:

COs	Statement
CO1	Able to interpret source coding with the help of Huffman coding, Shannon - Fano coding techniques for the generation of variable length codewords and calculation of efficiency of the code.
CO2	Able to apply channel capacity and channel coding for controlling error in a digital communication system on the basis of channel modelling information capacity theorem, Shannon limit.
CO3	Able to analyse error detection and correction in digital communication channel based on different error control codes like linear block code, cyclic code, convolution code.
CO4	Able to evaluate BCH code for error correction in channel coding using linear algebra, concept of Galois field, conjugate roots, minimal polynomial.
CO5	Able to design the encoder and decoder logic circuit in the transmitter and receiver section of the digital communication system for error detection and correction of the transmitted message word using respective encoding and decoding process of block code, cyclic code, convolution code.

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	-	-	-	-	2	-	-	2
CO2	3	3	3	2	-	-	-	-	2	-	-	2
CO3	3	3	3	3	-	-	-	-	2	-	-	2
CO4	3	3	3	3	-	-	-	-	2	-	-	2
CO5	3	3	3	3	-	-	-	-	2	-	-	2

CO-PSO Mapping

COs/POs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Course Name: Renewable Energy Sources & Applications
Course Code: EC 504B
Contacts: 3:0:0
Total Contact Hours:
36 Credit: 3

Course Outcome

CO1	Understand the importance of Renewable energy over conventional process and learn different methods of Power generation from the Non- conventional sources like Solar, Wind Energy, Biomass, Geothermal energy, OTEC, Tidal energy, MHD Power generation schemes.
CO2	CO2 Analyze the different techniques of grid integration of the power generated from renewable energy sources with the initiation of power electronic converters and drives.
CO3	Design different hybrid energy systems and energy storage systems

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1	-	2	-	2	2	2	2	3
CO2	3	2	2	1	2	3	-	2	2	1	2	3
CO3	3	2	1	3	-	3	1	3	1	1	1	3

CO-PSO Mapping

COs/POs	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3

Course Name: Nano Electronics
Course Code: EC 504C:
Contacts: 3:0:0
Total Contact hours: 36
Credits: 3
Course outcome

CO1	Able to Explain the importance of NanoElectronics and level of application.
CO2	Able to Analyze the recent trends of microelectronics and nano-electronics.
CO3	Able to Analyze nanodots, wire and nanowell design level and behavior
CO4	Able to Explore nanostructure levels and design
CO5	Able to Develop the fabrication and analytical techniques of nanomaterials

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1:	3	1	1	3	1	1	-	-	-	1	2	3
CO2:	3	2	2	3	1	-	2	1	1	1	1	3
CO3:	2	3	1	2	1	1	1	2	-	-	1	3

CO-PSO Mapping

COs/PSOs	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3

Course Name: Analog & Digital Communication Systems Lab Course
Code: EC 591
Contact: 0:0:3
Credit: 1.5

Prerequisites: Knowledge of signals and systems

CO1	Able to demonstrate the Amplitude Modulation & Demodulation by measuring and verifying the output power with varying modulation index.
CO2	Able to demonstrate the FM signal and measure the modulation index, frequency deviation and bandwidth.
CO3	Able to design a PLL to measure the lock frequency using VCO.
CO4	Able to demonstrate the generation of PCM, delta modulation, adaptive delta modulation techniques using the concepts of sampling.
CO5	Able to demonstrate the various Digital modulation techniques ASK, BFSK, BPSK, QPSK and develop insight into the input and output signals in various stages of a transmitter and a receiver.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	1	1	-	-	2	3	3	3	2
CO2	3	3	-	3	3	-	2	-	-	1	3	3	2
CO3	3	3	3	3	2	2	-	-	1	3	3	3	2
CO4	3	-	3	2	3	-	2	-	-	2	3	3	2
CO5	3	2	-	3	3	2	-	-	-	3	3	3	2

CO-PSO Mapping

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Course Name: Microprocessor and Microcontroller Lab
Course Code: EC592
Contacts: 0:0:3
Credits: 1.5

Prerequisites: Knowledge in Digital Electronics

Course Outcome:

CO	Statement
CO1	Able to apply assembly language programming in 8085 & 8086 Trainer Kits using arithmetic and Logical operations of the instruction sets.
CO2	Able to develop assembly language programming in 8051trainer kits using arithmetic, logical and bit manipulation instructions.
CO3	Able to design the interfacing program of 8085 with 8255 in glowing LEDs accordingly, stepper motor rotation control, interfacing Seven Segment Display and displaying string etc based on Subroutine Call and IN/OUT.
CO4	Able to design the interfacing program of 8086 with 8255 in glowing LEDs accordingly, stepper motor rotation control, interfacing Seven Segment Display and displaying string etc based on Subroutine Call and IN/OUT.
CO5	Able to analyze Timer/Counter and Interrupt handling in 8051 interfacing using timer and interrupt control instructions.

CO-PO Mapping:

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	-	-	-	3	-	-	2
CO2	3	3	3	3	3	-	-	-	3	-	-	2
CO3	3	3	3	3	3	-	-	-	3	-	-	2
CO4	3	3	3	3	3	-	-	-	3	-	-	2
CO5	3	3	3	3	3	-	-	-	3	-	-	2

CO-PSO Mapping

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Course Name: Digital Signal Processing Lab.
Course Code: EC593

Contacts: 0:0:3

Credits: 1.5

Course Outcomes:

CO1	Able to analyze generation and operation of various discrete sequences using MATLAB tools.
CO2	Able to compute the system output using circular,linear and sectioned convolution methods using MATLAB tools.
CO3	Able to Calculate DFT, FFT, IDFT using MATLAB
CO4	Able to analyze Magnitude and phase characteristics (Frequency response Characteristics) of digital IIR Butterworth using MATLAB tools.
CO5	Able to Develop and Implement DSP algorithms in software using a computer language such as C with TMS320C6713 floating point Processor.

CO-PO Mapping

COs/PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	-	-	-	3	-	-	3
CO2	3	3	2	3	3	-	-	-	3	-	-	3
CO3	3	3	3	3	3	-	-	-	3	-	-	3
CO4	3	3	3	3	3	-	-	-	3	-	-	3
CO5	3	3	3	3	3	-	-	-	3	-	-	3

CO-PSO Mapping

COs/POs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Course Name: Constitution of India Course Code: MC 501

Contact: 3:0:0

Total Contact Hours:

32 Prerequisite: NA

Course Outcome: Student will be able to:

CO1	Develop human values, create awareness about law ratification and significance of Constitution
CO2	Comprehend the Fundamental Rights and Fundamental Duties of the Indian Citizen to implant 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 Economy of the country

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CO-PO mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	3	2	3	-	-	-	2
CO2	-	-	-	-	-	3	2	3	-	-	-	2
CO3	-	-	-	-	-	3	2	3	-	1	-	2
CO4	-	-	-	-	-	3	2	3	-	1	-	2
CO5	-	-	-	-	-	3	2	3	-	1	-	2

CO-PSO Mapping

COs/PSOs	PSO1	PSO2	PSO3
CO1	-	-	2
CO2	-	-	2
CO3	-	-	2
CO4	-	-	2
CO5	-	-	2

Course Name: VLSI & Microelectronics

Course Code: EC601

Contacts: 3:0:0

Total Contact Hours: 36

Credit: 3

Course Objective:

Objective of the course VLSI & Microelectronics, Code : EC702 is to motivate students to design VLSI circuits in the area of digital , analog and also to encourage for the design of IC with low power and high speed .

COs	CO Statement
CO1	Able to illustrate scale of integration – SSI, MSI,LSI,VLSI, Moor's Law ,scaling , short channel effect ,VLSI design flow, FPGA architecture and construct gate level circuit with PAL & PLA concept.
CO2	Able to analyze voltage transfer characteristics of CMOS inverter with the parameters – VIL, VIH , VOL , VOH , Vth and able to construct schematic of combinational , sequential circuit , SRAM , DRAM cell using circuit design methodology – CMOS , Pass transistor , TG , DCVSL , dynamic logic ,NORA Logic.
CO3	Based on the fundamental concept of MOSFET characteristics and model, able to determine value of resistance of current source, MOS diode , current of current mirror circuit , voltage of references (voltage divider , threshold voltage and band gap), resistance of switch capacitor circuit , gain of switch capacitor integrator and 1st order switch capacitor filter and value of parameters to design CMOS differential amplifier and two stage OP-AMP.
CO4	Able to illustrate fabrication steps of IC and construct stick diagram & layout of CMOS inverter and basic gates based on lambda and micron design rules.
CO5	Able to estimate gate delay, dynamic power, short circuit power and leakage power and total power consumption across CMOS inverter circuit based on the mathematical expression.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	3	-	-	-	-	2	-	-	3
CO2	3	3	3	3	-	-	-	-	2	-	-	3
CO3	3	3	3	2	-	-	-	-	2	-	-	2
CO4	3	3	3	3	-	-	-	-	2	-	-	3
CO5	3	3	3	3	-	-	-	-	2	-	-	2

CO-PSO Mapping:

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	2	3
CO3	3	3	3
CO4	3	3	3
CO5	2	3	2

Course Name: Control Systems Course
Code: EC 602
Contacts:3:0:0
Total Contact Hours: 36
Creditd:3

Course outcome:

CO1	Able to implement different types of system and identify a set of algebraic equations to represent and model a complicated system into a more simplified form to interpret different physical and mechanical systems in terms of electrical system to construct equivalent electrical models for analysis using block diagram reduction and signal flow graph procedure between open loop and closed loop control systems.
CO2	Able to analyse the time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions and to identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system.
CO3	Able to analyse the stability of control systems in S-domain using RH criterion, Root-locus.
CO4	Able to examine the relative stability of control systems using frequency domain analysis using Polar plot, Nyquist plot, Bode plot.
CO5	Able to identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system and design accordingly using P, PI, PD, PID technique to desired performance specifications.

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	-	-	-	2	-	-	2
CO2	3	3	3	3	-	-	-	-	2	-	-	2
CO3	3	3	3	3	-	-	-	-	1	-	-	2
CO4	3	3	3	3	-	-	-	-	1	-	-	2
CO5	3	3	3	3	-	-	-	-	2	-	-	2

CO-PSO Mapping

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	2	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Course Name: RF & Microwave Engineering
Course Code: EC 603
Contacts: 3:0:0
Total Contact Hours: 36
Credits: 3

Course Outcomes:

CO1	Able to analyze the characteristics of rectangular & circular microwave waveguides and planar transmission lines with the concept of computation techniques of electromagnetic wave propagation.
CO2	Able to **describe** the components of the lumped network of waveguide, planar transmission line with the help of equivalent circuit & waveguide Passive Components with their S-matrix Representation
CO3	Able to **design** parameters of RF amplifier and microwave matching network with the concept of the characteristics of Microwave Tubes - two cavity klystron, Reflex Klystron, Magnetron and Microwave Active devices - Gunn diode, Avalanche Transit Time device, Schottky diode, PIN diode, Microwave bipolar transistor, Microwave field effect transistor.
CO4	Able to **explain** the working principle of Microwave measuring equipment Microwave test bench, VSWR meter, Tunable detector, Slotted line, Probe detector, Frequency meter with the help of medium,low and high frequency microwave power.
CO5	Able to **interpret** the design principle for Radio Frequency component with the concept of microwave generators, waveguide operating principles, planar transmission lines & measuring methods.

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	-	-	-	2	-	-	2
CO2	3	3	2	3	-	-	-	-	2	-	-	2
CO3	3	3	3	2	-	-	-	-	2	-	-	2
CO4	3	2	2	3	-	-	-	-	2	-	-	2
CO5	3	2	3	2	-	-	-	-	2	-	-	2

CO-PSO Mapping:

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	2	3
CO3	3	3	3
CO4	3	3	3
CO5	2	3	2

Course Name: Mobile Communication and Network
Course Code: EC 604A
Contacts: 3:0:0
Total Contact hours: 36
Credits: 3

Course Outcomes:

CO1:	Describe the evolution and History of Wireless Technology
CO2:	Explain cellular concept for mobile communication.
CO3:	Learn radio signal propagation issues and different technological advancement of mobile communication, Wireless and Radio channels.
CO4:	Compare 3G Cellular telephone data transfer rates with those over Wireless LAN and core networks associated with 3G Cellular networks.
CO5:	Describe mobile IP allocation and function of the station roaming.

CO-PO mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	-	-	-	2	-	-	2
CO2	3	3	2	3	-	-	-	-	2	-	-	2
CO3	3	3	3	2	-	-	-	-	2	-	-	2
CO4	3	2	2	3	-	-	-	-	2	-	-	2
CO5	3	2	3	2	-	-	-	-	2	-	-	2

CO-PSO Mapping:

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	2	3
CO3	3	3	3
CO4	3	3	3
CO5	2	3	2

Course Name: Advanced Microprocessor & Microcontroller
Course Code: EC 604B
Contacts: 3:0:0
Total Contact Hours: 36
Credits: 3
Pre requisite: Concepts in 8085 ,8086 Microprocessor and MCS51 series of Microcontroller.

CO1	Understand the features, architecture of ARM7 and its applications.
CO2	Analyse and understand the instruction set and development tools of ARM
CO3	Get comprehensive knowledge on features, architecture, pin diagram, input-output configuration, the interrupts and timers of PIC microcontroller
CO4	Understand the significance of input-output device interface with PIC microcontroller.
CO5	Work on different projects making use of the ARM & PIC microcontroller

CO-PSO Mapping:

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	2	3
CO3	3	3	3
CO4	3	3	3
CO5	2	3	2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	-	-	-	2	-	-	2
CO2	3	3	2	3	-	-	-	-	2	-	-	2
CO3	3	3	3	2	-	-	-	-	2	-	-	2
CO4	3	2	2	3	-	-	-	-	2	-	-	2
CO5	3	2	3	2	-	-	-	-	2	-	-	2

Course Name: Introduction to Python
Course Code: EC 604C
Contacts: 3:0:0
Total Contact Hours: 36
Credits: 3

Prerequisites: Students are expected to be able to open command prompt window or terminal window, edit a text file, download and install software, and understand basic programming concepts.

CO1	Able to develop the skill based on the variable,basic operators to acquire programming skills in core python.
CO2	Able to understand object oriented skills in python based on the knowledge of decision making & loops
CO3	Able to describe the skill of python programming with the help of string,list,tuples,dictionary in python.
CO4	Able to write the program of python with the help of the knowledge of functions.
CO5	Able to develop the ability to write the programming based on the packages in python.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	3	2	-	-	2	1	3	3
CO2	3	3	3	3	3	2	-	-	2	1	3	3
CO3	3	3	3	2	3	2	-	-	2	1	3	2
CO4	3	3	3	2	3	2	-	-	2	1	3	3
CO5	3	3	3	2	3	2	-	-	2	1	3	3

CO-PSO Mapping

COs/PSOs	PSO1	PSO2	PSO3
CO1	2	2	-
CO2	2	2	-
CO3	2	2	-
CO4	2	2	-
CO5	2	2	-

Course Name: Object Oriented Programming using Java
Course Code: EC 605A
Contacts: 3:0:0
Total Contact Hours: 36
Credit: 3
Pre requisites: Basic knowledge of computers, basic knowledge of programming.

CO1	Understand the key concepts of object-oriented programming and have an ability to design OO programs and appreciate the techniques of good design.
CO2	Understand advanced features of Java like Class Members-Local variable, instance variable, class variable, Primitive and Reference variable, Constructor, this keyword, finalize and garbage collection, Array- Declaring and defining array.
CO3	Analyze complex programming problems and optimize the solutions.
CO4	Apply an understanding of ethical principles to problems which commonly arise in the Information Technology Industry
CO5	Analyze there usability properties using super class & subclasses, dynamic method dispatch.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	2	-	-	2	1	3	2
CO2	3	3	3	3	3	2	-	-	2	1	3	2
CO3	3	3	3	2	3	2	-	-	2	1	3	2
CO4	3	3	3	3	3	2	-	-	2	1	3	3
CO5	3	3	3	2	3	2	-	-	2	1	3	2

CO-PSO Mapping

COs/PSOs	PSO1	PSO2	PSO3
CO1	2	2	-
CO2	2	2	-
CO3	2	2	-
CO4	2	2	-
CO5	2	2	-

Course Name: Computer Communication and Network Security
Course Code:EC605B
Contacts: 3:0:0
Total Contact Hours: 36
Credits: 3

Pre requisite: Knowledge of Communication

Course Outcomes:

CO1	Analyze various protocols in Data Communication
CO2	Design Networking structure in Data communication
CO3	Identify some of the factors driving the need for network security, classify particular examples of attacks and physical points of vulnerability in simple networks.
CO4	Identify compare and contrast symmetric and asymmetric encryption systems

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	-	-	1	-	3	3	1	1
CO2	2	2	3	3	2	2	-	-	3	3	3	3
CO3	2	2	2	2	2	1	-	-	3	3	1	3
CO4	3	2	2	2	2	3	-	-	3	3	2	3

CO-PSO Mapping

	PSO1	PSO2	PSO3
CO1	**3**	**3**	**3**
CO2	**3**	**3**	**3**
CO3	**3**	**3**	**3**
CO4	**3**	**3**	**3**

Course Name: Artificial Intelligence and Robotics
Course Code: EC 605C
Contacts: 3:0:0
Total Contact Hours: 36
Prerequisites: Linear algebra and probability theory. Basic understanding of control systems and computing.

Course Outcomes:

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

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	-	-	-	2	-	-	3
CO2	3	3	2	3	-	-	-	-	-	-	-	3
CO3	3	3	3	2	-	-	-	-	2	-	-	3
CO4	3	2	2	3	-	-	-	-	2	-	-	3
CO5	3	2	3	2	-	-	-	-	2	-	-	3

CO-PSO Mapping

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	2	3
CO3	3	3	3
CO4	3	3	3
CO5	2	3	2

Course Name: VLSI & Microelectronics Lab

Course Code: EC 691

Contacts: 0:0:3

Credit: 1.5

Course Outcomes:

CO1	Able to measure VIL, VIH,VOL,VOH,noise margin.CMOS inverter gate delay and average power consumption of CMOS inverter for VDD≤1.2V and with the nano dimension challenging of MOS transistors through transient analysis using SPICE.
CO2	Able to design combinational circuit - CMOS AND/NAND, OR/NOR, XOR/XNOR gate, CMOS full adder circuit, sequential circuit-CMOS SRlatch, clocked SRlatch & D flip-flop at schematic level for functional verification with the help of SPICE tools.
CO3	Able to construct layout of CMOS inverter, CMOS NAND, CMOS NOR gate using layout design tools of SPICE based on design rules.
CO4	Design of combinational circuits-logic gates, Fulladderusinghalfadder,4:1MUXusing2:1 MUX, Sequential circuits-S-R Flip-Flop, 8-bit synchronous counter, 8 Bit bi-directional register with tri-stated input output using VHDL and 4:1 MUX using FPGA
CO5	Design of CMOS differential amplifier with active load and biased with current mirror for given specification using SPICE tools at schematic level.

CO-PO Mapping:

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	-	-	-	3	-	-	2
CO2	3	3	3	3	3	-	-	-	3	-	-	2
CO3	3	3	3	3	3	-	-	-	2	-	-	2
CO4	3	3	3	3	3	-	-	-	3	-	-	3
CO5	3	3	3	3	3	-	-	-	2	-	-	2

CO-PSO Mapping

COs/Pos	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Course Name: Control Systems Lab
Course Code: EC 692
Contacts: 0:0:3
Creditd:1.5

Course Outcome:

CO1	Able to familiarize with the Control System toolbox and Simulink using MATLAB/Scilab tools.
CO2	Determine Transient and Steady State behaviour of different types of systems using standard test signals using MATLAB/Scilab tools.
CO3	Able to determine the importance of gain, location of poles and zeros to design a system using MATLAB/Scilab tools
CO4	Able to check the stability of the systems using the concept of different stability criterion using MATLAB/Scilab tools.
CO5	Gain experience using modern software tools to design the systems according to the desired specifications or requirements using different types of controllers using MATLAB/Scilab tools.

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	-	-	-	3	-	-	2
CO2	3	3	3	3	3	-	-	-	3	-	-	2
CO3	3	3	3	3	3	-	-	-	3	-	-	2
CO4	3	3	3	3	3	-	-	-	3	-	-	2
CO5	3	3	3	3	3	-	-	-	3	-	-	2

CO-PSO Mapping

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Course Name: RF & Microwave Engineering Lab Course
Code: EC 693
Contacts: 0:0:3
Credits: 1.5

Course Outcome:

CO1	Define, identify and list out special type transmission line, its characteristics in microwave frequencies and concept of load.
CO2	Categorize, arrange and implement suitably the various microwave passive devices with the utilization of engineering mathematics
CO3	Analyze and use the various sources of microwave energy and the characters of its operation.
CO4	Use, and apply various hardware, software tools and measuring instruments in the field of Radio Frequencies
CO5	Compute and solve, in the field of Radio Frequencies, for the betterment of communication engineering, medical science, various domestic and commercial engineering.

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	-	-	-	3	-	-	2
CO2	3	3	3	3	3	-	-	-	3	-	-	2
CO3	3	3	3	3	3	-	-	-	3	-	-	2
CO4	3	3	3	3	3	-	-	-	3	-	-	2
CO5	3	3	3	3	3	-	-	-	3	-	-	2

CO-PSO Mapping

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Course Name: Mobile Communication and Network Lab
Course Code: EC 694A

Contacts: 0:0:3

Credits: 1.5

Course Outcome:

Students will be able to:

CO1:	Understand the path Loss.
CO2:	Analyze the Horizontal & vertical Beam Pattern of a Base station Antenna.
CO3:	Understand the concept of co-channel interference and hence Signal to Interference and Noise Ratio.
CO4:	Understand the impact of many different parameters influence the downlink C/I ratio like Cell radios, Tx power of B.S, Frequency reuse, Sectoring, Shadowing effect, B.S. height, Path loss exponent, Vertical beam tilt.
CO5:	Study the effect of handover threshold and margin on SINR and call drop probability and handover probability.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	-	-	-	3	-	-	2
CO2	3	3	3	3	3	-	-	-	3	-	-	2
CO3	3	3	3	3	3	-	-	-	3	-	-	2
CO4	3	3	3	3	3	-	-	-	3	-	-	2
CO5	3	3	3	3	3	-	-	-	3	-	-	2

CO-PSO Mapping:

	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Course Name: Advanced Microprocessor & Microcontroller Lab
Course Code: EC 694B
Contacts: 0:0:3
Credits: 1.5

Course Outcome:

CO1	Understand the features, architecture of ARM7 and its applications.
CO2	Analyse and understand the instruction set and development tools of ARM
CO3	Get comprehensive knowledge on features, architecture, pin diagram, input-output configuration, the interrupts and timers of PIC microcontroller
CO4	Understand the significance of input-output device interface with PIC microcontroller.
CO5	Work on different projects making use of the ARM & PIC microcontroller

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	-	-	-	3	-	-	2
CO2	3	3	3	3	3	-	-	-	3	-	-	2
CO3	3	3	3	3	3	-	-	-	3	-	-	2
CO4	3	3	3	3	3	-	-	-	3	-	-	2
CO5	3	3	3	3	3	-	-	-	3	-	-	2

CO-PSO Mapping

	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Course Name: Python Programming
Lab Course Code: EC 694C

Contacts: 0:0:3

Credits: 1.5

Course Outcomes:

CO1	Able to apply Variable, Basic operators
CO2	Able to evaluate decision making & loops to solve problems
CO3	Able to compile string, list, tuples, dictionary for data structure.
CO4	Able to write functions for recursive problems.
CO5	Able to apply packages in python

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	3	-	-	-	3	-	-	3
CO2	3	3	3	3	3	-	-	-	3	-	-	3
CO3	3	3	3	2	3	-	-	-	3	-	-	2
CO4	3	3	3	2	3	-	-	-	3	-	-	3
CO5	3	3	3	2	3	-	-	-	3	-	-	3

CO-PSO Mapping

COs/PSOs	PSO1	PSO2	PSO3
CO1	2	2	-
CO2	2	2	-
CO3	2	2	-
CO4	2	2	-
CO5	2	2	-

Course Name: Object Oriented Programming using Java Lab

Course Code: EC 695A

Contacts: 0:0:3

Credit: 1.5

Course Outcomes: After the completion of the course students will be able to

CO1	Apply object-oriented programming concepts in designing programs
CO2	**Analyze** different dimensions of a problem and provide optimal solutions.
CO3	The advance features of JAVA in designing of projects
CO4	Apply I/O technique to read and write from file.
CO5	Apply swing and applet technique to create GUI

CO –PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	-	-	-	-	3	-	-	3
CO2	2	2	3	2	-	-	-	-	3	-	-	3
CO3	3	3	3	2	-	-	-	-	3	-	-	3
CO4	3	3	3	2	-	-	-	-	3	-	-	3
CO5	3	3	3	2	-	-	-	-	3	-	-	3

CO-PSO Mapping

COs/PSOs	PSO1	PSO2	PSO3
CO1	2	2	-
CO2	2	2	-
CO3	2	2	-
CO4	2	2	-
CO5	2	2	-

Course Name: Computer Communication and Network Security Lab
Course Code:EC695B
Contacts: 0:0:3
Credits: 1.5
Course Outcome :

CO1	Understand details and functionality of layered network architecture underlying principles of computer networking.
CO2	Analyze the packet /file transmission between nodes and performance of various communication protocols.
CO3	Analyze and evaluate the network security needs of an organization
CO4	Determine and analyze vulnerabilities and security solutions to reduce the risk of exploitation.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	-	-	-	3	-	-	1
CO2	2	2	2	2	2	-	-	-	3	-	-	3
CO3	2	2	2	2	2	-	-	-	3	-	-	3
CO4	3	3	3	3	3	-	-	-	3	-	-	3

CO-PSO Mapping

	PSO1	PSO2	PSO3
CO1	**3**	**3**	**3**
CO2	**3**	**3**	**3**
CO3	**3**	**3**	**3**
CO4	**3**	**3**	**3**

Course Name: Artificial Intelligence and Robotics Lab
Course Code: EC 695C
Contacts: 0:0:3
Credit: 1.5

Course outcomes:

CO1	Able to analyse logical reasoning using Prolog
CO2	Able to evaluate searching lgorithm.
CO3	Able to create roboticarm.
CO4	Able to apply robots to solve practical problems.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	2	-	-	-	3	-	-	1
CO2	2	2	3	3	2	-	-	-	3	-	-	3
CO3	2	2	2	2	2	-	-	-	3	-	-	3
CO4	3	2	2	2	2	-	-	-	3	-	-	3

CO-PSO Mapping

	PSO1	PSO2	PSO3
CO1	**3**	**3**	**3**
CO2	**3**	**3**	**3**
CO3	**3**	**3**	**3**
CO4	**3**	**3**	**3**

Course Name: Technical Lecture Presentation & Group Discussion I
Course Code: MC 681
Contacts: 0:0:3
Credit: 0

Course Outcome:

CO1	Learn how to use non verbal communication to create the impression of credibility and to feel confident.
CO2	Learn methods for organizing your thoughts and ideas into a compelling presentation.
CO3	Demonstrate interpersonal skills by way of Group discussions in a healthy environment
CO4	Develop confidence and life skills to handle engineering assignments

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	-	-	-	3	-	-	3
CO2	3	3	3	3	3	-	-	-	3	-	-	3
CO3	3	3	3	3	3	-	-	-	3	-	-	3
CO4	3	3	3	3	3	-	-	-	3	-	-	3

CO-PSO Mapping

COs/PSOs	**PSO1**	**PSO2**	**PSO3**
CO1	-	-	2
CO2	-	-	2
CO3	-	-	2
CO4		-	2
CO5	-	-	2

Course Name: Principles of Management
Course Code: HU 704
Contact hour: 2:0:0
Total contact hour- 24
Credits: 2
Prerequisites: NIL

Course outcome:

CO1	**To recall and identify the relevance of management concepts.**
CO2	**To apply management techniques for meeting current and future management challenges faced by the organization**
CO3	**To compare the management theories and models critically to solve real life problems in an organisation.**
CO4	**To apply principles of management in order to execute the role as a manager in an organization.**

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	2	-	3	2	3	3	3
CO2	3	3	3	3	3	2	-	3	2	3	3	3
CO3	3	3	3	3	3	2	-	3	2	3	3	3
CO4	3	3	3	3	3	2	-	3	2	3	3	3

CO-PSO Mapping

COs/PSOs	PSO1	PSO2	PSO3
CO1	-	-	2
CO2	-	-	2
CO3	-	-	2
CO4		-	2
CO5	-	-	2

Course Name: Satellite & Optical Communication Paper
Course Code: EC701A
Total Contact Hours: 36
Credit: 3
Course Outcome :

CO1	Able to learn the dynamics of the satellite and the design of satellite links.
CO2	Able to understand the communication satellite design and how analogue and digital technologies are used for satellite communication networks
CO3	Apply the fundamental principles of optics and light wave to design optical fibre communication systems.
CO4	Design optical fibre communication links using appropriate optical fibres light sources ,detectors.
CO5	Explore concept of designing and operating principles of modern optical systems and networks.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	2	-	-	2	1	3	2
CO2	3	3	3	3	3	2	-	-	2	1	3	2
CO3	3	3	3	2	3	2	-	-	2	1	3	2
CO4	3	3	3	3	3	2	-	-	2	1	3	3
CO5	3	3	3	2	3	2	-	-	2	1	3	2

CO-PSO Mapping

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Course Name: Digital Image & Video Processing
Course Code: EC 701B
Contact hour: 3:0:0
Total contact hour- 36
Credits: 3
Course Outcome:

CO1	Identify the structure of human eye, image formation , Brightness, sensing, acquisition, storage, Communication, Sampling, quantization, spectrum analysis using image Enhancement, image transformations, Histogram processing both in the Spatial and Frequency Domain.
CO2	Elaborate image compression, recognition, restoration, segmentation and representation techniques with the help of DCT,wavelet, inverse filtering,watershed algorithms applicable to the Spatial and Frequency Domain.
CO3	Explain the importance of Edge detection and security using morphological operation, security, encryption techniques in the scope of mathematical interpretation.
CO4	Develop the basic steps of Video Processing using data compression, redundancy, 3D motion , sampling, filtering for realtime and offline applications
CO5	Estimate optical flow in 2D motion of objects both in still image and Video based using block matching, mesh based, region based, multiresolution motion algorithm applicable to computer vision.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	2	-	-	2	1	3	3
CO2	3	3	3	3	3	2	-	-	2	1	3	3
CO3	3	3	3	2	3	2	-	-	2	1	3	3
CO4	3	3	3	3	3	2	-	-	2	1	3	3
CO5	3	3	3	2	3	2	-	-	2	1	3	3

CO-PSO Mapping

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Course Name: Remote Sensing & GIS
Course Code: EC701C
Contact: 3:0:0
Total Contact Hours: 36
Credit: 3
Course Objective:

CO1	Able to recognize the principles of aerial and satellite remote sensing.
CO2	Able to understand the basic concept of GIS and its applications.
CO3	Able to know different types of data representation in GIS.
CO4	Able to develop models for GIS spatial Analysis
CO5	Able to apply knowledge of GIS software and able to work with GIS software in various application fields.
CO6	Apply basic procedures of digital image processing for RS image enhancement analysis

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1									3		3	
CO2						2			3		3	3
CO3	3								2		3	3
CO4						2			3		3	
CO5		2		2				2	3		3	
CO6	3					3				2		

CO-PSO Mapping

	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3
CO6	3	3	3

Course Name: DATABASE MANAGEMENT SYSTEM
Course Code: EC702A
Contacts: 3:0:0
Total Contact Hours: 36
Credit: 3
Course Outcome

CO1	Apply the knowledge of Entity Relationship (E-R)diagram for an application.
CO2	Create a normalized relational database model
CO3	Analyze real world queries to generate reports from it.
CO4	Determine whether the transaction satisfies the ACID properties.
CO5	Create and maintain the database of an organization

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	-	-	-	2	-	-	3
CO2	3	3	2	3	-	-	-	-	-	-	-	2
CO3	3	3	3	2	-	-	-	-	2	-	-	3
CO4	3	2	2	3	-	-	-	-	2	-	-	2
CO5	3	2	3	2	-	-	-	-	2	-	-	3

CO-PSO Mapping:

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	3	2
CO2	3	2	2
CO3	3	2	2
CO4	3	2	2
CO5	2	3	2

Course Name : Machine Learning
Course Code : EC 702 B
Contacts : 3:0:0
Total Contact : 36
Credits : 3
Consumer Outcomes:

CO1	Able to apply regression, classification, dimensionality reduction, clustering based on requirement of problem to achieve minimum error in prediction.
CO2	Able to infer the importance of feature selection and extraction depending on quality of application upto more than available maximum performance.
CO3	Able to use k-means, hierarchial clustering, gausian estimation to achieve silhouette index on the basis of performance of prediction.
CO4	Able to develop suitable model based on application upto achievable minimization of performance error.
CO5	Able to develop algorithm depending on prediction of real time happening upto 95% prediction accuracy.

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	-	-	-	2	-	-	3
CO2	3	3	2	3	-	-	-	-	-	-	-	2
CO3	3	3	3	2	-	-	-	-	2	-	-	3
CO4	3	2	2	3	-	-	-	-	2	-	-	2
CO5	3	2	3	2	-	-	-	-	2	-	-	3

CO-PSO Mapping:

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	2
CO4	3	3	3
CO5	2	3	2

Course Name: Internet of Things
Course Code: EC 702 C
Contacts: 3:0:0
Total Contact: 36
Credits: 3
Course Outcome:

CO1	Understand internet of Things and its hardware and software components
CO2	Apply Interface I/O devices, sensors & communication modules
CO3	Illustrate Remotely monitor data and control devices
CO4	Create real life IoT based projects

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	-	-	-	2	-	-	3
CO2	3	3	2	3	-	-	-	-	-	-	-	2
CO3	3	3	3	2	-	-	-	-	2	-	-	3
CO4	3	2	2	3	-	-	-	-	2	-	-	2

CO-PSO Mapping:

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	2
CO4	3	3	3

Course Name: Satellite & Optical Communication Lab
Course Code: EC 791A
Contacts: 3:0:0
Credits: 1.5
Course Outcome:

CO1	Able to learn the dynamics of the satellite and the design of satellite links.
CO2	Able to understand the communication satellite design and how analogue and digital technologies are used for satellite communication networks.
CO3	Apply the fundamental principles of optics and light wave to design optical fiber communication systems.
CO4	Design optical fiber communication links using appropriate optical fibers light sources, detectors.
CO5	Explore concept of designing and operating principles of modern optical systems and networks.

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	-	-	-	3	-	-	3
CO2	3	3	2	3	2	-	-	-	3	-	-	2
CO3	3	3	3	2	2	-	-	-	3	-	-	2
CO4	3	2	2	3	2	-	-	-	3	-	-	2
CO5	3	2	3	2	2	-	-	-	3	-	-	3

CO-PSO Mapping:

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	2
CO4	3	3	3
CO5	2	3	2

Course Name: Digital Image & Video Processing Lab
Course Code: EC 791B
Contacts: 3:0:0
Credits: 1.5
Course Outcome:

CO1	Have a clear idea on digital image fundamentals, Transform of Digital Images and its applications, simple image enhancement techniques in both spatial and frequency domain
CO2	Understanding the importance of image compression, recognition, and restoration segmentation and representation techniques.
CO3	Explaining the Edge detection & Security in Digital Image Processing
CO4	Demonstrate the basic steps of Video Processing
CO5	Familiarize with 2D motion Estimation of Objects in Video Processing

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	-	-	-	3	-	-	3
CO2	3	3	2	3	3	-	-	-	3	-	-	2
CO3	3	3	3	2	3	-	-	-	3	-	-	2
CO4	3	2	2	3	3	-	-	-	3	-	-	2
CO5	3	2	3	2	3	-	-	-	3	-	-	3

CO-PSO Mapping:

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	2
CO4	3	3	3
CO5	2	3	2

Course Name: Remote sensing and GIS Lab
Course Code: EC 791C
Contacts: 3:0:0
Credits: 1.5
Course Outcome:

CO1	Understand the basic fundamentals of remote sensing and GIS.
CO2	Demonstrate the practical applications of remote sensing and GIS.
CO3	learn different types of remote sensors and GIS components and their characteristics

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	-	-	-	3	-	-	3
CO2	3	3	2	3	3	-	-	-	3	-	-	2
CO3	3	3	3	2	3	-	-	-	3	-	-	2

CO-PSO Mapping:

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	2

Course Name: DATABASE MANAGEMENT SYSTEM LAB
Course Code: EC 791C
Contacts: 3:0:0
Credits: 1.5
Course Outcome:

CO1	Understand the basic concepts regarding database, know about query processing and techniques involved in query optimization and understand the concepts of database transaction and related database facilities including concurrency control, backup and recovery.
CO2	Understand the introductory concepts of some advanced topics in data management like distributed databases, data warehousing, deductive databases and be aware of some advanced databases like partial multimedia and mobile databases.
CO3	Differentiate between DBMS and advanced DBMS and use of advanced database concepts and become proficient in creating database queries
CO4	Analyze database system concepts and apply normalization to the database.
CO5	Apply and create different transaction processing and concurrency control applications.

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	-	-	-	3	-	-	3
CO2	3	3	2	3	3	-	-	-	3	-	-	2
CO3	3	3	3	2	3	-	-	-	3	-	-	2
CO4	3	2	2	3	3	-	-	-	3	-	-	2
CO5	3	2	3	2	3	-	-	-	3	-	-	3

CO-PSO Mapping:

COs/PSOs	PSO1	PSO2	PSO3
CO1	-	2	2
CO2	-	2	2
CO3	3	2	2
CO4	-	2	2
CO5	2	2	2

Course Name: Machine Learning Lab
Course Code: EC 792B
Contacts: 3:0:0
Credits: 1.5
Course Outcome:

CO1	Able to analyse different learning techniques.
CO2	Able to evaluate important features from data.
CO3	Able to apply classify &cluster data.
CO4	Able to evaluate models generated from data.

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	-	-	-	3	-	-	3
CO2	3	3	2	3	2	-	-	-	3	-	-	2
CO3	3	3	3	2	3	-	-	-	3	-	-	2
CO4	3	2	2	3	3	-	-	-	3	-	-	2

CO-PSO Mapping:

COs/PSOs	PSO1	PSO2	PSO3
CO1	-	3	3
CO2	-	3	3
CO3	-	3	2
CO4	-	3	3

Course Name: Internet of Things(IoT) Lab
Course Code: EC 792C
Contacts: 3:0:0
Credits: 1.5
Course Outcome:

CO1	Understand internet of Things and its hardware and software components
CO2	Apply Interface I/O devices, sensors & communication modules
CO3	Illustrate remotely monitor data and control devices
CO4	Create real life IoT based projects

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	-	-	-	3	-	-	3
CO2	3	3	2	3	2	-	-	-	3	-	-	2
CO3	3	3	3	2	2	-	-	-	3	-	-	2
CO4	3	2	2	3	2	-	-	-	3	-	-	2

CO-PSO Mapping:

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	2
CO4	3	3	3

Course Name: Technical Lecture Presentation & GD II
Course Code: MC 781
Contacts: 0:0:3
Total Contact: 36
Credits: 0
Course Outcome:

CO1	Understand the importance of a clear purpose and organization in effective presentations
CO2	Develop techniques for analyzing audiences and adapting presentations accordingly.
CO3	Gain experience in working collaboratively and constructively with peers to produce quality work in a timely fashion
CO4	Practice and strengthen your skills in developing and delivering persuasive arguments in a professional setting
CO5	Gain confidence in both verbal and nonverbal skills of extemporaneous speech delivery and able Participate in a group discussion

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	3	3	-	3
CO2	-	-	-	-	-	-	-	-	3	3	-	2
CO3	-	-	-	-	-	-	-	-	3	3	-	2
CO4	-	-	-	-	-	-	-	-	3	3	-	2
CO5	-	-	-	-	-	-	-	-	3	3	-	3

CO-PSO Mapping:

COs/PSOs	PSO1	PSO2	PSO3
CO1	-	-	2
CO2	-	-	2
CO3	-	-	2
CO4	-	-	2
CO5	-	-	2

Course Name: Adaptive Signal Processing
Course Code: EC801 A
Contacts: 3:0:0
Total Contact: 36
Credits: 3
Course Outcome:

CO1	Comprehend design criteria and modelling adaptive systems and theoretical Performance evaluation.
CO2	Design a linear adaptive processor.
CO3	Apply mathematical models for error performance, stability adaptive modelling systems for real time applications
CO4	Comprehend the estimation theory for linear systems and modelling algorithms
CO5	Design based on Kalman filtering and extended Kalman filtering.

CO-PO mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	-	-	-	2	-	-	3
CO2	3	3	3	3	-	-	-	-	2	-	-	2
CO3	3	3	3	3	-	-	-	-	2	-	-	3
CO4	3	3	3	3	-	-	-	-	2	-	-	3
CO5	3	3	3	3	-	-	-	-	2	-	-	2

CO-PSO mapping

COs/POs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Course Name: Wireless Sensor Network
Course Code: EC801 B
Contacts: 3:0:0
Total Contact: 36
Credits: 3
Course Outcome:

CO1	Understand the fundamentals of wireless sensor networks and its application.
CO2	Study the various protocols at various layers and its differences with traditional protocols
CO3	Realize the issues pertaining to sensor networks and the challenges.

CO-PO Mapping:

	PO1	PO2	PO3	PO	PO	PO	PO	PO	PO9	PO10	PO11	PO12
CO1	3	1	2	3	2	1	2	3	2	1	1	1
CO2	3	2	1	2	3	3	2	1	2	1	2	2
CO3	2	3	2	3	2	1	1	2	3	2	1	1

CO-PSO mapping

COs/POs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3

Course Name: Embedded System
Course Code: EC801 C
Contacts: 3:0:0
Total Contact: 36
Credits: 3
Course Outcome:

CO1	Describe the differences between the general computing system and the embedded system, also recognize the classification of embedded systems.
CO2	Become aware of the architecture of the embedded processors
CO3	Become aware of interrupts, peripherals and Different types of Communication protocols.
CO4	Design real time embedded systems using the concepts of RTOS

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	3	3	2	-	1	-	-	-	1	1	-	1
CO2	3	2	2	-	-	-	-	1	2	1	-	1
CO3	3	2	1	2	1	1	-	-	2	1	-	-
CO4	3	2	2	1	1	1	-	1	2	1	0	1

CO-PSO mapping

COs/POs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3

Course Name: Cloud Computing
Course Code: EC802 A
Contacts: 3:0:0
Total Contact: 36
Credits: 3
Course Outcome:

CO1	Articulate the business model concepts, architecture and infrastructure of cloud computing, including cloud service models and deployment models.
CO2	Articulate the business model concepts, architecture and infrastructure of cloud computing, including cloud service models and deployment models.
CO3	Explore some important cloud computing driven commercial systems such asGoogle Apps, Microsoft Azure and Amazon Web Services and other businesses cloud applications.
CO4	Analyze the core issues of cloud computing such as security, privacy, interoperability, and its impact on cloud application.

CO-PO mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	-	-	-	2	-	-	2
CO2	3	3	3	3	-	-	-	-	2	-	-	2
CO3	3	3	3	3	-	-	-	-	2	-	-	2
CO4	3	3	3	3	-	-	-	-	2	-	-	2

CO-PSO mapping

COs/POs	PSO1	PSO2	PSO3
CO1	-	3	3
CO2	-	3	3
CO3	-	3	3
CO4	-	3	3

Course Name: Data Science
Course Code: EC802 B
Contacts: 3:0:0
Total Contact: 36
Credits: 3
Course Outcome:

CO1:	Describe the basic and intermediate concepts of probability, statistics, and distributions.
CO2:	Able to Apply regression, ANOVA, and goodness of fit test to construct model and infer conclusions about population/sample.
CO3:	Able to Analyze hypothesis to accept/reject alternative hypothesis based on statistical evidence available.
CO4:	Able to learn Programming Tools for Data Science
CO5:	Solve real-world machine learning tasks from data to inference

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	1	1	-	-	1	2	1	1	1
CO2	3	3	3	3	1	-	-	1	2	1	1	3
CO3	3	3	3	2	1	-	-	1	2	1	1	3
CO4	3	3	3	1	1	-	-	1	2	1	1	3
CO5	3	3	3	2	1	-	-	1	2	1	1	2

CO-PSO Mapping:

	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Course Name: Block Chain
Course Code: EC802 C
Contacts: 3:0:0
Total Contact: 36
Credits: 3
Course Outcome:

CO1	Understand block chain technology.
CO2	Develop block chain based solutions and write smart contract using Hyper ledger Fabric and Ethereum frameworks.
CO3	Build and deploy block chain application for on premise and cloud based architecture.
CO4	Integrate ideas from various domains and implement them using block chain technology in different perspectives

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	1	1	-	-	-	2	-	-	1
CO2	3	3	3	3	1	-	-	-	2	-	-	3
CO3	3	3	3	2	1	-	-	-	2	-	-	3
CO4	3	3	3	1	1	-	-	-	2	-	-	3

CO-PSO Mapping:

	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3

Course Name: Biomedical Electronics and Imaging
Course Code: EC803A
Contacts: 3:0:0
Total Contact: 36
Credits: 3
Course Outcome:

CO1:	Explain Bioelectric signals, human physiological system and different types of transducers
CO2:	Understand different types of medical measurement system.
CO3:	Able to understand deferent types of biomedical signal acquisition electrodes and different types of signal amplification techniques and able to design the amplifiers.
CO4:	Able to examine the data handling, filtering techniques of bio-medical signals and able to analysis
CO5:	Able to understand medical imaging techniques and implement different algorithms to feature extract the signals.

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	-	-	-	2	-	-	2
CO2	3	3	3	3	-	-	-	-	2	-	-	2
CO3	3	3	3	3	-	-	-	-	2	-	-	2
CO4	3	3	3	3	-	-	-	-	2	-	-	2
CO5	3	3	3	3	-	-	-	-	2	-	-	2

CO-PSO Mapping

COs/POs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Course Name: Automotive Electronics
Course Code: EC803B
Contacts: 3:0:0
Total Contact: 36
Credits: 3
Course Outcome:

CO1	Obtain an overview of automotive components, subsystems, design cycles, communication protocols and safety systems employed in today's automotive industry
CO2	Interface automotive sensors and actuators with microcontrollers
CO3	Develop, simulate and integrate control algorithms for ECU switch hardware

CO-PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	3	2	1	2	3	2	1	1	1
CO2	3	2	1	2	3	3	2	1	2	1	2	2
CO3	2	3	2	3	2	1	1	2	3	2	1	1

CO-PSO Mapping

COs/POs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3

Course Name: Physical Design, Verification & Testing
Course Code: EC803C
Contacts: 3:0:0
Total Contact: 36
Credits: 3
Course Outcome:

CO1:	Design, Verification and Test a VLSI circuit pertaining to these three phases.
CO2:	Understand the important problems/algorithms/tools so that students get a comprehensive idea of the whole digital VLSI design flow
CO3:	Understand High level Synthesis, Verilog RTL Design, Combinational and Sequential Synthesis Logic Synthesis (for large circuits) through VLSI Design
CO4:	Analyze Hardware Verification and methodologies, Binary Decision Diagrams (BDDs) and algorithms over BDDs through Verification Techniques.of time and frequency domain.
CO5:	Analyze Fault models, Fault Simulation, Test generation for combinational circuits, Test generation algorithms for sequential circuits and Built in Self test through VLSI Testing.

CO-PO mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	-	-	-	2	-	-	3
CO2	3	3	3	3	-	-	-	-	2	-	-	3
CO3	3	3	3	3	-	-	-	-	2	-	-	3
CO4	3	3	3	3	-	-	-	-	2	-	-	3
CO5	3	3	3	3	-	-	-	-	2	-	-	3

CO-PSO mapping

COs/POs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Course Name: Adaptive Signal Processing
Course Code: EC 891A
Contacts: 0:0:3
Credits: 1.5
Course Outcome:

CO1:	Comprehend design criteria and modeling adaptive systems and theoretical Performance evaluation.
CO2:	Design a linear adaptive processor
CO3:	Apply mathematical models for error performance, stability adaptive modelling systems for real time applications
CO4:	Comprehend the estimation theory for linear systems and modeling algorithms.
CO5:	Design based on Kalman filtering and extended Kalman filtering..

CO-PO mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	-	-	-	3	-	-	2
CO2	3	3	3	3	3	-	-	-	2	-	-	2
CO3	3	3	3	3	3	-	-	-	3	-	-	2
CO4	3	3	3	3	3	-	-	-	3	-	-	2
CO5	3	3	3	3	3	-	-	-	3	-	-	2

CO-PSO mapping

COs/POs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Course Name: Wireless Network Sensor Lab
Course Code: EC 891B
Contacts: 0:0:3
Credits: 1.5
Course Outcome:

CO1:	Analyze the parameters associated with wireless sensor networks in simulated environment.
CO2:	Learn different types of wireless topologies and routing protocols.
CO3:	Demonstrate an application of wireless sensor network through simulation.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	-	-	-	3	-	-	2
CO2	3	3	3	3	3	-	-	-	2	-	-	2
CO3	3	3	3	3	3	-	-	-	3	-	-	2

CO-PSO mapping

COs/POs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3

Course Name: Embedded system Lab
Course Code: EC 891C
Contacts: 0:0:3
Credits: 1.5
Course Outcome:

CO1	Describe the differences between the general computing system and the embedded system, also recognize the classification of embedded systems.
CO2:	Become aware of the architecture of the embedded processors
CO3:	Become aware of interrupts, peripherals and Different types of Communication protocols.
CO4:	Design real time embedded systems using the concepts of RTOS.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	3	3	3	3	3	-	-	-	3	-	-	2
CO2	3	3	3	3	3	-	-	-	2	-	-	2
CO3	3	3	3	3	3	-	-	-	3	-	-	2
CO4	3	3	3	3	3	-	-	-	3	-	-	2

CO-PSO Mapping

COs/POs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3

Course Name: Essence of Indian Knowledge Tradition Course
Course Code: MC 801
Total Contact Hour: 3h/Week Non-
Credits: Mandatory Course
Course Outcome:

CO1	Identify the concept of Traditional knowledge and its importance
CO2:	Explain the connection between Modern Science and Indian Knowledge System.
CO3:	Understand the importance of Yoga for health care..
CO4:	Interpret the effect of traditional knowledge on environment.

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	3	3	-	-	-	2
CO2	-	-	-	-	-	-	3	3	-	-	-	2
CO3	-	-	-	-	-	-	3	3	-	-	-	2
CO4	-	-	-	-	-	-	3	3	-	-	-	2

CO-PSO Mapping

COs/POs	PSO1	PSO2	PSO3
CO1	-	-	3
CO2	-	-	2
CO3	-	-	2
CO4	-	-	2