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CURRICULUM ESSENTIALS
Handbook on Outcome Based Education

ELECTRONICS AND INSTRUMENTATION 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 center, finally culminating in start-ups.

Department Vision

To uniquely position the Graduate as a Leader in Innovation and Excellence in Instrumentation, Control, Measurements and to recognise professional framework reflecting social Responsibility.

Department Mission

The Mission of the Department is to develop the next generation of Engineers in the Instrumentation sector by teaching them problem solving, leadership and teamwork skills, and the value of a commitment quality, ethical behaviour, and respect for others. To create and disseminate knowledge through research and to transfer our intellectual to enhance society in meaningful and sustainable ways.

Program Educational Objects (PEOs)

B.Tech. in Electronics and Instrumentation Engineering

The main objectives of the EIE Department are:

PEO1. To provide students with a strong foundation in Mathematical, Scientific and Engineering fundamentals.

PEO2. To acquaint students with necessary knowledge to formulate, solve and analyse engineering problems related to industry and research.

PEO3. To impart the state of the art technology to the students in the field of Electronics and Instrumentation Engineering.

PEO4. To foster the innovation, invention and entrepreneurship by enabling the students to transform their ideas to proof- of-concepts for high-tech applications.

PEO5. To inculcate in the students professional and ethical attitude, communication skills and the life-long learning skills needed for the successful professional career.

PEO6. To provide opportunity for the students to work as part of teams on multi-disciplinary projects.

PEO7. Work in core Instrumentation and allied industries and software companies and / or become successful entrepreneurs.

PEO8. Pursue their higher studies at the institutes of repute in India and abroad and work in educational institutions, research organizations and engineering consultancy companies.

PEO9. Have the highest integrity, social responsibility, teamwork skills and leadership capabilities in their profession or career.

Program Specific Outcomes (PSOs)

B.Tech. in Electronics and Instrumentation Engineering

PSO1. Professional Skills: An ability to understand the basic concepts in Electronics and Instrumentation engineering and to apply them to various areas like electronics, sensors, transducer, industrial instrumentation, biomedical engineering etc., in the design and implementation of complex systems.

PSO2. Problem-solving skills: An ability to solve complex Electronics and Instrumentation engineering problems, using latest hardware and software tools along with analytical skills to arrive cost effective and appropriate solutions.

PSO3. Successful Career and Entrepreneurship: An understanding of social-awareness & environmental-wisdom along with ethical responsibility to have a successful career and to sustain passion and zeal for real-world applications using optimal resources as an entrepreneur.

Program outcomes (POs)

Engineering Graduates will be able to:

PO1. Apply knowledge of mathematics, science, engineering fundamentals and an instrumentation engineering specialization to arrive solution for complex engineering problems.

PO2. Identify, formulate and analyze complex engineering problems using first principles of mathematics, management and engineering.

PO3. Design solutions for instrumentation engineering problems and develop Instrumentation and related system components or processes that meet specified needs with appropriate consideration for public health, safety, cultural, societal and environmental issues.

PO4. Conduct investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

PO5. Create, select and apply appropriate state-of-the-art techniques, resources and modern engineering and computing tools with an understanding of the limitations.

PO6. Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.

PO7. Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.

PO8. Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

PO9. Function effectively as an individual, and as a member or leader in multidisciplinary teams.

PO10. 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.

PO11. 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.

PO12. Demonstrate knowledge and understanding of 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.

Curriculum Structure

DEPARTMENT OF ELCTRONICS AND INSTRUMENTATION ENGINEERING

B.Tech First Semester Curriculum

Sl. No.	Category	Paper Code	Subject	L	T	P	Total	Credit Points
1st Semester				**Contact Hours/Week**				**Credit Points**
A.THEORY								
1	BS	M101	Mathematics-I	3	1	0	4	4
2	BS	CH101/ PH101	Chemistry (Gr.A)/ Physics-I (Gr.B)	3	0	0	3	3
3	ES	EE101/ EC101	Basic Electrical Engineering (Gr.A)/ Basic Electronics Engineering (Gr.B)	3	0	0	3	3
4	HS	HU101	English	2	0	0	2	2
Total of Theory							12	12
B.PRACTICAL								
5	BS	CH191/ PH191	Chemistry Laboratory (Gr.A)/ Physics-I Laboratory (Gr.B)	0	0	3	3	1.5
6	ES	EE191/ EC191	Basic Electrical Engineering Laboratory (Gr.A)/ Basic Electronics Engineering Laboratory (Gr.B)	0	0	3	3	1.5
7	ES	ME191/ ME192	Engineering Graphics & Design(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
C.MANDATORYACTIVITIES/COURSES								
10	MC	MC181	Induction Program	0	0	0	0	0
Total of Theory, Practical & Mandatory Activities/Courses							23	17.5

CO STATEMENTS

Course Name: Chemistry
Course Code: CH 101

COs	Statement
CO1	Describethefundamentalpropertiesofatoms&molecules,atomicstructureandtheperiodicityofelements 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
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

Course Name: Mathematics –I
Course Code: M 101

COs	Statement
CO1	Understand and recall the properties and formula related to matrix algebra, differential calculus, integral calculus and vector calculus.
CO2	Determine the solutions of the problems related to matrix algebra, differential calculus, multi variable calculus, vector calculus and infinite series.
CO3	Apply the appropriate mathematical tools of matrix algebra, differential calculus, Integral Calculus, multi variable 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.

Paper Name: English
Paper Code: HU101

COs	Statement
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.

Course Name: Basic Electrical Engineering
Course Code: EE 101

COs	Statement
CO1	Understand Basic Electrical circuits, Power distribution and Safety measures.
CO2	Analyze and apply DC network theorems.
CO3	Analyze and apply concept of AC circuits of single-phase and three-phase.
CO4	Analyze and apply concepts of AC fundamentals in solving AC network problems
CO5	Understand basic principles of Transformers and Rotating Machines.

Course Name: Basic Electrical Engineering Lab
Course Code: EE 191

COs	Statement
CO1	Identify and use common electrical components.
CO2	To develop electrical networks by physical connection of various components and analyze the circuit behavior
CO3	Apply and analyze the basic characteristics of transformers and electrical machines.

Course Name: Chemistry Lab
Course Code: CH 191

COs	Statement
CO1	Able to operate different types of instruments for estimation of small quantities chemical suspending industries and scientific and technical fields.
CO2	Able to analyze and determine the composition of liquid and solid samples working as an individual and also as a 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

Course Name: Engineering Graphics &Design
Course Code: ME 191

COs	Statement
CO1	Get introduced with Engineering Graphics and visual aspects of design.
CO2	Know and use common drafting tools with the knowledge of drafting standards.
CO3	Apply computer aided drafting technique store present line, surface or solid models in different Engineering view points.
CO4	Produce part models carry out assembly operation and show working procedure of a designed project two rousing animation.

Course Name: Theme based Project I
Course Code: PR191

COs	Statement
CO1	Understand the problems and their implications.
CO2	Develop skills for designing the plan of work.
CO3	Justify the societal impact of the said problems.
CO4	Facilitate problem solving skills.
CO5	Implement the technical skills in global interface and inculcate the practices of life long learning.

Course Name: Skill Development –I – Soft Skills
Course Code: PR 192

COs	Statement
CO1	Able to develop communication skills, enhance confidence building procedure and learn sense of time management aiming towards personality grooming.
CO2	Able to apply listening, speaking, analytical and critical skills in societal and professional life.
CO3	Able to demonstrate the skills necessary to be a competent Interpersonal communicator and team worker.
CO4	Able to foster leadership skills, decision making abilities, conflict and stress management capacity to develop a holistic approach towards life.
CO5	Able to analyze different situations and professional challenges by adapting negotiation skills.

CO-PO Mapping

Course Name: Mathematics-I
Course Code: M 101

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2		-	-	-	-	-	-	-	2	2	2
CO2	3	3	3	3	-	-	-	-	-	-	-	2	2	2
CO3	3	3	3	3	-	-	-	-	-	-	-	2	2	2
CO4	3	3	3	3	-	-	-	-	-	-	-	2	2	2
CO5	3	3	3	3	-	-	-	-	-	-	-	2	2	2

Course Name: Chemistry
Course Code: CH 101

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	-	-	-	-	-	-	-	2	-	-
CO2	3	3	3	3	-	-	-	-	-	-	-	2	-	-
CO3	3	3	2	2	-	-	-	-	-	-	-	2	-	-
CO4	3	2	3	2	-	-	-	-	-	-	-	2	-	-
CO5	3	3	3	3	-	-	-	-	-	-	-	2	-	-

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Course Name: Basic Electrical Engineering
Course Code: EE 101

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	-	-	-	2	-	-	-	2	2	1	2	2
CO2	2	3	-	-	-	-	-	-	-		1	1	3	1
CO3	2	3	1				-	-	-	-	1	1	2	3
CO4	1	2	3	1			-	-	-	-	-	1	2	3
CO5	3	-	-	-	-	-	-	-	-	-	-	1	1	2

Course Name: English
Course Code: HU 101

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	2	-	3	3	-	3	2	2
CO2	-	-	-	-	-	-	2	-	3	3	-	3	2	2
CO3	-	-	-	-	-	-	2	-	3	3	-	3	2	2
CO4	-	-	-	-	-	-	2	-	3	3	-	3	2	2
CO5	-	-	-	-	-	-	2	-	3	3	-	3	2	2

Course Name: Basic Electrical Engineering Lab
Course Code: EE 191

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		-	-	-	2	-	-	-	-		1	3	
CO2	2	3	-	-	-		-	-	-	-	1	1	2	3
CO3	3		-	-	-		-	-	-	-		1	3	

Course Name: Chemistry Lab
Course Code: CH 191

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	-	-	-	-	-	-	-	2	-	-
CO2	3	3	3	3	-	-	-	-	-	-	-	2	-	-
CO3	3	3	2	2	-	-	-	-	-	-	-	2	-	-
CO4	3	2	3	2	-	-	-	-	-	-	-	2	-	-
CO5	3	3	3	3	-	-	-	-	-	-	-	2	-	-

Course Name: Engineering Graphics & Design
Course Code: ME 191

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	1	-	1	1	-	1	2	1	-	-	-	-
CO2	2	1	2	-	1	1	-	2	1	2	1	1	-	-
CO3	2	1	3	2	3	-	-	2	2	2	1	1	-	-

Course Name: Theme based Project I
Course Code: PR191

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	3	-	-	2	3	-	-	-	-	-	-	-
CO2	-	-	3	-	-		3	-	-	-	3	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	2	-	-	-
CO5		-	-	-		3		-	-	-	-	3	-	-

Course Name: Skill Development –I – Soft Skills
Course Code: PR 192

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	2	-	1	3	3	-	3	-	-
CO2	-	3		-	-	3	-	1	2	3	-	3	-	-
CO3	-	3		-	-	2	-	3	3	3	-	3	-	-
CO4	-	3	3	-	-	3	-	2	3	3	-	3	-	-
CO5	-	-	-	-	-	3	-	1	3	3	-	3	-	-

B.Tech Second Semester Curriculum

Sl. No.	Category	Paper Code	Subject	L	T	P	Total	Credit Points
			2nd Semester					
				Contact Hours/Week				
			A.THEORY					
1	BS	M201	Mathematics-II	3	1	0	4	4
2	BS	CH201/ PH201	Chemistry (Gr.B)/ Physics-I (Gr.A)	3	0	0	3	3
3	ES	EE201/ EC201	Basic Electrical Engineering (Gr.B)/ Basic Electronics Engineering (Gr.A)	3	0	0	3	3
4	ES	CS201	Programming for Problem Solving	3	0	0	3	3
5	ES	ME201	Engineering Mechanics	3	0	0	3	3
			Total of Theory				16	16
			B.PRACTICAL					
6	ES	CS291	Programming for Problem Solving Laboratory	0	0	3	3	1.5
7	BS	CH291/ PH291	Chemistry Laboratory (Gr.B)/ Physics-I Laboratory(Gr.A)	0	0	3	3	1.5
8	ES	EE291/ EC291	Basic Electrical Engineering Laboratory (Gr.B)/ Basic Electronics Engineering Laboratory (Gr.A)	0	0	3	3	1.5
9	ES	ME291/ ME292	Engineering Graphics & Design (Gr.B)/ Workshop/Manufacturing Practices (Gr.A)	0	0	3	3	1.5
10	HS	HU291	Language Laboratory	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
			C. MANDATORY ACTIVITIES/COURSES					
13	MC	MC281	NSS/Physical Activities/Meditation & Yoga/ Photography/Nature Club	0	0	0	3	0
			Total of 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/entrepreneurshipcelloftheinstitute;participationinconferences/workshops /competitions etc.; Learning at Departmental Lab / Tinkering Lab / Institutional workshop; Working in all the activities of Institute's Innovation Council for e.g., 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.

CO STATEMENTS

Paper Name: Mathematics-II
Paper Code: M 201

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

Course Name: Physics –I
Course Code: PH 201

COs	Statements
CO1	Describe different types of mechanical resonance and its electrical equivalence
CO2	Explain basic principles of Laser, Optical fiber and Semiconductor Physics.
CO3	Apply superposition principle to explain the phenomena of interference and diffraction
CO4	Analyse different crystallographic structures according to their co –ordination number and packing factors
CO5	Determine and justify the need of a quantum mechanics as remedy to overcome limitations imposed by classical physics

Course Name: Basic Electronics Engineering
Course Code: EC201

COs	Statements
CO1	Study PN junction diode, ideal diode, diode models and its circuit analysis, application of diodes and special diodes.
CO2	Learn how operational amplifiers are modelled and analyzed, and to design Op-Amp circuits to perform operations such as integration differentiation on electronic signals.
CO3	Study the concepts of both positive and negative feedback in electronic circuits
CO4	Develop the capability to analyze and design simple circuits containing non-linear elements such as transistors using the concepts of load lines, operating points and incremental analysis.

Course Name: Programming for Problem Solving
Course Code: CS 201

COs	Statements
CO1	Understand and differentiate among different programming languages for problem solving.
CO2	Describe the way of execution and debug programs in C language.
CO3	Define, select, and compare data types, loops, functions to solve mathematical and scientific problem.
CO4	Understand the dynamic behavior of memory by the use of pointers
CO5	Design and develop modular programs using control structure, selection structure and file

Course Name: Engineering Mechanics
Course Code: ME 201

COs	Statements
CO1	To understand representation of force, moments for drawing free-body diagram s 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 system s under vibration.

Course Name: Programming for Problem Solving Lab
Course Code: CS291

COs	Statements
CO1	Learn the concept of DOS system command s 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 error s 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.

Course Name: Physics –I Laboratory
Course Code: PH 291

COs	Statements
CO1	Demonstrate experiments allied to their theoretical concepts
CO2	Conduct experiments using LASER, Optical fiber, Torsional pendulum.
CO3	Participate as an individual and as a member or leader in groups in laboratory sessions actively.
CO4	Analyze experimental data and graphical representations to communicate effectively in laboratory reports including innovative experiments.
CO5	Develop critical thinking skills to solve real life challenges.

Course Name: Basic Electronics Engineering Lab
Course Code: EC291

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

Course Name: Workshop/Manufacturing Practices
Course Code: ME 292

COs	Statements
CO1	Gain basic knowledge of Workshop Practice and Safety useful for our daily living.
CO2	Understand the use of Instruments of a pattern shop like Hand Saw, Jack Plain, Chisels etc.
CO3	Apply and performing operations like such as Marking, Cutting etc used in manufacturing processes.
CO4	Analyze the various operations in the Fitting Shop using Hack Saw, various files, Scriber, etc to understand the concept of tolerances applicable in all kind of manufacturing.
CO5	Get hands on practice of in Welding and apply various machining processes which give a lot of confidence to manufacture physical prototypes in project works.

Course Name: Language Lab
Course Code: HU291

COs	Statements
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 analyze communication behaviors
CO5	Able to adapt to multifarious socio-economical and professional are with the help of effective communication and interpersonal skills.

Course Name: Theme based Project I
Course Code: PR191

COs	Statements
CO1	Understand the problems and their implications.
CO2	Develop skills for designing the plan of work.
CO3	Justify the societal impact of the said problems.
CO4	Facilitate problem solving skills.
CO5	Implement the technical skills in global interface and inculcate the practices of life long learning.

Course Name: Skill Development –I – Soft Skills
Course Code: PR 192

COs	Statements
CO1	Able to develop communication skills, enhance confidence building procedure and learn sense of time management aiming towards personality grooming.
CO2	Able to apply listening, speaking, analytical and critical skills in societal and professional life.
CO3	Able to demonstrate the skills necessary to be a competent Interpersonal communicator and team worker.
CO4	Able to foster leadership skills, decision making abilities, conflict and stress management capacity to develop a holistic approach towards life.
CO5	Able to analyze different situations and professional challenges by adapting negotiation skills.

CO-PO Mapping

Course Name: Mathematics - II
Course Code: M 201

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	-	-	-	-	-	-	-	1	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	1	-	-
CO3	2	2	-	-	-	-	-	-	-	-	-	1	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	1	-	-

Course Name: Physics –I
Course Code: PH 201

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	2	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	1	-	-
CO4	2	3	-	-	-	-	-	-	-	-	-	1	-	-
CO5	1	3	-	-	-	-	-	-	-	-	-	1	-	-

Course Name: Basic Electronics Engineering
Course Code : EC 201

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	2	-	-	-	-	-	-	2	-	-
CO2	3	3	3	2	2	-	-	-	-	-	-	2	-	-
CO3	3	3	3	2	1	-	-	-	-	-	-	3	-	-
CO4	3	3	2	3	2	-	-	-	-	-	-	3	-	-

Course Name: Programming for Problem Solving
Course Code: CS 201

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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	-	-
CO5	3	3	3	3	2	3	-	-	3	3	3	3	-	-

Course Name: Engineering Mechanics
Course Code: ME 201

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	-	-	-	-	1	-	-	-	-	-
CO2	3	3	2	2	-	-	-	-	1	-	-	1	-	-
CO3	3	2	3	2	1	-	-	-	1	-	-	1	-	-
CO4	3	3	3	3	-	-	-	-	1	-	1	-	-	-

Course Name: Programming for Problem Solving Lab
Course Code: CS291

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	2	2	-	1		1	2	3	-	-
CO2	3	3	3			-	-	-	-	-	-	2	-	-
CO3	2	2	2	2	2	-	-	-	-	-	-	3	-	-
CO4	1	2	2	2	2	-	-	-	-	-	-	2	-	-
CO5	2	3	3	3	2	2	3	1	3	3	3	3	-	-

Paper Name: Physics – I Laboratory
Paper Code: PH 291

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2	3	3	-	-	-	-	-	-	-	-	-
CO2	2	3	2	3	3	-	-	-	-	-	-	-	-	-
CO3	2	3	2	3	3	-	-	-	-	-	-	-	-	-
CO4	2	3	2	3	3	-	-	-	-	-	-	-	-	-
CO5	2	3	2	3	2	-	-	-	-	-	-	-	-	-

Paper Name: Basic Electronics Engineering Laboratory
Paper Code: EC 291

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	3	3	-	3	3	3
CO2	3	3	-	-	-	-	-	-	3	2	-	3	3	3
CO3	3	3	-	-	-	-	-	-	3	2	-	3	2	2
CO4	2	3	-	-	-	-	-	-	3	2	-	3	2	3
CO5	2	2	-	-	-	-	-	-	3	3	-	2	2	2

Course Name: Workshop/Manufacturing Practices
Course Code: ME 292

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	1	1	-	-	-	2	1	-	2	-	-
CO2	3	3	2	2	1	-	-	-	2	1	-	2	-	-
CO3	3	2	2	2	1	1	-	1	2	2	3	2	-	-

Course Name: Language Lab
Course Code: HU 291

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	2	-	3	3	-	2	2	2
CO2	-	-	-	-	-	-	2	-	3	3	-	2	2	2
CO3	-	-	-	-	-	-	2	-	3	3	-	2	2	2
CO4	-	-	-	-	-	-	2	-	3	3	-	2	2	2
CO5	-	-	-	-	-	-	2	-	3	3	-	2	2	2

Course Name: Theme based Project II
Course Code: PR291

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	3	-	-	2	3	-	-	-	-	-	-	-
CO2	-	-	3	-	-		3	-	-	-	3	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	2	-	-	-
CO5		-	-	-		3		-	-	-	-	3	-	-

Course Name: Innovative Activities - I
Course Code: PR 292

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	2	-	1	3	3	-	3	-	-
CO2	-	3		-	-	3	-	1	2	3	-	3	-	-
CO3	-	3	-	-	-	2	-	3	3	3	-	3	-	-
CO4	-	3	3	-	-	3	-	2	3	3	-	3	-	-
CO5	-	-	-	-	-	3	-	1	3	3	-	3	-	-

B.Tech Third Semester Curriculum

Sl No	Course Code	Paper Code	Theory	Contact Hours /Week				Credit Points
				L	T	P	Total	
A. THEORY								
1	BS	M 301	Mathematics – III	3	1	0	4	4
2	PC	EI 301	Analog Electronic Circuits	3	0	0	3	3
3	PC	EI 302	Digital Electronic Circuits	3	0	0	3	3
4	ES	EI 303	Circuit Theory and Networks	3	1	0	4	4
5	PC	EI 304	Electrical & Electronic Measurement & Instrumentation	3	0	0	3	3
Total of Theory							**17**	**17**
B. PRACTICAL								
6	PC	EI 391	Analog Electronic Circuits Lab	0	0	3	3	1.5
7	PC	EI 392	Digital Electronic Circuits Lab	0	0	3	3	1.5
8	ES	EI 393	Circuits Theory and Networks Lab	0	0	3	3	1.5
9	PC	EI394	Electrical & Electronic Measurement & Instrumentation Lab	0	0	3	3	1.5
10	PROJ	PR 391	Project-III	0	0	2	2	1
11	PROJ*	PR 392	Innovative activities-II	0	0	0	0	0.5
C. MANDATORY ACTIVITIES / COURSES								
12	MC 381	MC	Behavioral & Interpersonal skills	0	0	3	3	
Total of Theory, Practical & Mandatory Activities/Courses							**35**	**24.5**

*Students may choose either to work on participation in all the activities of Institute's Innovation Council for eg: 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.

CO STATEMENTS

Course Name: Mathematics III
Course Code: M301

COs	Statements
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 indentifying 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.

Course Name Analog Electronic Circuits
Course Code: EI 301

COs	Statements
CO1	Explain the characteristics of diodes and transistors
CO2	Design and analyze various rectifier and amplifier circuits
CO3	Design sinusoidal and non-sinusoidal oscillators
CO4	Analyse the functioning of OP-AMP and design OP-AMP based circuits
CO5	Design ADC and DAC

NARULA INSTITUTE OF TECHNOLOGY

Course Name: Digital Electronic Circuits
Course Code: EI 302

COs	Statements
CO1	Interpret of the fundamental concepts and techniques used in digital electronics
CO2	Apply the concept of various number systems in digital design
CO3	Analyse and design various cost effective combinational and sequential circuits
CO4	Solve complex circuit problem by applying knowledge of digital electronics

Course Name: Circuit Theory and Networks
Course Code : EI 303

COs	Statements
CO1	Solve complex circuit problem by applying knowledge of circuit theorems.
CO2	Analyze dynamic performance of the networks using Laplace Transform.
CO3	Find out resonance of different circuit
CO4	Analyze two port networks using A,B,C,D and Z,Y Parameter Model
CO5	Design different types of filters

Course Name: Electrical & Electronic Measurement &Instrumentation
Course Code : EI304

COs	Statements
CO1	Apply the knowledge to measure a particular parameter using an appropriate measuring instrument
CO2	Calibrate and standardize the instruments applying the knowledge of calibration
CO3	Design measuring instruments on requirement basis
CO4	Apply the knowledge of the instrumentation and measurement systems in the real life applications

Course Name: Analog Electronic Circuits Lab
Course Code: EI 391

COs	Statements
CO1	Verify the working of diodes, transistors and their applications
CO2	Analyze electric circuits, signals and algorithms using mathematical tools
CO3	Build a common emitter/base/collector amplifier and measure its voltage gain
CO4	Explore the operation and advantages of operational amplifiers
CO5	Design a circuit to convert an analog signal to digital one

Course Name: Digital Electronic Circuits Lab
Course Code: EI 392

COs	Statements
CO1	Operate laboratory equipment
CO2	Design digital circuits
CO3	Construct, analyze, and troubleshoot the digital circuits
CO4	Measure and record the experimental data, analyze the results and prepare a formal laboratory report

Course Name: Circuits and Networks Lab
Course Code: EI 393

COs	Statements
CO1	Apply the techniques and skills of modern engineering tools necessary for engineering practice
CO2	Identify, formulate and solve engineering problems with simulation software
CO3	Analyze transient response of series /parallel R-L-C circuit using simulation software
CO4	Determine frequency response of different filters using simulation software

Course Name: Electrical & Electronic Measurement
 & Instrumentation Lab
Course Code: EI394

COs	Statements
CO1	Apply the knowledge for calibration of different electrical meters
CO2	Relate different static and dynamic characteristics of a measuring instrument for a typical application
CO3	Analyze the measured data statistically
CO4	Reconstruct a given signal using the knowledge of Digital Storage Oscilloscope

Course Name: Behavioral & Interpersonal Skill

Code: MC381

COs	Statements
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

Course Name: Mathematics-III
Course Code: M 301

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	3	1	1	-	-	-	-	-	-	-	-	1
CO2	3	2	1	-	-	-	-	-	-	-	-	1
CO3	3	2	2	-	-	-	-	-	-	-	-	1
CO4	3	2	2	-	-	-	-	-	-	-	-	1
CO5	3	3	2	3	-	-	-	-	-	-	-	1

Course Name: Analog Electronic Circuits
Course Code: EI 301

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	-	-	2	-	-	-	-	-	-	-	-	-
CO2	1	-	1	3	-	-	-	-	-	-	-	-
CO3	-	2	-	-	-	-	-	-	-	-	-	-
CO4	1	-	-	3	-	-	-	-	-	-	-	-
CO5	1	2	-	3	-	-	-	-	-	-	-	-

Course Name: Digital Electronic Circuits
Course Code: EI 302

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1	3	3	2	2	2	-	-	-	-	-	-	1
CO2	3	2	2	-	-	-	-	-	-	-	-	2
CO3	3	2	2	2	-	-	-	-	-	-	-	1
CO4	2	3	2	2	-	-	-	-	-	-	-	2

Course Name: Circuit Theory and Networks
Course Code: EI 303

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

Course Name: Electrical & Electronic Measurement & Instrumentation
Course Code: EI 304

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

Course Name: Analog Electronic Circuits Lab
Course Code: EI 391

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	-	-	2	-	-	-	-	-	-	-	-	-
CO2	1	-	1	3	-	-	-	-	-	-	-	-
CO3	-	2	-	-	-	-	-	-	-	-	-	-
CO4	1	-	-	3	-	-	-	-	-	-	-	-
CO5	1	2	-	3	-	-	-	-	-	-	-	-

Course Name: Digital Electronic Circuits Lab
Course Code: EI 392

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO 9	PO10	PO1 1	PO12
CO1	2	3	2	2	2	-	-	-	-	-	-	1
CO2	1	2	2	-	-	-	-	-	-	-	-	2
CO3	2	2	2	2	-	-	-	-	-	-	-	1
CO4	3	3	2	2	-	-	-	-	-	-	-	2

Course Name: Circuits Theory and Networks Lab
Course Code: EI 393

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

Course Name: Instrumentation Lab
Course Code: EI 394

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

B.Tech Fourth Semester Curriculum

Sl No	Course Code	Paper Code	Theory	Contact Hours /Week				Credit Points
			4 TH SEMESTER					
				L	T	P	Total	
A. THEORY								
1	BS	PH 401	Physics – II	3	0	0	3	3
2	PC	EI 401	Sensors and Transducers	3	0	0	3	3
3	PC	EI 402	Microprocessors and Microcontrollers	3	0	0	3	3
4	PC	EI403	Digital Signal Processing	3	0	0	3	3
5	PC	EI 404	Electromagnetic Theory and Transmission Line	3	0	0	3	3
Total of Theory							15	15
B. PRACTICAL								
6	BS	PH 491	Physics –II Lab	0	0	3	3	1.5
7	PC	EI 491	Sensors and Transducers Lab	0	0	3	3	1.5
8	PC	EI 492	Microprocessor and Microcontrollers Lab	0	0	3	3	1.5
9	PC	EI493	Digital Signal Processing Lab	0	0	3	3	1.5
10	PROJ	PR 491	Project-IV	0	0	2	2	1
11	PROJ*	PR 492	Innovative activities-III	0	0	0	0	0.5
C. MANDATORY ACTIVITIES / COURSES								
10	MC	MC 401	Environmental Science	3	0	0	3	
Total of 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 e.g., 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

CO STATEMENTS

Course Name: Physics – II
Course Code: PH 401

COs	Statements
CO1	Explain electron transport in metal-insulators and semiconductors using energy Band theory
CO2	Apply Schrödinger equation in variety of atomic scale problems including nano-materials.
CO3	Analyze the physics of various kinds of electric and magnetic materials
CO4	Justify the importance of Fermi energy level in turning electronic properties of various

Course Name: Sensors and Transducers
Course Code : EI 401

COs	Statements
CO1	Illustrate the fundamental principles of various types of sensors
CO2	Illustrate the different types of transducers available
CO3	Employ appropriate sensors to perform engineering tasks and scientific researches
CO4	Design of different Sensors
CO5	Reorganize the basics of modern sensors

Course Name: Microprocessors and Microcontrollers
Course Code: EI 402

COs	Statements
CO1	Apply the knowledge of the internal architecture 8085/8086 microprocessors and 8051 for a specific application
CO2	Analyzing various instructions related to particular programs for specific applications
CO3	Applying the knowledge of interfacing circuits to some real time applications
CO4	Designing various microprocessor and microcontroller based systems for a specific application

Course Name: Digital Signal Processing
Course Code: EI 403

COs	Statements
CO1	Apply the knowledge about continuous and discrete time signals
CO2	Understand the Fourier Transform, and examine the process of Quantization and the effects of finite register length
CO3	Understand and implement DFTs on long data sets such as speech signals and images
CO4	Develop different types of FIR & IIR filter structures and their implementations
CO5	Use of FFTs for efficient implementation of linear convolution
CO6	Excel in fields such as speech processing, audio signal processing, digital image processing, video and audio compression

Course Name: Electromagnetic Theory and Transmission Line

Course Code: EI 404

COs	Statements
CO1	Understand and interpret the physical meanings of gradient, divergence and curl, vector calculus and orthogonal coordinates
CO2	Apply the concept of steady fields and different associated laws in different cases and mediums and realize the physical significances of Maxwell's equations for static field
CO3	Solve different problems of the time varying fields and correlate the Poynting vector and Poynting theorem
CO4	Understand the thorough treatment of the theory of electro dynamics, mainly from a classical field theoretical point of view, and includes such things as electrostatics and magneto statics, boundary conditions
CO5	Analyze the wave equations, and be able apply the concepts in transmission line, wave guide
CO6	Explain universal concepts in three-dimension real world, i.e., electro-magnetic wave propagation in free-space, dielectrics, conductors

Course Name: Physics–II Laboratory
Course Code: PH 491

COs	Statements
CO1	Demonstrate experiments allied to their theoretical concepts.
CO2	Conduct experiment s using semiconductors, dielectric and ferroelectrics
CO3	Classify various types of magnetic materials.
CO4	Participate as an individual, and as a member or leader in groups in laboratory sessions actively.
CO5	Analyze experimental data from graphical representations, and to communicate effectively the min laboratory reports including innovative experiments.

Course Name: Sensors and Transducers Lab
Course Code: EI 491

COs	Statements
CO1	Illustrate the working of transducers and various transducers used for the measurement of various physical variables.
CO2	Analyze the characteristics of the transducers
CO3	Design sensor based on the real time application
CO4	Estimate the design specifications of different transducers

Course Name: Microprocessor and Microcontrollers Lab
Course Code: EI 492

COs	Statements
CO1	Write microprocessor and microcontroller based programs to solve any given problem statements
CO2	Design microprocessor based systems for real time applications
CO3	Reconstruct microprocessor and microcontroller based interfacing as per the requirements

Course Name: Digital Signal Processing Lab
Course Code: EE 493

COs	Statements
CO1	Understand various signals generation
CO2	Compute the system output using convolution method with MATLAB Software package
CO3	Analyze and Observe Magnitude and phase characteristics of different signals
CO4	Calculate DFT, FFT, IDFT using MATLAB
CO5	Analyze Magnitude and phase characteristics (Frequency response Characteristics) of digital LP,HP& FIR Butterworth filters
CO6	Develop and Implement DSP algorithms in software using a Computer language such as C with TMS320C6713 floating point Processor

Course Name: Environmental Science
Course Code: MC 401

COs	Statements
CO1	Study the mathematics and calculations of population growth, material balance and sustainable development.
CO2	Study the components and diversity of eco system
CO3	Study the fundamental knowledge of air pollution, calculations of earth's surface temperature, atmospheric window and lapse rate
CO4	Acquire fundamental knowledge of water pollution and its consequences knowledge and calculations regarding BOD, COD
CO5	Understand the basic concepts regarding noise and musical sound, decibel unit and its relation with sound intensity, reasons and consequences of noise pollution
CO6	Understand the concepts of land pollution and its remedies

CO-PO MAPPING

Course Name: Physics – II
Course Code: PH 401

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	2	2	3	-	-	-	-	-	-	-	1

Course Name: Sensors and Transducers

Course Code: EI 401

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

Course Name: Microprocessor and Microcontrollers

Course Code: EI 402

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

Course Name: Digital Signal Processing

Course Code: EI 403

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1	1	1	1	1	1	1	1	1
CO2	3	3	1	2	1	1	1	1	1	1	1	1
CO3	3	3	1	3	3	3	1	1	1	1	1	1
CO4	3	3	3	3	1	2	1	1	1	1	1	1
CO5	3	3	3	3	3	1	1	1	1	1	1	1
CO6	3	3	3	3	3	3	3	3	3	3	3	3

Course Name: Electromagnetic Field Theory and Transmission Lines

Course Code: EI 404

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2	1	1	1	1	1	1	1	2
CO2	3	3	1	3	1	1	1	1	1	1	1	2
CO3	3	3	1	3	1	1	1	1	1	1	1	2
CO4	3	3	1	3	1	1	1	1	1	2	1	3
CO5	3	3	2	3	2	1	1	1	1	2	1	1
CO6	3	3	2	3	2	2	1	1	1	1	1	1

Course Name: Physics – II Laboratory
Course Code: PH 491

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

Course Name: Sensors and Transducers Lab
Course Code: EI 492

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

Course Name: Microprocessor and Microcontrollers Lab

Course Code: EI 493

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

Course Name: Digital Signal Processing Lab

Course Code: EI 494

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	1
CO2	1	2	-	3	-	-	-	-	-	-	-	1
CO3	1	2	-	-	-	-	-	-	3	-	-	1
CO4	1	2	-	-	-	-	-	-	-	3	-	1
CO5	1	2	-	3	-	-	-	-	-	-	-	1
CO6	2	2	-	2	-	-	-	-	1	-	-	1

Course Name: Environmental Science
Course Code: MC 401

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	1	1	1	1	2	-	-
CO2	-	-	-	-	-	1	1	3	1	2	-	-
CO3	-	-	-	-	-	3	2	3	-	1	-	-
CO4	-	-	-	-	-	3	2	1	-		-	-
CO5	-	-	-	-	-	3	2	2	-	1	3	-
CO6	-	-	-	-	-	1	2	1	-	1	-	-

B.Tech Fifth Semester Curriculum

SI No	Course Code	Paper Code	Theory	L	T	P	Total	Credit Points
— 5th Semester								
— A. THEORY								
1	HS	HU502	Economics for Engineers	2	0	0	2	2
2	PC	EI 501	Industrial Instrumentation	3	0	0	3	3
3	PC	EI 502	Analog & Digital Communication Theory	3	0	0	3	3
4	PC	EI 503	Control Engineering	3	1	0	4	4
5	PE	EI 504A	Optoelectronics &Fibre Optic Sensors	3	0	0	3	3
		EI 504B	Soft Computing					
		EI 504C	IoT based Instrumentation System					
Total of Theory							15	15
— B. PRACTICAL								
6	PC	EI 591	Industrial Instrumentation Lab	0	0	3	3	1.5
7	PC	EI 592	Analog & Digital Communication Lab	0	0	3	3	1.5
8	PC	EI 593	Control Engineering Lab	0	0	3	3	1.5
9	PROJ	PR 591	Project-V	0	0	2	2	1
10	PROJ*	PR 592	Innovative activities-IV	0	0	0	0	0.5
— C. MANDATORY ACTIVITIES / COURSES								
10	MC	MC 501	Constitution of India	3	0	0	3	
Total of Theory, Practical & Mandatory Activities/Courses							29	21

CO STATEMENTS

Course Name: Economics for Engineers
Course Code: HU 502

COs	Statements
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

Course Name: Industrial Instrumentation
Course Code: EI 501

COs	Statements
CO1	Able to explain working principle of different measuring instruments
CO2	Able to Describe the specification of different instruments and advantages and disadvantages
CO3	Able to Measure different physical parameters like pressure, temperature, flow rate, level etc.
CO4	Able to install the instrument

Course Name: Analog and Digital Communication
Theory
Course Code: EI 502

COs	Statements
CO1	Able to analyze the performance of a baseband and pass band communication system in terms of error rate and spectral efficiency
CO2	Able to perform the time and frequency domain analysis of the signals in a communication system
CO3	Able to select the blocks in a design of communication system
CO4	Able to analyze Performance of spread spectrum communication system

Course Name: Control Engineering
Course Code: EI 503

COs	Statements
CO1	Apply Laplace transform and state space techniques to model dynamic systems
CO2	Demonstrate an understanding of the fundamentals of control systems
CO3	Determine the time domain responses of first and second-order systems
CO4	Analyze the system behavior in frequency domain & the system stability using compensator

Course Name: Optoelectronics &Fibre Optic Sensors
Course Code: EI 504A

COs	Statements
CO1	Compare double heterojunction LED, surface emitter LED, edge emitter LED, super luminescent LED, and semiconductor based LASER (p-n junction laser, double heterojunction laser, stripe geometry) as optoelectronic sources based on working principles and applications
CO2	Compare optoelectronic detectors (p-n photodiode, p-i-n photodiode, avalanche photo diode, Schottky photodiode, hetero junction diode, phototransistor, LDR, photovoltaic cells, photo emissive cells) based on detector parameters, which are responsivity, efficiency, and working principle
CO3	Select a suitable optical fiber for an engineering application, based on number of modes required, distance to be covered and V-parameter
CO4	Justify the selection of intensity modulated fiber optic sensors, phase modulated fiber optic sensors, and spectrally modulated fiber optic sensors for engineering applications, which are measurement of temperature, pressure, displacement, and liquid level. Justify optical fiber as communication channel

Course Name: Soft Computing
Course Code: EI 504B

COs	Statements
CO1	Justify the use of fuzzy logic for decision making in presence of uncertainty
CO2	Design a fuzzy logic control system for a continuous-time plant with single i/p-single o/p
CO3	Compare the supervised and unsupervised learning techniques in artificial neural networks
CO4	Explain the operation of genetic algorithm based optimization technique

Course Name: Industrial Instrumentation Lab
Course Code: EI 591

COs	Statements
CO1	Able to calibrate different instruments.
CO2	Able to measure different industrial parameter like pressure, temperature, flow, level etc.
CO3	Able to understand the working principle of different instruments
CO4	Able to choose the suitable instrument for desired measuring parameter

Course Name: Analog and Digital Communication Lab
Course Code: EI 592

COs	Statements
CO1	To learn signal and linear time invariant system properties.
CO2	Study, design, and build modulation systems examining trade-offs indifferent communication systems
CO3	To be able to perform experiments in converting analog information into digital data via sampling, quantization, and coding
CO4	To be able to choose necessary modulation technique for specific signal transmission

Course Name: Control Engineering Lab
Course Code: EI 593

COs	Statements
CO1	Apply formulate transfer function for given control system problems
CO2	Demonstrate an understanding of the fundamentals of control systems
CO3	Determine time response of given control system model
CO4	Analyze the system behavior through Root Locus, Bode plots & Nyquist plot for a given control system model

Course Name: Constitution of India
Course Code: MC 501

COs	Statements
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

CO-PO MAPPING

Course Name: Economics for Engineers
Course Code: HU 502

COs	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

Course Name: Industrial Instrumentation
Course Code: EI 501

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

Course Name: Analog and Digital Communication Theory
Course Code: EI 502

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

Course Name: Control Engineering
Course Code: EI 503

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

Course Name: Optoelectronics &Fibre Optic Sensors
Course Code: EI 504A

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

Course Name: Soft Computing
Course Code: EI 504B

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

Course Name: Industrial Instrumentation Lab
Course Code: EI 591

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

Course Name: Analog and Digital Communication Lab
Course Code: EI 592

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

Course Name: Control Engineering Lab
Course Code: EI 593

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

Course Name: Constitution of India
Course Code: MC 501

COs	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

B.Tech Sixth Semester Curriculum

					6th Semester			

SI No	Course Code	Paper Code	Theory	Contact Hours /Week				Credit Points
				L	T	P	Total	
A. THEORY								
1	PC	EI 601	Process Control-I	3	0	0	3	3
2	PE	EI 602	A. Bio Medical Instrumentation	3	0	0	3	3
			B. Advance Sensors					
			C. Non Destructive Testing& Ultrasonic Instrumentation					
3	PE	EI 603	A. Analytical Instrumentation	3	0	0	3	3
			B. Non-Conventional Energy Sources					
			C. Artificial Intelligence					
4	OE	EI 604	A. Power Electronics	3	0	0	3	3
			B. Industrial Drives					
			C. Robotics Engineering					
5	OE	EI 605	A. Data Structures & Algorithms	3	0	0	3	3
			B. Database Management System					
			C. Software Engineering					
	Total of Theory						15	15
B. PRACTICAL								
6	PC	EI 691	Process Control Lab	0	0	3	3	1.5
7	OE	EI 692	A. Power Electronics Lab	0	0	3	3	1.5
			B. Industrial Drives Lab					
			C. Robotics Engineering Lab					
8	OE	EI 693	A. Data Structures & Algorithms Lab	0	0	3	3	1.5
			B. Database Management System Lab					
			C. Software Engineering Lab					
10	PROJ	PR 691	Project-VI	0	0	2	2	1
11	PROJ*	PR 692	Innovative activities-V	0	0	0	0	0.5
C. MANDATORY ACTIVITIES / COURSES								

1 2	MC	MC 681	Technical Presentation & Group Discussion-I	0	0	3	3	
Total of Theory, Practical & Mandatory Activities/Courses							**29**	**21**

CO STATEMENTS

Course Name: Process Control-I
Course Code: EI 601

COs	Statements
CO1	Design a controller by applying the knowledge of different control action
CO2	Calculate controller parameters by applying different tuning methods
CO3	Describe different advanced control strategy
CO4	State the operation and use of final control element
CO5	Develop ladder logic programs and understand basics of DCS

Course Name: Biomedical Instrumentation
Course Code: EI 602A

COs	Statements
CO1	Able to understand the detailed physiology of various human anatomical systems
CO2	Able to identify proper transducer for acquisition of a particular bioelectric potential
CO3	Able to analyse various biological conditions from the measured bioelectric potentials
CO4	Able to design biotelemetry systems for acquiring bioelectric potentials from long distance

Course Name: Artificial Intelligence
Course Code: EI 603C

COs	Statements
CO1	Understand the concepts of Artificial intelligence
CO2	Analyze the dimensions along which agents and environments vary, along with key functions that must be implemented in a general agent
CO3	Develop intelligent algorithms for constraint satisfaction problems and also design intelligent systems for Game Playing
CO4	Represent knowledge of the world using logic and infer new facts from that Knowledge and working knowledge in PROLOG in order to write simple PROLOG programs and explore more sophisticated PROLOG code on their own.

Course Name: Robotics Engineering
Course Code: EI 604C

COs	Statements
CO1	Perform kinematic and dynamic analyses with simulation. Design control laws for a simple robot
CO2	Integrate mechanical and electrical hardware for a real prototype of robotic device
CO3	Select a robotic system for given industrial application
CO4	Use of robots in domestic applications

Course Name: Data Structure & Algorithms
Course Code: EI 605A

COs	Statements
CO1	Differentiate how the choices of data structure & algorithm methods impact the performance of program
CO2	Solve problems based upon different data structure & also write programs
CO3	Identify appropriate data structure & algorithmic methods in solving problem.
CO4	Discuss the computational efficiency of the principal algorithms for sorting, searching, and hashing
CO5	Compare and contrast the benefits of dynamic and static data structures implementations

Course Name: Process Control Lab
Course Code: EI 691

COs	Statements
CO1	Recognize & explain basic process control loop elements via hands on experiment.
CO2	Control different process variable (flow, pressure, level & temperature) using different controller mode
CO3	Use various PLC functions and develop PLC programs to control a real time system
CO4	Control & monitor different process variable through DCS

Course Name: Robotics Engineering Lab
Course Code: EI 692C

COs	Statements
CO1	Apply formulate transfer function for given control system problems
CO2	Demonstrate an understanding of the fundamentals of control systems
CO3	Determine time response of given control system model.
CO4	Analyze the system behavior through Root Locus, Bode plots & Nyquist plot fora given control system model

Course Name: Data Structure & Algorithms Lab
Course Code: EI 693A

COs	Statements
CO1	Choose appropriate data structure as applied to specified problem definition
CO2	Handle operations like searching, insertion, deletion, traversing mechanism on various data structures
CO3	Have practical knowledge on the applications of data structures
CO4	Able to store, manipulate and arrange data in an efficient manner
CO5	Able to implement queue and stack using arrays and linked list. Implementation of queue, binary tree and binary search tree

CO-PO Mapping

Course Name: Process Control-I
Course Code: EI 601

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

Course Name: Biomedical Instrumentation
Course Code: EI 602A

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

Course Name: Artificial Intelligence
Course Code: EI 603C

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

Course Name: Robotics Engineering
Course Code: EI 604C

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	3	1	3	2	1	2	1	2	3
CO2	1	2	2	3	2	1	3	2	4	2	1	2
CO3	1	2	2	1	2	2	3	3	2	3	2	2
CO4	1	3	2	1	3	2	1	3	3	3	2	3

Course Name: Data Structure & Algorithms
Course Code: EI 605A

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

Course Name: Process Control Lab
Course Code: EI 691

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

Course Name: Robotics Engineering Lab
Course Code: EI 692C

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	1	3	2	1	2	1	2	3
CO2	1	2	2	3	2	1	2	3	4	2	2	2
CO3	1	2	4	1	2	3	3	3	2	3	2	2
CO4	2	3	2	1	3	2	1	3	3	3	4	3

Course Name: Data Structure & Algorithms Lab
Course Code: EI 693A

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

B.Tech Seventh Semester Curriculum

Sl No	Course Code	Paper Code	Theory	L	T	P	Total	Credit Points
			7th Semester					
							Contact Hours /Week	**Credit Points**
			A. THEORY					
1	HS	HU701	Values & Ethics in Profession	2	0	0	2	2
2	PC	EI 701	Telemetry and Remote Control	3	0	0	3	3
3	PE	EI 702	A. Process Control-II	3	0	0	3	3
			B. Power Plant Instrumentation					
			C. Plant Automation					
4	OE	EI 703	A. Computer Networking	3	0	0	3	3
			B. Computer graphics and Multimedia					
			C. Object Oriented Programming					
Total of Theory							**11**	**11**
			B. PRACTICAL					
5	PC	EI 791	Telemetry and Remote Control Lab	0	0	3	3	1.5
6	OE	EI 792	A. Computer Networking Lab	0	0	2	2	1
			B. Multimedia Lab					
			C. Object Oriented Programming Lab					
7	PROJ	PR 791	Project-VII	0	0	0	6	3
8	PROJ*	PR 792	Innovative activities-VI	0	0	0	0	0.5
			C. MANDATORY ACTIVITIES / COURSES					
9	MC	MC 781	Technical Presentation & Group Discussion-II	0	0	3	3	
Total of Theory, Practical & Mandatory Activities/Courses							**25**	**17**

CO STATEMENTS

Course Name: Values and Ethics in Profession
Course Code: HU 701

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

Course Name: Telemetry and Remote Control
Course Code: EI 701

COs	Statements
CO1	Understand the concepts and purpose of different Telemetry & Remote control systems in Instrumentation field. Identify the concepts and utilities of telemetry systems
CO2	Recognize the various Telemetry systems, coding, modulation techniques and Time Division Multiplexing and Frequency Division Multiplexing techniques and MODEM andconcept of Wave propagation
CO3	Understand the concepts and applications of satellite Telemetry
CO4	Design and implement the Remote control system for various Industrial application purposes and the guidelines for solving different industry related complex problems

NARULA INSTITUTE OF TECHNOLOGY

Course Name: Process Control-II
Course Code: EI 702

COs	Statements
CO1	Perform the discretization and reconstruction of a given signal and carry out z-transform and inverse z-transform for given functions
CO2	Carry out mathematical modeling, stability analysis and time response analysis of a linear time-invariant discrete-time control system
CO3	Design digital PID controller and deadbeat controller for linear time-invariant single i/p- single o/p system and compare the fuzzy logic control system with a conventional control system topology
CO4	Explain the functionality of DCS in a process plant, including control, communication, protocols and network

Course Name: Computer Networking
Course Code: EI 703A

COs	Statements
CO1	Understand Basic introduction of Computer Network along with Physical layer of OSIand TCP/IP model.
CO2	Analyze Datalink layer protocols with MAC and LAN technologies
CO3	Design applications using internet protocols, routing and UDP,TCP
CO4	Develop application layer protocols and understand socket programming

Course Name: Telemetry and Remote Control lab
Course Code: EI 791

COs	Statements
CO1	Recognize and explain basic computational properties of remote sensing data acquisition, storage, and processing
CO2	Apply mathematical relationships describing fundamental physical, geometric, and computational principles relevant to remote sensing
CO3	Recognize and explain at a basic level fundamental physical principle of remote sensing
CO4	Demonstrate proficiency and conceptual understanding in using software or manualTechniques to carry out remote sensing image processing and analysis through a series of laboratory exercises and reports

Course Name: Computer Networking Lab
Course Code: EI 792

COs	Statements
CO1	Installation of different Network devices, simulators, hardware connection using cablesand other tools.
CO2	Demonstrate TCP & UDP using socket program.
CO3	Develop the code for Data link layer protocol simulation.
CO4	Examine the performances of Routing protocol with congestion control algorithm usingnetwork simulator

CO-PO Mapping

Course Name: Values and Ethics in Profession
Course Code: HU 701

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

Course Name: Telemetry and Remote Control
Course Code: EI 701

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

Course Name: Process Control-II
Course Code: EI 702

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

Course Name: Computer Networking
Course Code: EI 703A

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

Course Name: Telemetry and Remote Control lab
Course Code: EI 791

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

Course Name: Computer Networking Lab
Course Code: EI 792

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

B.Tech Eighth Semester Curriculum

Sl No	Course Code	Paper Code	Theory	Contact Hours /Week				Credit Points
			8th Semester					
				L	T	P	Total	
			A. THEORY					
1	HU	HU 804	Principles of Management	2	0	0	2	2
2	PE	EI 801	A. Virtual Instrumentation	3	0	0	3	3
			B. Embedded System Design					
			C. Mechatronics					
3	OE	EI 802	A. Mobile Communication	3	0	0	3	3
			B. VLSI & Microelectronics					
			C. Quantum Computing					
Total of Theory							**8**	**8**
			B. PRACTICAL					
4	PE	EI 891	A. Virtual Instrumentation Lab	0	0	3	3	1.5
			B. Embedded System Design Lab					
			C. Mechatronics Lab					
5	PROJ	PR 891	Project-VIII	0	0	0	6	3
			C. MANDATORY ACTIVITIES / COURSES					
6	MC	MC 801	Essence of Indian Knowledge Tradition	3	0	0	3	0
Total of Theory, Practical & Mandatory Activities/Courses							**20**	**12.5**

CO STATEMENTS

Course Name: Principles of Management
Course Code: HU 804

COs	Statements
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 organization
CO4	To apply principles of management in order to execute the role as a manager in an organization

Course Name: Embedded System Design
Course Code: EI 801

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

Course Name: Quantum Computing
Course Code: EI 802C

COs	Statements
CO1	Explain the basics of quantum computation
CO2	Solve different quantum circuits
CO3	Describe quantum Information and cryptography protocols
CO4	Write quantum algorithms

Course Name: Embedded System Design lab
Course Code: EI 891

COs	Statements
CO1	Familiarization with PIC Microcontroller, ARM Microcontroller, FPGA andtheir interfacing
CO2	Design of different types real time projects with digital controllers
CO3	Program ARM microcontroller to perform various tasks
CO4	Understand the key concepts of embedded systems such as I/O, timers,interrupts and interaction with peripheral devices

CO-PO Mapping

Course Name: Principles of Management
Course Code: HU 804

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

Course Name: Embedded System Design
Course Code: EI 801

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

Course Name: Quantum Computing
Course Code: EI 802C

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

Course Name: Embedded System Design lab
Course Code: EI 891

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

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