HINDUSTHAN

COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

Coimbatore – 641032

DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

Curriculum and ODD Semesters Syllabus for the Batch

2024 – 2028 (R2022)

2023 – 2027 (R2022)

2022 – 2026 (R2022)

2021 – 2025 (R2019 with Amendments)

(Board of Studies held on 24.05.2024)

(Academic Council Meeting held on 21.06.2024)

VISION AND MISSION OF THE DEPARTMENT

VISION

To impart quality technical education in the field of Electronics and Instrumentation Engineering and strive to serve the society.

MISSION

M1. To enrich technical knowledge through effective teaching-learning process.

M2. To inculcate leadership and managerial skills.

M3. To create passion for serving the society with innovation and ethical responsible.

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

PO1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. **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.

PO3. **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.

PO4. **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.

PO5. **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.

PO6. **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.

PO7. **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.

PO8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. **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.

PO11. **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.

PO12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1. Ability to apply concepts of measurement and sensor to design, calibrate and control various process instruments using industrial automation.

PSO2. Ability to analyze advanced electronics and instrumentation concepts required for industrial and research pursuits.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1. Graduates would have strong foundation in basic science and mathematics to formulate, analyze and solve electronics and instrumentation problems.

PEO2. Graduates shall have good knowledge of instrumentation systems and their applications to design control and safety systems for industrial process.

PEO3. Graduates exhibit professionalism with ethics, communication and team work to satisfy the needs of the society.

DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS
CBCS PATTERN
UNDERGRADUATE PROGRAMMES
B.E ELECTRONICS AND INSTRUMENTATION ENGINEERING (UG)
REGULATION-2022
(For the students admitted during the academic year 2024-2025 and onwards)

SEMESTER I

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
		THEORY									
1.	22MA1101	Matrices and Calculus (common to all branches)	BSC	3	1	0	4	4	40	60	100
		THEORY WITH LAB COMPONENT									
2.	22HE1151	English for Engineers (Common to all branches)	HSC	2	0	2	3	4	50	50	100
3.	22CY1153	Chemistry For Electrical Sciences	BSC	2	0	2	3	4	50	50	100
4.	22CS1151	Problem Solving using C Programming	ESC	2	0	2	3	4	50	50	100
5.	22EI1201	Basic Electrical and Electronics Engineering	PCC	2	0	2	3	4	50	50	100
		EEC COURSES (SE/AE)									
6.	22HE1072	Entrepreneurship & Innovation (Common to all)	AEC	1	0	0	1	1	100	0	100
7.	22HE1073	Introduction to Soft Skills	SEC	2	0	0	0	1	100	0	100
		MANDATORY COURSE									
8.	22MC1093/ 22MC1094	தமிழர்மரபு / Heritage of Tamil	MC	2	0	0	1	2	100	0	100

9.	22MC1095	Universal Human Values (Common to All Branches)	MC	2	0	0	0	2	40	60	100
			TOTAL	**18**	**1**	**6**	**18**	**26**	**570**	**330**	**900**

SEMESTER II

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
		THEORY									
1.	22MA2102	Differential Equations and Laplace Transform	BSC	3	1	0	4	4	40	60	100
2.	22CY2101	Environmental Studies	ESC	2	0	0	2	3	40	60	100
3.	22EI2201	Basics of Instrumentation Engineering	BSC	2	0	0	2	3	40	60	100
		THEORY WITH LAB COMPONENT									
4.	22HE2151	Effective Technical Communication (Common to all)	HSC	2	0	2	3	4	50	50	100
5.	22PH2151	Physics For Circuit Engineering	BSC	2	0	2	3	4	50	50	100
6.	22EI2251	Electronic Devices and Circuits	PCC	2	0	2	3	4	50	50	100
		PRACTICAL									
7.	22ME2001	Engineering Practices (Common to all)	ESC	0	0	4	2	2	60	40	100
		EEC COURSES (SE/AE)									
8.	22HE2071	Design Thinking(Common to all)	AEC	2	0	0	2	2	100	0	100
9.	22HE2072	Soft Skills and Aptitude-I(Common to all)	SEC	1	0	0	1	1	100	0	100
		MANDATORY COURSE									
10.	22MC2094/ 22MC2095	தமிழரும்தொழில்நுட்பமும் / Tamils and Technology	MC	2	0	0	1	2	100	0	100
11.	22MC2093	NCC */NSS / YRC / Sports / Clubs / Society Service - Enrollment (Common)	MC	All students shall enroll, on admission, in anyone of the personality and character development programmes and undergo training for about 80 hours							
			TOTAL	**19**	**1**	**8**	**23**	**27**	**520**	**380**	**900**

SEMESTER III

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22MA3102	Complex Analysis and Transforms	BSC	3	1	0	4	4	40	60	100
2.	22EI3201	Electronic Instrumentation	ESC	3	0	0	3	3	40	60	100
3.	22EE3202	Electric Circuit Analysis	PCC	3	1	0	4	4	40	60	100
4.	22EI3203	Sensors and Transducers	PCC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
5.	22EI3251	Digital Electronics	PCC	2	1	2	4	4	50	50	100
PRACTICAL											
6.	22EE3001	Electric Circuits Laboratory	ESC	0	0	4	2	4	60	40	100
7.	22EI3002	Sensors and Transducers Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
8.	22HE3071	Soft Skills -II (Common to all)	SEC	1	0	0	1	1	100	0	100
9.	22HE3072	Fundamentals of JAVA Programming	AEC	2	0	0	2	2	100	0	100
MANDATORY COURSE											
10.	22MC3191	Indian Constitution	MC	2	0	0	0	2	100	0	100
			TOTAL	**19**	**3**	**10**	**25**	**31**	**570**	**430**	**1000**

SEMESTER IV

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22HE4101	IPR and Start-ups	HSC	2	0	0	2	2	40	60	100
2.	22EI4201	Electrical Machines	PCC	3	0	0	3	3	40	60	100
3.	22EE4202	Integrated Circuits and Its Applications	PCC	3	1	0	4	4	40	60	100
4.	22EI4203	Industrial Instrumentation - I	PCC	3	0	0	3	3	40	60	100
5.	22EI4204	Analytical Instrumentation	PCC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
6.	22EI4251	Electrical and Electronic Measurements	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	22EI4001	Electrical Machines Laboratory	PCC	0	0	4	2	4	60	40	100
8.	22EE4002	Integrated Circuits Laboratory	PCC	0	0	4	2	4	60	40	100

EEC COURSES (SE/AE)												
9.	22HE4071	Soft Skills -III	SEC	1	0	0	1	1	100	0	100
MANDATORY COURSE												
10.	22MC4191	Essence of Indian Traditional Knowledge	MC	2	0	0	0	2	100	0	100
			TOTAL	**20**	**2**	**8**	**23**	**30**	**570**	**440**	**1000**

* Two weeks internship carries 1 credit and it will be done during Semester III summer vacation and same willbe evaluated in Semester IV.
If students unable to undergo in semester III, then the Internship I offered in the semester IV can be clubbed with Internship II (Total: 4 weeks-2 credits)

SEMESTER V

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22EI5201	Industrial Instrumentation -II	PCC	3	0	0	3	3	40	60	100
2.	22EE5202	Microprocessors and Microcontrollers	PCC	3	0	0	3	3	40	60	100
3.	22EI53XX	Professional Elective-1	PEC	3	0	0	3	3	40	60	100
4.	22EI53XX	Professional Elective-2	PEC	3	0	0	3	3	40	60	100
5.	22EI53XX	Professional Elective-3	PEC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
6.	22EI5251	Control Systems	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	22EI5001	Industrial Instrumentation Laboratory	PCC	0	0	4	1.5	3	60	40	100
8.	22EE5002	Microprocessors and Microcontrollers Laboratory	PCC	0	0	4	1.5	3	60	40	100
EEC COURSES (SE/AE)											
9.	22HE5071	Soft Skills -IV/Foreign languages	SEC	1	0	0	1	1	100	0	100
			TOTAL	**18**	**0**	**6**	**22**	**25**	**410**	**390**	**800**

SEMESTER VI

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22EI6201	Process Control	PCC	3	0	0	3	3	40	60	100
2.	22HE6101	Professional Ethics	HSC	3	0	0	3	3	40	60	100

3.	22EI63XX	Professional Elective-4	PEC	3	0	0	3	3	40	60	100
4.	22EI63XX	Professional Elective-5	PEC	3	0	0	3	3	40	60	100
5.	22XX64XX	Open Elective – 1*	OEC	3	0	0	3	3	40	60	100
6.	22XX64XX	Open Elective – 2*	OEC	3	0	0	3	3	40	60	100
PRACTICAL											
7.	22EI6001	Process Control Laboratory	PCC	0	0	4	2	4	60	40	100
8.	22EI6002	Virtual Instrumentation and Data Acquisition Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
9.	22HE6071	Soft Skills – V	SEC	2	0	0	2	2	100	0	100
			TOTAL	**20**	**0**	**8**	**24**	**28**	**460**	**440**	**900**

SEMESTER VII

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22EI7201	Programmable Logic Controller and Its Applications	PCC	3	0	0	3	3	40	60	100
2.	22EI73XX	Professional Elective-6	PEC	3	0	0	3	3	40	60	100
3.	22XX7401	Open Elective – 3*	OEC	3	0	0	3	3	40	60	100
4.	22LS74XX	Open Elective – 4*	OEC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
5.	22EI7251	VLSI Design	PCC	2	0	2	3	4	40	60	100
PRACTICAL											
6.	22EI7001	Industrial Automation Laboratory	PCC	0	0	4	1.5	3	60	40	100
7.	22EI7001	Instrumentation System Design Laboratory	PCC	0	0	4	1.5	3	60	40	100
EEC COURSES (SE/AE)											
8.	22EI7701	Internship Training	SEC	-	-	-	2	1	100	0	100
			TOTAL	**15**	**1**	**4**	**20**	**21**	**360**	**340**	**700**
* - Four weeks internship carries 2 credit and it will be done in before Semester VI summer vacation/placement training and same will be evaluated in Semester VII.											

SEMESTER VIII

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
EEC COURSES (SE/AE)											
1.	22EI8901	Project Work/Granted Patent	SEC	0	0	20	10	20	100	100	200
			TOTAL	0	0	20	10	20	100	100	200

Note:

* 1. As per the AICTE guideline, in Semester I, II, III & IV NCC one credit subject is added as Value Added Course with Extra Credit. Further, the students' who enrolled his/her name in HICET NCC and Air Wing are eligible to undergo this subject. The earned extra credits printed in the Consolidated Mark sheet as per the regulation.

2. NCC course level 1 & Level 2 will be added in the list of open elective subjects in the appropriate semester. Further, the students' who have opted NCC subjects in Semester I, II, III & IV are eligible to undergo NCC Open Elective Subjects.

3. The above-mentioned NCC Courses will be offered to the Students who are going to be admitted in the Academic Year 2021 – 22.

OPEN ELECTIVE I AND II (EMERGING TECHNOLOGIES)

(To be offered for the students other than CSE, IT, AI&ML, ECE & BIOMEDICAL)

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PERWEEK L	T	P	TOTAL CONTACT PERIODS	CREDITS
1	22AI6401	Artificial Intelligence and Machine Learning Fundamentals	OEC	2	0	2	4	3
2	22CS6401	Blockchain Technology	OEC	2	0	2	4	3
3	22EC6401	Cyber security	OEC	2	0	2	4	3
4	22EC6402	IoT Concepts and Applications	OEC	2	0	2	4	3
5	22IT6401	Data Science and Analytics	OEC	2	0	2	4	3
6	22BM6401	Augmented and Virtual Reality	OEC	2	0	2	4	3

OPEN ELECTIVE I AND II

(To be offered for the students other than AUTO, AERO, AGRI, MECH, MCTS, CIVIL, EEE, CHEMICAL, FOOD TECH, E&I)

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PERWEEK			TOTAL CONTAC TPERIOD S	CREDITS
				L	T	P		
1	22AE6401	Space Science	OEC	3	0	0	3	3
2	22MT6401	Introduction to Industrial Engineering	OEC	3	0	0	3	3
3	22MT6402	Industrial Safety and Environment	OEC	3	0	0	3	3
4	22CE6401	Climate Change and its Impact	OEC	3	0	0	3	3
5	22CE6402	Environment and Social Impact Assessment	OEC	3	0	0	3	3
6	22ME6401	Renewable Energy System	OEC	3	0	0	3	3
7	22ME6402	Additive Manufacturing systems	OEC	3	0	0	3	3
8	22EI6401	Introduction to Industrial Instrumentation and Control	OEC	3	0	0	3	3
9	22EI6402	Graphical Programming using Virtual Instrumentation	OEC	3	0	0	3	3
10	22AU6401	Fundamentals of Automobile Engineering	OEC	3	0	0	3	3
11	22AU6402	Automotive Vehicle Safety	OEC	3	0	0	3	3
12	22EE6401	Digital Marketing	OEC	3	0	0	3	3
13	22EE6402	Research Methodology	OEC	3	0	0	3	3
14	22FT6401	Traditional Foods	OEC	3	0	0	3	3

Note: Non Circuit Departments can add one Open Elective course in the above list to offer for the circuit branches

OPEN ELECTIVE III

Students shall choose any one of the open elective courses such that the course content or title not belong to their own programme.

(Note: Each programme in our institution is expected to provide one course only)

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PERWEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22EI7401	Smart Sensors for Engineering Applications	OEC	3	0	0	3	3
2	22EI7402	Electrical Energy Management and Audit	OEC	3	0	0	3	3

OPEN ELECTIVE IV

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PERWEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22LS7401	General studies for competitive examinations	OEC	3	0	0	3	3
2	22LS7402	Human Rights, Women Rights and Gender equity	OEC	3	0	0	3	3
3	22LS7403	Indian ethos and Human values	OEC	3	0	0	3	3
4	22LS7404	Financial independence and management	OEC	3	0	0	3	3
5	22LS7405	Yoga for Human Excellence	OEC	3	0	0	3	3
6	22LS7406	Democracy and Good Governance	OEC	3	0	0	3	3
7	22LS7407	NCC Level - II	OEC	3	0	0	3	3

PROFESSIONAL ELECTIVE COURSES:VERTICALS

Vertical I Applied Instrumentation	Vertical II Health care Instrumentation	Vertical III Advanced Measurements and Control	Vertical IV Electronics & Communication systems	Vertical V Control and Automation	Vertical VI Process Instrumentation
22EI5301 Power plant Instrumentation	22EI5304 Bio-Medical Instrumentation	22EI5307 Micro Electro Mechanical Systems	22EI5310 Embedded Systems	22EI5313 Plant Automation and IIOT	22EI5316 Instrumentation and Control in paper Industries
22EI5302 Industrial Pollution Control	22EI5305 Telemetry and Telecontrol	22EI5308 Wireless Instrumentation	22EI5311 Communication Engineering	22EI5314 PC based Instrumentation	22EI5317 System Identification
22EI5303 Safety Instrumented Systems	22EI5306 Digital Image Processing	22EI5309 Wearable Technology	22EI5312 Fundamentals of Nanotechnology and Nanoelectronics	22EI5315 Introduction to Soft Computing	22EI5318 Industrial data Communication
22EI6301 Piping and Instrumentation Diagrams	22EI6303 Medical Robotics	22EI6305 Fiber optics and Laser Instrumentation	22EI6307 Digital Signal Processing	22EI6309 Advanced Control Theory	22EI6311 Project and Finance Management
22EI6302 Virtual Instrumentation	22EI6304 Diagnosis and Therapeutic Equipment	22EI6306 Machine Monitoring and Control	22EI6308 Industrial Electronics	22EI6310 Robotics and Automation	22EI6312 Instrumentation and Control in Petrochemical Industries
22EI7301 Computer Control of Process	22EI7302 Occupational Health and Safety Management	22EI7303 Computer Vision and Image Processing	22EI7304 Microcontroller Based System Design	22EI7305 Introduction to DCS	22EI7306 Instrumentation System design

Note:
Students are permitted to choose all professional electives from any of the verticals.

DETAILS OF VERTICAL I: Applied Instrumentation

SL. NO.	COURSE C ODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22EI5301	Power plant Instrumentation	PEC	3	0	0	3	3
2.	22EI5302	Industrial Pollution Control	PEC	3	0	0	3	3
3.	22EI5303	Safety Instrumented Systems	PEC	3	0	0	3	3
4.	22EI6301	Piping and Instrumentation Diagrams	PEC	3	0	0	3	3
5.	22EI6302	Virtual Instrumentation	PEC	3	0	0	3	3
6.	22EI7301	Computer Control of Process	PEC	3	0	0	3	3

DETAILS OF VERTICAL II: Health care Instrumentation

SL. NO.	COURSE CODE	COURSE TITLE	CAT EGO RY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22EI5304	Bio-Medical Instrumentation	PEC	3	0	0	3	3
2.	22EI5305	Telemetry and Telecontrol	PEC	3	0	0	3	3
3.	22EI5306	Digital Image Processing	PEC	3	0	0	3	3
4.	22EI6303	Medical Robotics	PEC	3	0	0	3	3
5.	22EI6304	Diagnosis and Therapeutic Equipment	PEC	3	0	0	3	3
6.	22EI7302	Occupational Health and Safety Management	PEC	3	0	0	3	3

DETAILS OF VERTICAL III: Advanced Measurements and Control

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22EI5307	Micro Electro Mechanical Systems	PEC	3	0	0	3	3
2.	22EI5308	Wireless Instrumentation	PEC	3	0	0	3	3
3.	22EI5309	Wearable Technology	PEC	3	0	0	3	3
4.	22EI6305	Fiber optics and Laser Instrumentation	PEC	3	0	0	3	3
5.	22EI6306	Machine Monitoring and Control	PEC	3	0	0	3	3
6.	22EI7303	Computer Vision and Image Processing	PEC	3	0	0	3	3

DETAILS OF VERTICAL IV: Electronics & Communication systems

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22EI5310	Embedded Systems	PEC	3	0	0	3	3
2.	22EI5311	Communication Engineering	PEC	3	0	0	3	3
3.	22EI5312	Fundamentals of Nanotechnology and Nanoelectronics	PEC	3	0	0	3	3
4.	22EI6307	Digital Signal Processing	PEC	3	0	0	3	3
5.	22EI6308	Industrial Electronics	PEC	3	0	0	3	3
6.	22EI7304	Microcontroller Based System Design	PEC	3	0	0	3	3

DETAILS OF VERTICAL V: Control and Automation

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22EI5313	Plant Automation and IIOT	PEC	3	0	0	3	3
2.	22EI5314	PC based Instrumentation	PEC	3	0	0	3	3
3.	22EI5315	Introduction to Soft Computing	PEC	3	0	0	3	3
4.	22EI6309	Advanced Control Theory	PEC	3	0	0	3	3
5.	22EI6310	Robotics and Automation	PEC	3	0	0	3	3
6.	22EI7305	Introduction to DCS	PEC	3	0	0	3	3

DETAILS OF VERTICAL VI: Process Instrumentation

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22EI5316	Instrumentation and Control in paper Industries	PEC	3	0	0	3	3
2.	22EI5317	System Identification	PEC	3	0	0	3	3
3.	22EI5318	Industrial Data Communication	PEC	3	0	0	3	3
4.	22EI6311	Project and Finance Management	PEC	3	0	0	3	3
5.	22EI6312	Instrumentation and Control in Petrochemical Industries	PEC	3	0	0	3	3
6.	22EI7306	Instrumentation System design	PEC	3	0	0	3	3

Enrolment for B.E. / B. TECH. (HONOURS) / Minor Degree (optional)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only. For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes.

Clause 4.10 of Regulation 2022 is applicable for the Enrolment of B.E. / B. TECH. (HONOURS) / Minor Degree(Optional).

VERTICALS FOR MINOR DEGREE

- Heads are requested to provide one vertical from their program to offer for other program students to register for additional courses (18 Credits) to become eligible for the B.E./B.Tech. Minor Degree.

  Note: Each programme should provide verticals for minor degree –

ELECTRONICS AND INSTRUMENTATION ENGINEERING OFFERING MINOR DEGREE IN INSTRUMENTATION AND CONTROL

S No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1.	22EI5601	Sem 5: Transducer Engineering	MDC	3	0	0	3	3
2.	22EI6601	Sem 6: Measurements and Measuring Instruments	MDC	3	0	0	3	3
3.	22EI6602	Sem 6: Industrial Instrumentation	MDC	3	0	0	3	3
4.	22EI7601	Sem 7: Industrial data Communication	MDC	3	0	0	3	3
5.	22EI7602	Sem 7: Powerplant Instrumentation	MDC	3	0	0	3	3
6.	22EI8601	Sem 8: Industrial Automation	MDC	3	0	0	3	3

*MDC – Minor Degree Course

In addition to the above the following additional courses for Minor Degree can also be given to the student's common to all the branches.

Vertical I
Fintech and Block Chain

S. No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	22CS5601	Financial Management	MDC	3	0	0	3	3
2	22CS6601	Fundamentals of Investment	MDC	3	0	0	3	3
3	22CS6602	Banking, Financial Services and Insurance	MDC	3	0	0	3	3
4	22CS7601	Introduction to Blockchain and its Applications	MDC	3	0	0	3	3
5	22CS7602	Fintech Personal Finance and Payments	MDC	3	0	0	3	3
6	22CS8601	Introduction to Fintech	MDC	3	0	0	3	3

Vertical II
Entrepreneurship

S. No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	22BA5601	Foundations of Entrepreneurship	MDC	3	0	0	3	3
2	22BA6601	Introduction to Business Venture	MDC	3	0	0	3	3
3	22 BA6602	Team Building & Leadership Management for Business	MDC	3	0	0	3	3
4	22 BA7601	Creativity & Innovation in Entrepreneurship	MDC	3	0	0	3	3
5	22 BA7602	Principles of Marketing Management For Business	MDC	3	0	0	3	3
6	22 BA8601	Human Resource Management for Entrepreneurs	MDC	3	0	0	3	3
7	22BA8602	Financing New Business Ventures	MDC	3	0	0	3	3

Vertical III

Environment and Sustainability

S. No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	22CE5601	Sustainable infrastructure Development	MDC	3	0	0	3	3
2	22CE6501	Sustainable Agriculture and Environmental Management	MDC	3	0	0	3	3
3	22CE6602	Sustainable Bio Materials	MDC	3	0	0	3	3
4	22CE7601	Materials for Energy Sustainability	MDC	3	0	0	3	3
5	22CE7602	Green Technology	MDC	3	0	0	3	3
6	22CE6601	Environmental Quality Monitoring and Analysis	MDC	3	0	0	3	3

B.E (Hons) ELECTRONICS AND INSTRUMENTATION ENGINEERING

Vertical I IoT and Smart Sensors	Vertical II Process Control	Vertical III Industrial Automation
Sem 5: 22EI5203 Introduction to Internet of Things	**Sem 5:** 22EI5204 Instrumentation Practices in Industries	**Sem 5:** 22EI5205 Drives and control system for Automation
Sem 6: 22EI6202 Principle of Sensors and Signal Conditioning	**Sem 6:** 22EI6204 Adaptive control	**Sem 6:** 22EI6206 Applied Industrial Instrumentation
Sem 6: 22EI6203 Embedded systems for IoT	**Sem 6:** 22EI6205 Advanced Process Control	**Sem 6:** 22EI6207 Building Automation
Sem 7: 22EI7202 IoT for Industry Automation	**Sem 7:** 22EI7204 Unit operation and control	**Sem 7:** 22EI7206 Machine vision system
Sem 7: 22EI7203 Optical sensors and photonics	**Sem 7:** 22EI7205 Advanced Instrumentation Systems	**Sem 7:** 22EI7207 SCADA systems and its applications
Sem 8: 22EI8201 Smart Instrumentation	**Sem 8:** 22EI8202 Industrial safety and Hazard Management	**Sem 8:** 22EI8203 Technological Trends in Automation

Vertical I
B.E (Hons)_Electronics and Instrumentation Engineering with Specialization in IoT and Smart Sensors

S. No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	22EI5203	Introduction to Internet of Things	PC	3	0	0	3	3
2	22EI6202	Principles of Sensors and Signal Conditioning	PC	3	0	0	3	3
3	22EI6203	Embedded systems for IoT	PC	3	0	0	3	3
4	22EI7202	IoT for Industry Automation	PC	3	0	0	3	3
5	22EI7203	Optical sensors and photonics	PC	3	0	0	3	3
6	22EI8201	Smart Instrumentation	PC	3	0	0	3	3

Vertical II
B.E (Hons)_Electronics and Instrumentation Engineering with Specialization in Process Control

S. No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	22EI5204	Instrumentation Practices in Industries	PC	3	0	0	3	3
2	22EI6204	Adaptive control	PC	3	0	0	3	3
3	22EI6205	Advanced Process Control	PC	3	0	0	3	3
4	22EI7204	Unit operation and control	PC	3	0	0	3	3
5	22EI7205	Advanced Instrumentation Systems	PC	3	0	0	3	3
6	22EI8202	Industrial safety and Hazard Management	PC	3	0	0	3	3

Vertical III
B.E (Hons)_Electronics and Instrumentation Engineering
with Specialization in Industrial Automation

S No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	22EI5205	Drives and control system for Automation	PC	3	0	0	3	3
2	22EI6206	Applied Industrial Instrumentation	PC	3	0	0	3	3
3	22EI6207	Building Automation	PC	3	0	0	3	3
4	22EI7206	Machine vision system	PC	3	0	0	3	3
5	22EI7207	SCADA systems and its applications	PC	3	0	0	3	3
6	22EI8203	Technological Trends in Automation	PC	3	0	0	3	3

SEMESTER-WISE CREDIT DISTRIBUTION

B.E. / B.TECH.PROGRAMMES										
S.No.	Course Area	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HSC	3	3	-	2	-	3	-	-	**11**
2	BSC	7	9	4	-	-	-	-	-	**20**
3	ESC	6	4	5	-	-	-	-	-	**15**
4	PCC	-	3	13	20	12	7	9	-	**64**
5	PEC	-	-	-	-	9	9	-	-	**18**
6	OEC	-	-	-	-	-	3	9	-	**12**
7	EEC	2	4	3	1	1	2	2	10	**25**
8	MC	√	√							
	Total	**18**	**23**	**25**	**23**	**22**	**24**	**20**	**10**	**165**

Credit Distribution R2022

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	18	23	25	23	22	24	20	10	165

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COIMBATORE - 641 032.

SEMESTER - I

Programme/ Semester	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech/I	22MA1101	MATRICES AND CALCULUS (Common to all Branches)	3	1	0	4

Course Objective

The learner should be able to

1. Construct the characteristic polynomial of a matrix and use it to identify Eigen values and Eigenvectors
2. Impart the knowledge of single variate calculus.
3. Familiarize the student with functions of several variables.
4. Acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.
5. Make a vector differential operator for vector function and theorems to solve engineering problems

Unit	Description	Instructional Hours
I	**Matrices** Eigen values and Eigen vectors – Properties of Eigen values and Eigen vectors (without proof) - Cayley - Hamilton Theorem (excluding proof) - Reduction of a quadratic form to canonical form by orthogonal transformation.	12
II	**Single Variate Calculus** Rolle's Theorem – Lagrange's Mean Value Theorem - Maxima and Minima – Taylor's and Maclaurin's Series.	12
III	**Functions of Several Variables** Partial derivatives - Total derivative - Jacobians – Maxima and minima of functions of two variables and Lagrange's method of undetermined multipliers.	12
IV	**Integral Calculus** Double integrals in Cartesian coordinates – Area enclosed by plane curves (excluding surface area) – Triple integrals in Cartesian co-ordinates – Volume of solids (Sphere, Ellipsoid, Tetrahedron) using Cartesian co-ordinates.	12
V	**Vector Calculus** Gradient, divergence and curl vectors - Green's theorem - Stoke's and Gauss divergence theorem (statement only) for cubes only.	12
	Total Instructional Hours	60

Course Outcome

At the end of the course, the learner will be able to

CO1: Compute Eigen values and Eigen vectors of the given matrix and transform given quadratic form into canonical form.
CO2: Apply the concept of differentiation to identify the maximum and minimum values of curve.
CO3: Able to use differential calculus ideas on several variable functions.
CO4: Apply multiple integral ideas in solving areas, volumes and other practical problems.
CO5: Apply the concept of vector calculus in two and three-dimensional spaces.

TEXT BOOKS:

T1 - Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 10th edition, 2019.
T2 - K. P. Uma and S. Padma, "Engineering Mathematics I (Matrices and Calculus) ", Pearson Ltd.2022.

REFERENCE BOOKS:

R1 - Jerrold E. Marsden, Anthony Tromba, "Vector Calculus", W.H.Freeman, 2003-Strauss M. J, G. L Bradley and K. J .Smith, "Multivariable calculus", 6th edition, Prentice Hall, 2011.
R2 - Veerarajan T, "Engineering Mathematics", 5th edition, Mc Graw Hill Education(India) Pvt Ltd, New Delhi, 2016.
R3 - G. B. Thomas and R. L. Finney, "Calculus and Analytical Geometry", 9th Edition, Addison Wesley Publishing Company, 2016.

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	2	2	-	-	1	2	2	3	2
CO2	3	3	3	3	2	2	2	-	-	1	2	2	2	2
CO3	3	3	3	3	2	2	2	-	-	1	2	2	2	2
CO4	3	3	3	3	2	2	2	-	-	1	2	2	2	2
CO5	3	3	3	3	2	2	2	-	-	1	2	2	3	3
AVG	3	3	3	3	2.2	2	2			1	2	2	2.4	2.2

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Programme/ Semester	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech/ I	22HE1151	**ENGLISH FOR ENGINEERS (Common to all Branches)**	2	0	2	3

Course Objective	**The student should be able** 1. To help the students of engineering and technology develop a strong base in the use of English. 2. To help learners use language effectively in professional writing. 3. To impart basic English grammar and essentials of important language skills 4. To impart knowledge about the importance of vocabulary and grammar 5. To develop the communication skills of the students in both formal and informal situations

Unit	Description	Instructional Hours
I	**Language Proficiency:** Parts of Speech, Degrees of Comparison, Abbreviation& Acronyms **Writing:** Process Description, Instructions. **Vocabulary** – Words on Environment. **Practical Component: Listening-** Watching Short Videos and answer the questions, **Speaking-** Self introduction , Narrating personal experiences / events; Interviewing a celebrity: Reporting / and summarizing of documentaries / podcasts / interviews **Reading-** Purpose of Reading - Churning & Assimilation. Interpreting Ideas - Interpreting Graphs in Technical Writing.	7+2
II	**Language Proficiency:** Types of Sentences, Framing Question, One Word Substitution **Writing:** Writing Checklist, Reading Comprehension. **Vocabulary–** Words on Entertainment. **Practical Component: Listening-**Comprehensions based on TED talks **Speaking-** Story Telling **Reading** - Skimming – Scanning – Reading: Scientific Texts	7+2
III	**Language Proficiency:** Tenses, Conditional Clause ('If' clause), Active and Passive voices, **Writing:** Formal letter (invitation, acceptance, decline, Congratulation) Cloze test. **Vocabulary** – Words on Tools. **Practical Component: Listening-**Listening pre-recorded English language learning programme**Speaking** - Just a minute **Reading-** Reading feature articles (from newspapers and magazines) -Reading to identify point of view and perspective (opinion pieces, editorials etc.)	5+4
IV	**Language Proficiency:** Subject Verb Concord, Articles, The Use of Prefixes and Suffixes **Writing:** Preparing Agenda &Minutes, Writing Recommendations. **Vocabulary–** Words on Engineering process. **Practical Component: Listening-**An interview with someone who works for recruitment personnel. **Speaking-**Presentation on a general topic. **Reading-** Reading Comprehension - Literary Texts.	5+4
V	**Language Proficiency:** Prepositions, Phrasal Verbs, Modal Auxiliaries, **Writing:** Letter to the Editor, Sequencing of Sentences **Vocabulary** –Words on Engineering material **Practical Component: Listening-** Listening- Comprehensions based on Nat Geo/Discovery channel videos **Speaking-** Preparing posters and presenting as a team. **Reading-** Biographies. Travelogues, Technical blogs.	6+3
	Total Instructional Hours	**45**

Course Outcome	**After completion of the course the learner will be able** CO1: Understand English and converse effectively. CO2: Enable the students to write coherently and cohesively. CO3: Enable the development of basic grammar to enhance language for a better communication CO4: Use suitable vocabulary and grammar with confidence and express their ideas. CO5: Follow the etiquettes in formal and informal communication.

TEXT BOOKS:

T1- Raymond Murphy, "English Grammar in Use"-5thedition Cambridge University Press, 2019.
T2-Norman Whitby, "Business Benchmark-Pre-intermediate to Intermediate", Cambridge University Press, 2016.

REFERENCE BOOKS:

R1- Kapoor A.N., Business Letters for Different Occasions, New Delhi: S. Chand & Co. Pvt. Ltd., 2012.
R2-RaymondMurphy, " English Grammar For ESL Learners " Premium Fourth Edition.
R3- McCarthy, Michael et.al (2011) English Vocabulary in Use – advanced, Cambridge University Press.

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	-	-	-	-	-	-	2	-	3	2	1	-	-
CO2	-	-	-	-	2	3	2	3	1	3	1	-	-	-
CO3	-	-	-	3		2	-	2	2	3	2	2	-	-
CO4	-	-	-	-	-	2	-	2	1	3	1	1	-	-
CO5	-	-	-	2	-	-	-	2	3	3	3	1	-	-
AVG	-	-	-	2.5	2	2.3	2	2.2	1.8	3	1.8	1.3	-	-

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Programme/ Semester	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech/ I	22CY1153	Chemistry for Electrical Sciences	2	0	2	3

Course Objective	**The learner should be able to** 1. Acquire knowledge on the concepts of chemistry involved in display systems and conducting polymer materials. 2. Extend the knowledge on the concepts of purification of water. 3. Extend the knowledge on principles of electrochemistry and modern batteries 4. Enhance the fundamental knowledge on the mechanism of corrosion and its control. 5. Gain knowledge on the E-waste management methods.	
Unit	**Description**	**Instructional Hours**
I	**Water Science** Impurities in Water, Hardness of Water and Boiler feed Water – Boiler troubles -Sludge and scale formation, Caustic embrittlement, priming and foaming, boiler corrosion- -Softening Method - Ion-Exchange Method, Desalination of Brackish Water - Reverse Osmosis. **Estimation of hardness of water by EDTA.** **Determination of Dissolved Oxygen in sewage water by Winkler's method.** **Estimation of alkalinity of water sample by indicator method.**	6+9
II	**Polymers in Electronics** Conducting polymers – Definition – Properties – Applications - Synthesis, Properties and applications of Polyacetylene, Polyaniline, Poly-p-phenylenesulphide, Polypyrrole, Polythiophene. Biodegradable polymer: Preparation, Properties and applications of Poly Lactic acid (PLA).	6
III	**Electrochemical Cell and Energy Storage** Electrochemical cells - Single and Standard Electrode Potential - Nernst equationfor single electrode potential. EMF series - Applications. Batteries - Components - Classification - Construction, workingand applicationsofelectric vehicle batteries - Lithium-ionbattery,Nickel-Metal Hydride Batteries and Solar Cells. **Estimation of Ferrous iron by Potentiometry.**	6+3
IV	**Corrosion Science** Introduction, Chemical corrosion – Pilling Bedworth rule – electrochemical corrosion – theory and types of electrochemical corrosion - Galvanic corrosion, Differential aeration corrosion. Corrosion control – Sacrificial anode and impressed cathodic current methods - factors influencing the rate of corrosion.	6
V	**Electronic Waste Management** E-waste - Introduction - Definition – Sources - Effects of E-waste on environment and human health - need for E-waste management - Extraction Gold and copper from printed circuit boards (PCBs) - Disposal treatment methods of E-waste - recycling of E-waste. **Estimation of copper by EDTA method.**	6+3
	Total Instructional Hours	**45**
Course Outcome	**At the end of the course, the learner will be able to** CO1: Utilize the electronic materials for various applications. CO2:Explain the basic properties of water and its usage in domestic and industrial purposes. CO3: Develop knowledge on the basic principles of electrochemistry and applications of energy conversion and storage devices. CO4: Develop knowledge and understand the causes of corrosion and methods for corrosion prevention and protection of materials. CO5: Utilize the knowledge to handle the E-waste and reduce its impacts on environment.	

TEXT BOOKS:

T1 - P. C. Jain & Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi, 17th edition, (2022).
T2 -O. G. Palanna, "Engineering chemistry" McGraw Hill Education India (2017).

REFERENCE BOOKS:

R1 -Shikha Agarwal "Engineering Chemistry -Fundamentals and Applications, Cambridge University Press, Delhi, 2019
R2 - S. S. Dara "A Text book of Engineering Chemistry" S. Chand& Co. Ltd., New Delhi (2018).

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	1	1	1	1	-	1	-	1	2	-	-
CO2	2	3	2	1	1	1	1	-	1	-	1	2	-	-
CO3	2	2	2	2	1	1	1	-	1	-	1	2	-	-
CO4	2	2	2	2	1	1	1	-	1	-	1	2	-	-
CO5	2	3	2	-	-	-	3	-	-	-	-	-	-	-
AVG	2	2.6	2.2	1.5	1	1	1.4	-	1	-	1	2	-	-

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Programme	Course code	Name of the course	L	T	P	C
BE	22CS1151	PROBLEM SOLVING USING C PROGRAMMING (EEE, EIE, CSE, IT &CS)	2	0	2	3

Course Objective

The student should be able to

1. To develop simple algorithms for arithmetic and logical problems
2. To understand and implement the fundamental concepts in a program.
3. To enable how to implement conditional branching, iteration and recursion
4. To understand how to decompose a problem into functions and synthesize a complete program and to enable them to use arrays, pointers, strings and structures in solving problems.
5. To understand the use files to perform read and write operations

Unit	Description	Instructional Hours
I	**INTRODUCTION TO COMPUTERS** Computer Systems – Computing Environments – Computer Language – Creating and Running programs – Computer Numbering System – Storing Integers and Real Numbers – Algorithms - Flowchart.	7
II	**INTRODUCTION TO C LANGUAGE** Character set - C Tokens, Identifiers and Keywords - Constants, Variables - Data types – Text Input / Output – Operators - Expressions – Precedence and Associativity – Evaluating Expressions – Type Conversions. *Illustrative program: 1) Josh went to the market to buy N apples. He found two shops, shop A and B, where apples were being sold in lots. He can buy any number of the complete lot(s) but not loose apples. He is confused with the price and wants you to figure out the minimum cost to buy exactly N apples. Write an algorithm for Josh to calculate the minimum cost to buy exactly N apples.* ***Input Format:*** • *The first line of the input consists of an integer – N, representing the total number of apples that Josh wants to buy.* • *The second line consists of two space-separated positive integers – M1 and P1, representing the number of apples in a lot and the lot's price at shop A, respectively.* • *The third line consists of two space-separated positive integers-M2 and P2, representing the number of apples in a lot and lot's price at shop B, respectively.* ***Output Format:*** *Print a positive integer representing the minimum price at which Josh can buy the apples.* *2) Chaman planned to choose a four-digit lucky number for his car. His lucky numbers are 3,5 and 7. Help him find the number, whose sum is divisible by 3 or 5 or 7. Provide a valid car number, fails to provide a valid input then display that number is not a valid car number. Note: The input other than 4 digit positive number[includes negative and 0] is considered as invalid.*	6+4
III	**DECISION MAKING, ARRAYS, STRINGS AND POINTERS** Two-way selection – Multi-way selection – Concept of a Loop – Pre-test and Post-test Loops – Initialization and Updating – Controlled Loops – Other Statements Related to Looping – Looping Application - Arrays - Strings - Pointers – Pointer Applications – Processor Commands. *Illustrative program: 1) You are playing an online game. In the game, a list of N numbers is given. The player has to arrange the numbers so that all the odd numbers of the list come after the even numbers. Write an algorithm to arrange the given list such that all the odd numbers of the list come after the even numbers.*	6+4

Input

- *The first line of the input consists of an integer number, representing the size of the list(N).*
- *The second line of the input consists of N space-separated integers representing the values of the list*

Output

Print N space-separated integers such that all the odd numbers of the list come after the even numbers

2) Given an integer matrix of size N x N. Traverse it in a spiral form.

Input:

The first line contains N, which represents the number of rows and columns of a matrix. The next N lines contain N values, each representing the values of the matrix.

Output:

A single line containing integers with space, representing the desired traversal.

Constraints: 0 < N < 500

3) A digital machine generates binary data which consists of a string of 0s and 1s. A maximum signal M, in the data, consists of the maximum number of either 1s or 0s appearing consecutively in the data but M can't be at the beginning or end of the string. Design a way to find the length of the maximum signal.

Input

The first line of the input consists of an integer N, representing the length of the binary string. The second line consists of a string of length N consisting of 0s and 1s only.

Output

Print an integer representing the length of the maximum signal.

4) Given a string S(input consisting) of '' and '#'. The length of the string is variable. The task is to find the minimum number of '*' or '#' to make it a valid string. The string is considered valid if the number of '*' and '#' are equal. The '*' and '#' can be at any position in the string.*

Note : The output will be a positive or negative integer based on number of '' and '#' in the input string.*

(>#): positive integer*

(#>): negative integer*

(#=): 0*

FUNCTIONS, STRUCTURES AND UNION

Designing Structured Programs – Functions in C – User defined functions – Inter-Function Communication – Standard Function – Passing Arrays to Functions – Passing Pointers to Function – Recursion – Passing an array to a function – typedef – Enumerated types - Structure – Union – Programming Application.

IV *Illustrative program: 1) The Caesar cipher is a type of substitution cipher in which each alphabet in the plaintext or messages is shifted by a number of places down the alphabet. For example, with a shift of 1, P would be replaced by Q, Q would become R, and so on. To pass an encrypted message from one person to another, it is first necessary that both parties have the 'Key' for the cipher, so that the sender may encrypt and the receiver may decrypt it. Key is the number of OFFSET to shift the cipher alphabet. Key can have basic shifts from 1 to 25 positions as there are 26 total alphabets. As we are designing custom Caesar Cipher, in addition to alphabets, we are considering numeric digits from 0 to 9. Digits can also be shifted by key places. For Example, if a given plain text contains any digit with values 5 and keyy = 2, then 5 will be replaced by 7. "-"(minus sign) will remain as it is. Key value less than 0 should result into "INVALID INPUT". Write a function CustomCaesarCipher(int key, String message) which will accept plaintext and key as input parameters and returns its cipher text as output.* 5+4

Enter your PlainText: All the best

Enter the Key: 1

The encrypted Text is: BmmuifCftu

V	**BINARY INPUT / OUTPUT** Defining and Opening a file. closing a file - input/output operations on files - error handling during I/O operations - random access to files - Text versus Binary Streams – Standard Library Functions for Files – Converting File type. *Illustrative program: 1) Write a C Program to merge contents of two files into a third file. 2) Write a program in C to delete a specific line from a file.*	6+3
	Total Instructional Hours	45

Course Outcome	CO1	Develop simple algorithms for arithmetic and logical problems.
	CO2	Test and execute the programs and correct syntax and logical errors
	CO3	Implement conditional branching, iteration and recursion
	CO4	Decompose a problem into functions and synthesize a complete program and use arrays, pointers, strings and structures to formulate algorithms and programs.
	CO5	Use files to perform read and write operations

TEXT BOOKS:

T1 Behrouz A. Forouzan, Richard F. Gilberg, J. Jaya, S. Shankar, I. Jasmine SelvakumariJeya, M. Ramya Devi, "Computer Programming in C", Cengage Learning, 2022.

T2 Byron Gottfried, "Programming with C", Schaum's Outlines Series, McGraw Hill Education, 3rd edition, 2017.

REFERENCE BOOKS:

R1 Schildt Herbert, "C: The Complete Reference", Tata McGraw Hill Education, 4th edition, 2014.

R2 R. S. Bichkar, "Programming with C", Universities Press, 2nd edition 2012.

R3 YashvantKanetkar, "Exploring C", BPB Publishers, 2nd edition, 2003.

R4 W. Kernighan Brian, Dennis M. Ritchie, "The C Programming Language", PHI Learning, 2nd edition, 1988

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	3	3	2	0	0	0	3	0	3	0	3	3
CO2	2	2	2	2	2	3	0	1	2	0	3	2	3	2
CO3	3	2	1	2	2	3	0	1	2	0	2	2	2	2
CO4	3	1	2	2	0	3	0	1	0	0	2	2	2	1
CO5	3	1	2	1	2	0	0	0	0	0	2	3	2	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI1251	Basic Electrical and Electronics Engineering	2	0	2	3

Course Objective	1. Explain the basics of electrical quantities. 2. Educate on AC Fundamentals. 3. Explain the basics of semiconductor devices and applications 4. Elucidate the concepts of electrical wiring and safety 5. Introduce the fundamentals of Communication systems

Unit	Description	Instructional Hours
I	**DC CIRCUITS** Conductors, Insulators and Semiconductors- Energy Sources - Electric Quantities: Power, Energy – Law of Electromagnetic Induction - Ohm's Law - Kirchhoff's Laws - Resistors in Series Parallel Circuit Current and Voltage revision rule – Star–Delta Transformation – Source Transformation – Active and Passive Elements. ***Verification of Ohm's law, Kirchhoff's laws***	6+3
II	**AC CIRCUITS** AC Fundamentals - Phasor Representation – Relationship Between Voltage And Current in R,L,C – Single phase AC circuits– Power – Power factor - R, RL, RLC Circuits (Quantitative approach only) – Resonance in RLC series Circuits - Band width – Q-Factor. ***Steady state response of simple RL, RC circuits***	6+3
III	**SEMICONDUCTOR DEVICES AND APPLICATIONS** Semiconductor Materials - PN Junction Diode and its Characteristics – Zener Diode and its Characteristics – Zener Effect – Half wave and Full wave Rectifiers – Voltage Regulation. Bipolar Junction Transistor (BJT) – CB, CE, CC Configurations and Characteristics. ***V-I characteristics of PN Junction Diode***	6+3
IV	**ELECTRICAL WIRING AND SAFETY** Wiring types - Concealed wiring- One way and two way control-Need for Electrical safety - Electric shock - Precautions against shock - Elementary discussion on Circuit protective devices - Fuse and Miniature Circuit Breaker (MCB's) –Earthing – Types –Neutral Earthing - Pipe and plate Earthing - Residual current circuit Breaker. ***Field visit for gaining knowledge on safety equipments***	6+3
V	**FUNDAMENTALS OF COMMUNICATION SYSTEMS** Introduction — Elements of Communication Systems– Modulation and Demodulation: Principles of Amplitude and Frequency Modulations. Digital Communication – Communication Systems: Radio, Antenna, TV, Fax, ISDN, Microwave, Satellite and Optical Fibre (Block Diagram Approach only). ***Field visit for gaining knowledge on Radio communication devices.***	6+3
	Total Instructional Hours	**45**

Course Outcome	CO1: Analyze the DC electric circuits. CO2: Understand the concepts of AC circuits. CO3: Analyze basics of semiconductor devices and applications CO4: Familiarize on electrical wiring and safety CO5: Understand the working of communication devices.

TEXT BOOKS:

T1 - S.K.Bhattacharya, S.Annadurai, N.PAnanthamoorthy, "Basic Electrical and Electronics Engineering", Pearson India Education Services Pvt.Ltd. 2020

T2 - D P Kothari and I J Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.

REFERENCE BOOKS:

R1 - Salivahanan, "Electronic devices and Circuits", 5th edition PHI, 2008.

R2 - Jegatheesan, R., " Analysis of Electric Circuits",McGraw Hill, 2015.

R3 -Charles K. Alxander, Mathew N.O Sadiku, "Fundamentals of Electric circuits", 2nd edition McGraw Hill, 2013.

R4 - Sawhney A.K. "A Course in Electrical and Electronics measurements and instrumentation", 19th edition, Dhanpat Rai, 2011.

Web References:

1. https://nptel.ac.in/courses/108105053
2. https://onlinecourses.nptel.ac.in/noc19_ee44/preview

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	3	1	1	-	-	-	-	-	-	2	2	3
CO2	3	3	2	1	1	-	-	-	-	-	-	2	3	3
CO3	3	2	3	2	2	-	-	-	-	-	-	2	3	3
CO4	3	2	3	2	2	-	-	-	-	-	-	3	2	3
CO5	3	3	2	1	2	-	-	-	-	-	-	2	3	3
Avg	3	2.4	2.6	1.4	1.6	-	-	-	-	-	-	2.2	2.6	3

1-Low, 2-Medium, 3-High, "-" No correlation

Chairman - BoS
EIE - HiCET

ACADEMIC COUNCIL
Chairman

Dean (Academics)
HiCET

Programme/ Semester	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech/I	22HE1072	ENTREPRENEURESHIP AND INNOVATION (Common to all Branches)	1	0	0	1

Course Objectives

The student should be made

1. To acquire the knowledge and skills needed to manage the development of innovation.
2. To recognize and evaluate potential opportunities to monetize these innovations.
3. To plan specific and detailed method to exploit these opportunities.
4. To acquire the resources necessary to implement these plans.
5. To make students understand organizational performance and its importance.

Module	Description
1	Entrepreneurial Thinking
2	Innovation Management
3	Design Thinking
4	Opportunity Spotting / Opportunity Evaluation
5	Industry and Market Research
6	Innovation Strategy and Business Models
7	Financial Forecasting
8	Business Plans/ Business Model Canvas
9	Entrepreneurial Finance
10	Pitching to Resources Providers / Pitch Deck
11	Negotiating Deals
12	New Venture Creation
13	Lean Start-ups
14	Entrepreneurial Ecosystem
15	Velocity Venture
	TOTAL INSTRUCTIONAL HOURS 15

Course Outcome

At the end of the course, the learner will be able to

CO1: Understand the nature of business opportunities, resources, and industries in critical aspects.
CO2: Understand the processes by which innovation is fostered, managed, and commercialized.
CO3:Remember effectively and efficiently the potential of new business opportunities.
CO4:Assess the market potential for a new venture, including customer need, competitors.
CO5:Developabusiness model for a new venture, including revenue. Margins, operations, working capital.

TEXT BOOKS

T1:AryaKumar"Entrepreneurship–CreatingandleadinganEntrepreneurialOrganization",Pearson,SecondEdition(2012).
T2:EmrahYayici"DesignThinkingMethodology", Artbiztech, FirstEdition(2016).

REFERENCE BOOKS

R1: Christopher Golis "Enterprise & Venture Capital", Allen &Unwin Publication, Fourth Edition (2007).
R2: ThomasLockWood&EdgerPapke"InnovationbyDesign",CareerPress.com.SecondEdition(2017).
R3: Jonathan Wilson "Essentials of Business Research", Sage Publication, First Edition(2010).

WEB RESOURCES

W1:https://blof.forgeforward.in/tagged/startup-lessons
W2:https://blof.forgeforward.in/tagged/entrepreurship
W3:https://blof.forgeforward.in/tagged/minimum-viable-product
W4:https://blof.forgeforward.in/tagged/minimum-viable-product
W5:https://blof.forgeforward.in/tagged/innovation

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Chairman

Programme/ Semester	Course Code	Course Title	L	T	P	C
B.E./B.Tech/ I	22HE1073	INTRODUCTION TO SOFT SKILLS	2	0	0	0

Course Objectives:

1. To develop and nurture the soft skills of the students through instruction, knowledge acquisition, demonstration and practice.
2. To enhance the students ability to deal with numerical and quantitative skills.
3. To identify the core skills associated with critical thinking.
4. To develop and integrate the use of English language skills.

Unit	Description	Instructional Hours
I	**Lessons on excellence** Skill introspection, Skill acquisition, consistent practice	2
II	**Logical Reasoning** Problem Solving - Critical Thinking- Lateral Thinking - Coding and Decoding – Series – Analogy - Odd Man Out - Visual Reasoning - Sudoku puzzles - Attention to detail	11
III	**Quantitative Aptitude** Addition and Subtraction of bigger numbers - Square and square roots - Cubes and cube roots - Vedic maths techniques - Multiplication Shortcuts - Multiplication of 3 and higher digit numbers – Simplifications - Comparing fractions - Shortcuts to find HCF and LCM - Divisibility tests shortcuts - Algebra and functions	11
IV	**Recruitment Essentials** Resume Building - Impression Management	2
V	**Verbal Ability** Nouns and Pronouns – Verbs - Subject-Verb Agreement - Pronoun-Antecedent – Agreement – Punctuations	4
	Total Instructional Hours	30

Course Outcome

CO1	Students will analyze interpersonal communication skills, public speaking skills.
CO2	Students will exemplify tautology, contradiction and contingency by logical thinking.
CO3	Students will be able to develop an appropriate integral form to solve all sorts of quantitative problems.
CO4	Students can produce a resume that describes their education, skills, experiences and measurable achievements with proper grammar, format and brevity.
CO5	Students will be developed to acquire the ability to use English language with an error while making optimum use of grammar.

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Programme/ Semester	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech/ I	22MC1093	TAMIZHAR MARABHU	2	0	0	1

GE3152 **தமிழர் மரபு** **L T P C 1 0 0 1**

அலகு I **<u>மொழி மற்றும் இலக்கியம்</u>** **3**

இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துகள் – தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு II **மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை:** **3**

நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள்– பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு III **<u>நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்</u>** **3**

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு IV **<u>தமிழர்களின் திணைக் கோட்பாடுகள்:</u>** **3**

தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால நகரங்களும் துறை முகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு V **<u>இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு:</u>** **3**

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department ofArchaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

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Programme/ Semester	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech/I	22MC1094	**HERITAGE OF TAMIL (Common to all Branches)**	2	0	0	1

Course Objective	**The learner should be able to** 1. Introduce students to the great History of Tamil literature. 2. Establish the heritage of various forms of Rock art and Sculpture art. 3. To study and understand the various folk and Martial arts of Tamil culture 4. Introduce students to Ancient Tamil concepts 5. To learn about the various influences or impacts of Tamil language in Indian culture.

Unit	Description	Instructional Hours
I	**Language and Literature** Language families in India – Dravidian Languages – Tamil as a classical language – Classical Literature in Tamil- Secular nature of Sangam Literature – Distributive justice in Sangam Literature – Management principles in Thirukural – Tamil epics and impacts of Buddhism & Jainism in Tamil and Bakthi literature of Azhwars and Nayanmars – Forms of minor poetry _ Development of Modern literature in Tamil – Contribution of Bharathiyar and Bharathidasan.	6
II	**Heritage _ Rock Art Paintings to Modern Art – Sculpture** Hero Stone to Modern Sculpture – Bronze icons – Tribes and their handcrafts - Art of temple car making – Massive Terracotta sculptures, Village deities, Thiruvalluvar statue at Kanyakumari, Making of musical instruments – Mridangam, Parai, Yazh and Nadhaswaram - Role of Temples in social and economic life of Tamils.	6
III	**Folk and Martial Arts** Therukoothu, Karagattem, Villupattu, Kaniyankoothu, Oyilattam, Leather puppertry, Silambattam.,Valari Tiger dance – Sports and Games of Tamils.	6
IV	**Thinai Concept of Tamils** Flora and Fauna of Tamils – Aham and Puram Concept from Tholkappiyam and Sangam Literature – Aram concept of Tamils – Education and Literacy during Sangam Age - Ancient cities and ports of Sangam age – Exporot and Import during Sangam age – Overseas conquest of Cholas.	6
V	**Contribution of Tamils to Indian National Movement and Indian Culture** Contribution of Tamils to Indian freedom struggle – The cultural influence of Tamils over the other parts of India – Self respect movement – Role of Siddha Medicine in indigenous systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil books.	6
	Total Instructional Hours	**30**

Course Outcome	**At the end of the course, the learner will be able to** CO1: Learn about the works pertaining to Sangam age CO2: Aware of our Heritage in art from Stone sculpture to Modern Sculpture. CO3Appreciate the role of Folk arts in preserving, sustaining and evolution of Tamil culture. CO4: Appreciate the intricacies of Tamil literature that had existed in the past. CO5: Understand the contribution of Tamil Literature to Indian Culture

TEXT BOOKS:

T1- Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)

T2- Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by:International Institute of Tamil Studies.

T3-Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu)(Published by: International Institute of Tamil Studies).

REFERENCE BOOKS:

R1-The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies)

R2- Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu TextBookand Educational Services Corporation, Tamil Nadu.

Hindusthan College of Engineering and Technology
(An Autonomous Institution, Affiliated to AnnaUniversity, Chennai
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Valley Campus, Pollachi Highways, Coimbatore, Tamilnadu.

Department of Electronics and Instrumentation Engineering

SYLLABUS REVISION DETAILS FOR THE REGULATION 2022 – 2024 Batch - SEMESTER I

S. NO	COURSE CODE/COURSE NAME	SUGGESTION BY EXPERTS	EXISTING CONTENT (IN THE AY2023-24 ODD)	REVISED CONTENT(FOR AY 2024-25 ODD)	TYPE OF REVISION DELETION/ INSERTION/ MODIFICATION	PERCENTAGE OF REVISION
1.	**22EI1251** Basic Electrical and Electronics Engineering	Inclusion of topics & Revision (in unit V)	**UNIT V - BASICS OF MEASUREMENTS AND INSTRUMENTATION** S.I. Units and Standards – Elements of generalized measurement system - Instrument signal levels- Methods of measurements, Classification - Static and dynamic characteristics - Operating Principles of Permanent Magnet Moving coil (PMMC) Instruments - Voltmeter and Ammeter- Moving Iron (MI) Ammeters and Voltmeters - Energy meter – Wattmeter.	**UNIT V - FUNDAMENTALS OF COMMUNICATION SYSTEMS** Introduction - Elements of Communication Systems– Modulation and Demodulation: Principles of Amplitude and Frequency Modulations. Digital Communication -Communication Systems: Radio, Antenna, TV, Fax, ISDN, Microwave, Satellite and Optical Fibre (Block Diagram Approach only).	Topics included & revised	25%
				Experiments *Verification of Ohm's law.* *Kirchhoff's laws.* *Steady state response of simple RL, RC circuits.* *V-I characteristics of PN Junction Diode.* *Field visit for gaining knowledge on safety equipments.* *Field visit for gaining knowledge on Radio communication devices.*	Experiments Included	
					Total Percentage Changes	**25%**

HICET

Hindusthan College of Engineering and Technology

(An Autonomous Institution, Affiliated to AnnaUniversity, Chennai
Approved by AICTE,NewDelhi &Accredited by NAAC with'A++'Grade)
Valley Campus, Pollachi Highways, Coimbatore, Tamilnadu.

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Department of Electronics and Instrumentation Engineering

New Course Introduced (2022 Regulation) – 2024 Batch - I Semester

S.No	Regulation	Course code with Name	Credits
		NIL	

Chairman-BoS

Chairman - BoS
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ACADEMIC COUNCIL HINDUSTHAN COLLEGE Chairman

Dean-Academics

Dean (Academics)
HiCET

DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.E ELECTRONICS AND INSTRUMENTATION ENGINEERING (UG)

REGULATION-2022

(For the students admitted during the academic year 2023-2024 and onwards)

SEMESTER I

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
		THEORY									
1.	22MA1101	Matrices and Calculus (common to all branches)	BSC	3	1	0	4	4	40	60	100
2.	22EI1201	Fundamentals of Electrical, Electronics and Instrumentation Engineering	PCC	3	0	0	3	3	40	60	100
		THEORY WITH LAB COMPONENT									
3.	22HE1151	English for Engineers (Common to all branches)	HSC	2	0	2	3	4	50	50	100
4.	22CY1151	Chemistry for Circuit Engineering	BSC	2	0	2	3	4	50	50	100
5.	22CS1151	Problem Solving using C Programming	ESC	2	0	2	3	4	50	50	100
		EEC COURSES (SE/AE)									
6.	22HE1072	Entrepreneurship & Innovation (Common to all)	AEC	1	0	0	1	1	100	0	100
7.	22HE1073	Introduction to Soft Skills	SEC	1	0	0	0	1	100	0	100
		MANDATORY COURSE									
8.	22MC1093/ 22MC1094	தமிழர்மரபு / Heritage of Tamil	MC	2	0	0	1	2	100	0	100

9.	22MC1095	Universal Human Values (Common to All Branches)	MC	2	0	0	0	2	40	60	100
			TOTAL	18	1	6	18	25	570	330	900

SEMESTER II

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22MA2102	Differential Equations and Laplace Transform	BSC	3	1	0	4	4	40	60	100
2.	22CY2101	Environmental Studies	ESC	2	0	0	2	3	40	60	100
3.	22PH2101	Basics of Material Science	BSC	2	0	0	2	3	40	60	100
THEORY WITH LAB COMPONENT											
4.	22HE2151	Effective Technical Communication (Common to all)	HSC	2	0	2	3	4	50	50	100
5.	22PH2151	Physics For Circuit Engineering	BSC	2	0	2	3	4	50	50	100
6.	22EI2251	Electronic Devices and Circuits	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	22ME2001	Engineering Practices (Common to all)	ESC	0	0	4	2	2	60	40	100
EEC COURSES (SE/AE)											
8.	22HE2071	Design Thinking(Common to all)	AEC	2	0	0	2	2	100	0	100
9.	22HE2072	Soft Skills and Aptitude-I(Common to all)	SEC	1	0	0	1	1	100	0	100
MANDATORY COURSE											
10.	22MC2094/ 22MC2095	தமிழரும்தொழில்நுட்பமும் / Tamils and Technology	MC	2	0	0	1	2	100	0	100
11.	22MC2093	NCC */NSS / YRC / Sports / Clubs / Society Service - Enrollment (Common)	MC	All students shall enroll, on admission, in anyone of the personality, and character development programmes and undergo training for about 80 hours							
			TOTAL	19	1	8	23	27	520	380	900

SEMESTER III

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22MA3102	Complex Analysis and Transforms	BSC	3	1	0	4	4	40	60	100
2.	22EI3201	Electronic Instrumentation	ESC	3	0	0	3	3	40	60	100
3.	22EE3202	Electric Circuit Analysis	PCC	3	1	0	4	4	40	60	100
4.	22EI3203	Sensors and Transducers	PCC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
5.	22EI3251	Digital Electronics	PCC	2	1	2	4	4	50	50	100
PRACTICAL											
6.	22EE3001	Electric Circuits Laboratory	ESC	0	0	4	2	4	60	40	100
7.	22EI3002	Sensors and Transducers Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
8.	22HE3071	Soft Skills -II (Common to all)	SEC	1	0	0	1	1	100	0	100
9.	22HE3072	Fundamentals of JAVA Programming	AEC	2	0	0	2	2	100	0	100
MANDATORY COURSE											
10.	22MC3191	Essence of Indian Traditional Knowledge	MC	2	0	0	0	2	100	0	100
			TOTAL	**19**	**3**	**10**	**25**	**31**	**570**	**430**	**1000**

SEMESTER IV

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22HE4101	IPR and Start-ups	HSC	2	0	0	2	2	40	60	100
2.	22EI4201	Electrical Machines	PCC	3	0	0	3	3	40	60	100
3.	22EE4202	Integrated Circuits and Its Applications	PCC	3	1	0	4	4	40	60	100
4.	22EI4203	Industrial Instrumentation - I	PCC	3	0	0	3	3	40	60	100
5.	22EI4204	Analytical Instrumentation	PCC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
6.	22EI4251	Electrical and Electronic Measurements	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	22EI4001	Electrical Machines Laboratory	PCC	0	0	4	2	4	60	40	100
8.	22EE4002	Integrated Circuits Laboratory	PCC	0	0	4	2	4	60	40	100

EEC COURSES (SE/AE)												
9.	22HE4071	Soft Skills -III	SEC	1	0	0	1	1	100	0	100
MANDATORY COURSE												
10.	22MC4191	Indian Constitution	MC	2	0	0	0	2	100	0	100
			TOTAL	**20**	**2**	**8**	**23**	**30**	**570**	**440**	**1000**

* Two weeks internship carries 1 credit and it will be done during Semester III summer vacation and same willbe evaluated in Semester IV.
If students unable to undergo in semester III, then the Internship I offered in the semester IV can be clubbed with Internship II (Total: 4 weeks-2 credits)

SEMESTER V

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22EI5201	Industrial Instrumentation -II	PCC	3	0	0	3	3	40	60	100
2.	22EE5202	Microprocessors and Microcontrollers	PCC	3	0	0	3	3	40	60	100
3.	22EI53XX	Professional Elective-1	PEC	3	0	0	3	3	40	60	100
4.	22EI53XX	Professional Elective-2	PEC	3	0	0	3	3	40	60	100
5.	22EI53XX	Professional Elective-3	PEC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
6.	22EI5251	Control Systems	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	22EI5001	Industrial Instrumentation Laboratory	PCC	0	0	4	1.5	3	60	40	100
8.	22EE5002	Microprocessors and Microcontrollers Laboratory	PCC	0	0	4	1.5	3	60	40	100
EEC COURSES (SE/AE)											
9.	22HE5071	Soft Skills -IV/Foreign languages	SEC	1	0	0	1	1	100	0	100
			TOTAL	**18**	**0**	**6**	**22**	**25**	**410**	**390**	**800**

SEMESTER VI

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22EI6201	Process Control	PCC	3	0	0	3	3	40	60	100
2.	22HE6101	Professional Ethics	HSC	3	0	0	3	3	40	60	100

3.	22EI63XX	Professional Elective-4	PEC	3	0	0	3	3	40	60	100
4.	22EI63XX	Professional Elective-5	PEC	3	0	0	3	3	40	60	100
5.	22XX64XX	Open Elective – 1*	OEC	3	0	0	3	3	40	60	100
6.	22XX64XX	Open Elective – 2*	OEC	3	0	0	3	3	40	60	100
PRACTICAL											
7.	22EI6001	Process Control Laboratory	PCC	0	0	4	2	4	60	40	100
8.	22EI6002	Virtual Instrumentation and Data Acquisition Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
9.	22HE6071	Soft Skills – V	SEC	2	0	0	2	2	100	0	100
			TOTAL	**20**	**0**	**8**	**24**	**28**	**460**	**440**	**900**

SEMESTER VII

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22EI7201	Programmable Logic Controller and Its Applications	PCC	3	0	0	3	3	40	60	100
2.	22EI73XX	Professional Elective-6	PEC	3	0	0	3	3	40	60	100
3.	22XX7401	Open Elective – 3*	OEC	3	0	0	3	3	40	60	100
4.	22LS74XX	Open Elective – 4*	OEC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
5.	22EI7251	VLSI Design	PCC	2	0	2	3	4	40	60	100
PRACTICAL											
6.	22EI7001	Industrial Automation Laboratory	PCC	0	0	4	1.5	3	60	40	100
7.	22EI7001	Instrumentation System Design Laboratory	PCC	0	0	4	1.5	3	60	40	100
EEC COURSES (SE/AE)											
8.	22EI7701	Internship Training	SEC	-	-	-	2	1	100	0	100
			TOTAL	**15**	**1**	**4**	**20**	**21**	**360**	**340**	**700**

* - Four weeks internship carries 2 credit and it will be done in before Semester VI summer vacation/placement training and same will be evaluated in Semester VII.

SEMESTER VIII

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
EEC COURSES (SE/AE)											
1.	22EI8901	Project Work/Granted Patent	SEC	0	0	20	10	20	100	100	200
			TOTAL	**0**	**0**	**20**	**10**	**20**	**100**	**100**	**200**

Note:

* 1. As per the AICTE guideline, in Semester I, II, III & IV NCC one credit subject is added as Value Added Course with Extra Credit. Further, the students' who enrolled his/her name in HICET NCC and Air Wing are eligible to undergo this subject. The earned extra credits printed in the Consolidated Mark sheet as per the regulation.

2. NCC course level 1 & Level 2 will be added in the list of open elective subjects in the appropriate semester. Further, the students' who have opted NCC subjects in Semester I, II, III & IV are eligible to undergo NCC Open Elective Subjects.

3. The above-mentioned NCC Courses will be offered to the Students who are going to be admitted in the Academic Year 2021 – 22.

OPEN ELECTIVE I AND II
(EMERGING TECHNOLOGIES)

(To be offered for the students other than CSE, IT, AI&ML, ECE & BIOMEDICAL)

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PERWEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22AI6401	Artificial Intelligence and Machine Learning Fundamentals	OEC	2	0	2	4	3
2	22CS6401	Blockchain Technology	OEC	2	0	2	4	3
3	22EC6401	Cyber security	OEC	2	0	2	4	3
4	22EC6402	IoT Concepts and Applications	OEC	2	0	2	4	3
5	22IT6401	Data Science and Analytics	OEC	2	0	2	4	3
6	22BM6401	Augmented and Virtual Reality	OEC	2	0	2	4	3

OPEN ELECTIVE I AND II

(To be offered for the students other than AUTO. AERO, AGRI, MECH. MCTS, CIVIL, EEE, CHEMICAL, FOOD TECH, E&I)

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PERWEEK			TOTAL CONTAC TPERIOD S	CREDITS
				L	T	P		
1	22AE6401	Space Science	OEC	3	0	0	3	3
2	22MT6401	Introduction to Industrial Engineering	OEC	3	0	0	3	3
3	22MT6402	Industrial Safety and Environment	OEC	3	0	0	3	3
4	22CE6401	Climate Change and its Impact	OEC	3	0	0	3	3
5	22CE6402	Environment and Social Impact Assessment	OEC	3	0	0	3	3
6	22ME6401	Renewable Energy System	OEC	3	0	0	3	3
7	22ME6402	Additive Manufacturing systems	OEC	3	0	0	3	3
8	**22EI6401**	Introduction to Industrial Instrumentation and Control	OEC	3	0	0	3	3
9	**22EI6402**	Graphical Programming using Virtual Instrumentation	OEC	3	0	0	3	3
10	22AU6401	Fundamentals of Automobile Engineering	OEC	3	0	0	3	3
11	22AU6402	Automotive Vehicle Safety	OEC	3	0	0	3	3
12	22EE6401	Digital Marketing	OEC	3	0	0	3	3
13	22EE6402	Research Methodology	OEC	3	0	0	3	3
14	22FT6401	Traditional Foods	OEC	3	0	0	3	3

Note: Non Circuit Departments can add one Open Elective course in the above list to offer for the circuit branches

OPEN ELECTIVE III

Students shall choose any one of the open elective courses such that the course content or title not belong to their own programme.

(Note: Each programme in our institution is expected to provide one course only)

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PERWEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22EI7401	Smart Sensors for Engineering Applications	OEC	3	0	0	3	3
2	22EI7402	Electrical Energy Management and Audit	OEC	3	0	0	3	3

OPEN ELECTIVE IV

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PERWEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22LS7401	General studies for competitive examinations	OEC	3	0	0	3	3
2	22LS7402	Human Rights, Women Rights and Gender equity	OEC	3	0	0	3	3
3	22LS7403	Indian ethos and Human values	OEC	3	0	0	3	3
4	22LS7404	Financial independence and management	OEC	3	0	0	3	3
5	22LS7405	Yoga for Human Excellence	OEC	3	0	0	3	3
6	22LS7406	Democracy and Good Governance	OEC	3	0	0	3	3
7	22LS7407	NCC Level - II	OEC	3	0	0	3	3

PROFESSIONAL ELECTIVE COURSES:VERTICALS

Vertical I Applied Instrumentation	Vertical II Health care Instrumentation	Vertical III Advanced Measurements and Control	Vertical IV Electronics & Communication systems	Vertical V Control and Automation	Vertical VI Process Instrumentation
22EI5301 Power plant Instrumentation	22EI5304 Bio-Medical Instrumentation	22EI5307 Micro Electro Mechanical Systems	22EI5310 Embedded Systems	22EI5313 Plant Automation and IIOT	22EI5316 Instrumentation and Control in paper Industries
22EI5302 Industrial Pollution Control	22EI5305 Telemetry and Telecontrol	22EI5308 Wireless Instrumentation	22EI5311 Communication Engineering	22EI5314 PC based Instrumentation	22EI5317 System Identification
22EI5303 Safety Instrumented Systems	22EI5306 Digital Image Processing	22EI5309 Wearable Technology	22EI5312 Fundamentals of Nanotechnology and Nanoelectronics	22EI5315 Introduction to Soft Computing	22EI5318 Industrial data Communication
22EI6301 Piping and Instrumentation Diagrams	22EI6303 Medical Robotics	22EI6305 Fiber optics and Laser Instrumentation	22EI6307 Digital Signal Processing	22EI6309 Advanced Control Theory	22EI6311 Project and Finance Management
22EI6302 Virtual Instrumentation	22EI6304 Diagnosis and Therapeutic Equipment	22EI6306 Machine Monitoring and Control	22EI6308 Industrial Electronics	22EI6310 Robotics and Automation	22EI6312 Instrumentation and Control in Petrochemical Industries
22EI7301 Computer Control of Process	22EI7302 Occupational Health and Safety Management	22EI7303 Computer Vision and Image Processing	22EI7304 Microcontroller Based System Design	22EI7305 Introduction to DCS	22EI7306 Instrumentation System design

Note:
Students are permitted to choose all professional electives from any of the verticals.

DETAILS OF VERTICAL I: Applied Instrumentation

SL. NO.	COURSE C ODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK L	T	P	TOTAL CONTACT PERIODS	CREDITS
1.	22EI5301	Power plant Instrumentation	PEC	3	0	0	3	3
2.	22EI5302	Industrial Pollution Control	PEC	3	0	0	3	3
3.	22EI5303	Safety Instrumented Systems	PEC	3	0	0	3	3
4.	22EI6301	Piping and Instrumentation Diagrams	PEC	3	0	0	3	3
5.	22EI6302	Virtual Instrumentation	PEC	3	0	0	3	3
6.	22EI7301	Computer Control of Process	PEC	3	0	0	3	3

DETAILS OF VERTICAL II: Health care Instrumentation

SL. NO.	COURSE CODE	COURSE TITLE	CAT EGO RY	PERIODS PER WEEK L	T	P	TOTAL CONTACT PERIODS	CREDITS
1.	22EI5304	Bio-Medical Instrumentation	PEC	3	0	0	3	3
2.	22EI5305	Telemetry and Telecontrol	PEC	3	0	0	3	3
3.	22EI5306	Digital Image Processing	PEC	3	0	0	3	3
4.	22EI6303	Medical Robotics	PEC	3	0	0	3	3
5.	22EI6304	Diagnosis and Therapeutic Equipment	PEC	3	0	0	3	3
6.	22EI7302	Occupational Health and Safety Management	PEC	3	0	0	3	3

DETAILS OF VERTICAL III: Advanced Measurements and Control

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22EI5307	Micro Electro Mechanical Systems	PEC	3	0	0	3	3
2.	22EI5308	Wireless Instrumentation	PEC	3	0	0	3	3
3.	22EI5309	Wearable Technology	PEC	3	0	0	3	3
4.	22EI6305	Fiber optics and Laser Instrumentation	PEC	3	0	0	3	3
5.	22EI6306	Machine Monitoring and Control	PEC	3	0	0	3	3
6.	22EI7303	Computer Vision and Image Processing	PEC	3	0	0	3	3

DETAILS OF VERTICAL IV: Electronics & Communication systems

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22EI5310	Embedded Systems	PEC	3	0	0	3	3
2.	22EI5311	Communication Engineering	PEC	3	0	0	3	3
3.	22EI5312	Fundamentals of Nanotechnology and Nanoelectronics	PEC	3	0	0	3	3
4.	22EI6307	Digital Signal Processing	PEC	3	0	0	3	3
5.	22EI6308	Industrial Electronics	PEC	3	0	0	3	3
6.	22EI7304	Microcontroller Based System Design	PEC	3	0	0	3	3

DETAILS OF VERTICAL V: Control and Automation

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22EI5313	Plant Automation and IIOT	PEC	3	0	0	3	3
2.	22EI5314	PC based Instrumentation	PEC	3	0	0	3	3
3.	22EI5315	Introduction to Soft Computing	PEC	3	0	0	3	3
4.	22EI6309	Advanced Control Theory	PEC	3	0	0	3	3
5.	22EI6310	Robotics and Automation	PEC	3	0	0	3	3
6.	22EI7305	Introduction to DCS	PEC	3	0	0	3	3

DETAILS OF VERTICAL VI: Process Instrumentation

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22EI5316	Instrumentation and Control in paper Industries	PEC	3	0	0	3	3
2.	22EI5317	System Identification	PEC	3	0	0	3	3
3.	22EI5318	Industrial Data Communication	PEC	3	0	0	3	3
4.	22EI6311	Project and Finance Management	PEC	3	0	0	3	3
5.	22EI6312	Instrumentation and Control in Petrochemical Industries	PEC	3	0	0	3	3
6.	22EI7306	Instrumentation System design	PEC	3	0	0	3	3

Enrolment for B.E. / B. TECH. (HONOURS) / Minor Degree (optional)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only. For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes.

Clause 4.10 of Regulation 2022 is applicable for the Enrolment of B.E. / B. TECH. (HONOURS) / Minor Degree(Optional).

VERTICALS FOR MINOR DEGREE

- Heads are requested to provide one vertical from their program to offer for other program students to register for additional courses (18 Credits) to become eligible for the B.E./B.Tech. Minor Degree.

  Note: Each programme should provide verticals for minor degree –

ELECTRONICS AND INSTRUMENTATION ENGINEERING OFFERING MINOR DEGREE IN INSTRUMENTATION AND CONTROL

S No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1.	22EI5601	Sem 5: Transducer Engineering	MDC	3	0	0	3	3
2.	22EI6601	Sem 6: Measurements and Measuring Instruments	MDC	3	0	0	3	3
3.	22EI6602	Sem 6: Industrial Instrumentation	MDC	3	0	0	3	3
4.	22EI7601	Sem 7: Industrial data Communication	MDC	3	0	0	3	3
5.	22EI7602	Sem 7: Powerplant Instrumentation	MDC	3	0	0	3	3
6.	22EI8601	Sem 8: Industrial Automation	MDC	3	0	0	3	3

*MDC – Minor Degree Course

In addition to the above the following additional courses for Minor Degree can also be given to the student's common to all the branches.

Vertical I
Fintech and Block Chain

S. No	Course Code	Course Title	Category	Periods Per week L	T	P	Total Contact Periods	Credits
1	22CS5601	Financial Management	MDC	3	0	0	3	3
2	22XXXX	Fundamentals of Investment	MDC	3	0	0	3	3
3	22XXXX	Banking, Financial Services and Insurance	MDC	3	0	0	3	3
4	22XXXX	Introduction to Blockchain and its Applications	MDC	3	0	0	3	3
5	22XXXX	Fintech Personal Finance and Payments	MDC	3	0	0	3	3
6	22XXXX	Introduction to Fintech	MDC	3	0	0	3	3

Vertical II
Entrepreneurship

S. No	Course Code	Course Title	Category	Periods Per week L	T	P	Total Contact Periods	Credits
1	22BA5601	Foundations of Entrepreneurship	MDC	3	0	0	3	3
2	22BA6601	Introduction to Business Venture	MDC	3	0	0	3	3
3	22 BA6602	Team Building & Leadership Management for Business	MDC	3	0	0	3	3
4	22 BA7601	Creativity & Innovation in Entrepreneurship	MDC	3	0	0	3	3
5	22 BA7602	Principles of Marketing Management For Business	MDC	3	0	0	3	3
6	22 BA8601	Human Resource Management for Entrepreneurs	MDC	3	0	0	3	3
7	22BA8602	Financing New Business Ventures	MDC	3	0	0	3	3

Vertical III
Environment and Sustainability

S. No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	22CE5602	Sustainable infrastructure Development	MDC	3	0	0	3	3
2	22XXXX	Sustainable Agriculture and Environmental Management	MDC	3	0	0	3	3
3	22XXXX	Sustainable Bio Materials	MDC	3	0	0	3	3
4	22XXXX	Materials for Energy Sustainability	MDC	3	0	0	3	3
5	22XXXX	Green Technology	MDC	3	0	0	3	3
6	22XXXX	Environmental Quality Monitoring and Analysis	MDC	3	0	0	3	3

B.E (Hons) ELECTRONICS AND INSTRUMENTATION ENGINEERING

Vertical I IoT and Smart Sensors	Vertical II Process Control	Vertical III Industrial Automation
Sem 5: 22EI5203 Introduction to Internet of Things	**Sem 5:** 22EI5204 Instrumentation Practices in Industries	**Sem 5:** 22EI5205 Drives and control system for Automation
Sem 6: 22EI6202 Principle of Sensors and Signal Conditioning	**Sem 6:** 22EI6204 Adaptive control	**Sem 6:** 22EI6206 Applied Industrial Instrumentation
Sem 6: 22EI6203 Embedded systems for IoT	**Sem 6:** 22EI6205 Advanced Process Control	**Sem 6:** 22EI6207 Building Automation
Sem 7: 22EI7202 IoT for Industry Automation	**Sem 7:** 22EI7204 Unit operation and control	**Sem 7:** 22EI7206 Machine vision system
Sem 7: 22EI7203 Optical sensors and photonics	**Sem 7:** 22EI7205 Advanced Instrumentation Systems	**Sem 7:** 22EI7207 SCADA systems and its applications
Sem 8: 22EI8201 Smart Instrumentation	**Sem 8:** 22EI8202 Industrial safety and Hazard Management	**Sem 8:** 22EI8203 Technological Trends in Automation

Vertical I
B.E (Hons)_Electronics and Instrumentation Engineering
with Specialization in IoT and Smart Sensors

S. No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	22EI5203	Introduction to Internet of Things	PC	3	0	0	3	3
2	22EI6202	Principles of Sensors and Signal Conditioning	PC	3	0	0	3	3
3	22EI6203	Embedded systems for IoT	PC	3	0	0	3	3
4	22EI7202	IoT for Industry Automation	PC	3	0	0	3	3
5	22EI7203	Optical sensors and photonics	PC	3	0	0	3	3
6	22EI8201	Smart Instrumentation	PC	3	0	0	3	3

Vertical II
B.E (Hons)_Electronics and Instrumentation Engineering
with Specialization in Process Control

S. No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	22EI5204	Instrumentation Practices in Industries	PC	3	0	0	3	3
2	22EI6204	Adaptive control	PC	3	0	0	3	3
3	22EI6205	Advanced Process Control	PC	3	0	0	3	3
4	22EI7204	Unit operation and control	PC	3	0	0	3	3
5	22EI7205	Advanced Instrumentation Systems	PC	3	0	0	3	3
6	22EI8202	Industrial safety and Hazard Management	PC	3	0	0	3	3

Vertical III
B.E (Hons)_Electronics and Instrumentation Engineering
with Specialization in Industrial Automation

S No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	22EI5205	Drives and control system for Automation	PC	3	0	0	3	3
2	22EI6206	Applied Industrial Instrumentation	PC	3	0	0	3	3
3	22EI6207	Building Automation	PC	3	0	0	3	3
4	22EI7206	Machine vision system	PC	3	0	0	3	3
5	22EI7207	SCADA systems and its applications	PC	3	0	0	3	3
6	22EI8203	Technological Trends in Automation	PC	3	0	0	3	3

SEMESTER-WISE CREDIT DISTRIBUTION

B.E. / B.TECH.PROGRAMMES										
S.No.	Course Area	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HSC	3	3	-	2	-	3	-	-	**11**
2	BSC	7	9	4	-	-	-	-	-	**20**
3	ESC	6	4	5	-	-	-	-	-	**15**
4	PCC	-	3	13	20	12	7	9	-	**64**
5	PEC	-	-	-	-	9	9	-	-	**18**
6	OEC	-	-	-	-	-	3	9	-	**12**
7	EEC	2	4	3	1	1	2	2	10	**25**
8	MC	√	√							
	Total	**18**	**23**	**25**	**23**	**22**	**24**	**20**	**10**	**165**

Credit Distribution R2022

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	18	23	25	23	22	24	20	10	165

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SEMESTER - III

Programme	Course Code	Name of the Course	L	T	P	C
B.E	22MA3102	COMPLEX ANALYSIS AND TRANSFORMS (EEE, EIE, ECE)	3	1	0	4

Course Objective

The learner should be able to

1. Introduce the basic concepts of analytic functions and its properties.
2. Impart knowledge on the Cauchy's theorem and its applications in evaluation of integral.
3. Analyze the Fourier series which is central to many applications in engineering
4. Acquaint the knowledge of Fourier transform techniques in various situations.
5. Explore the Z transform techniques for discrete time systems

Unit	Description	Instructional Hours
I	**COMPLEX DIFFERENTIATION** Functions of complex variables – Analytic functions – Cauchy's – Riemann equations and sufficient conditions (excluding proof) – Construction of analytic functions – Milne –Thomson's method – Conformal mapping w = A+z , Az, 1/z and bilinear transformations.	12
II	**COMPLEX INTEGRATION** Cauchy's integral theorem – Cauchy's integral formula –Taylor's and Laurent's series (statement only) –Residues - Cauchy's Residue theorem - Contour Integration with unit circle only.	12
III	**FOURIER SERIES** Dirichlet's conditions- General Fourier Series – Odd and Even Functions – Change of Interval - Parseval's Identity - Half Range Sine and Cosine Series.- Harmonic analysis	12
IV	**FOURIER TRANSFORMS** Fourier Transform Pairs - Fourier Sine and Cosine transforms – Properties - Transforms of Simple functions – Convolution Theorem (Statement only) – Parseval's identity (Statement only).	12
V	**Z - TRANSFORMS AND DIFFERENCE EQUATIONS** Z- Transforms - Elementary properties – Inverse Z - transform (using partial fraction and residues) – Convolution theorem(excluding proof)– Solution of difference equations using Z – transform	12
	Total Instructional Hours	60

Course Outcome

At the end of the course, the learner will be able to

CO1: Apply the concept of analytic functions and discuss its properties.
CO2: Evaluate various integrals by using Cauchy's residue theorem and classify singularities and derive Laurent series expansion
CO3: Understand the principles of Fourier series which helps them to solve physical problems of Engineering
CO4: Apply Fourier transform techniques which extend its applications.
CO5: Acquire knowledge about the Z- transforms for analyzing discrete-time signals and systems

TEXT BOOKS:

T1 – Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2019.
T2 - Veerarajan T. "Engineering Mathematics ", McGraw Hill Education(India) Pvt Ltd, New Delhi, 2016.

REFERENCE BOOKS:

R1 - James Ward Brown, Ruel Vance Churchill, Complex Variables and Applications, McGraw-Hill Higher Education, 2004
R2 - Dennis Zill, Warren S. Wright, Michael R. Cullen, Advanced Engineering Mathematics, Jones & Bartlett Learning, 2011
R3 - Ian N. Sneddon, Elements of Partial Differential Equations, Courier Corporation, 2013

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	2	3	1	-	-	-	-	-	-	2	2	2
CO2	2	3	3	3	1	-	-	-	-	-	-	2	3	2
CO3	3	2	3	2	1	-	-	-	-	-	-	2	2	3
CO4	3	2	3	3	1	-	-	-	-	-	-	2	3	3
CO5	3	3	2	2	1	-	-	-	-	-	-	2	3	3
Avg	2.6	2.4	2.6	2.6	1	-	-	-	-	-	-	2	2.6	2.6

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
BE	22EI3201	Electronic Instrumentation	3	0	0	3

Course Objective	1. Describe the various analog electronic instruments and it's working 2. Classify signal generators and different types of wave analyzers 3. Illustrate cathode ray oscilloscope and display devices. 4. Explain about digital electronic instruments and its conversion techniques. 5. Outline smart instrumentation and measurements.

Unit	Description	Instructional Hours
I	**ELECTRONIC ANALOG METERS** A.C and D.C voltmeters - ammeter. multimeter - Q meter - true RMS meter - vector impedance meter - vector voltmeter - component measuring instruments - RF voltage and power measurements. AF oscillators - Instrument Transformers - Instrumentation amplifier.	9
II	**SIGNAL GENERATORS AND WAVE ANALYZERS** Sine wave generator - Sweep frequency generator. pulse and square wave generator - Function generator - Noise generator - Applications. Wave analyzer: Types - Harmonic distortion analyzer - Spectrum analyzer.	9
III	**CATHODE RAY OSCILLOSCOPE, RECORDERS AND DISPLAYS** General purpose oscilloscope - Vertical &horizontal deflection systems - Delay line - Multiple trace - Dual beam & dual trace - Storage oscilloscopes - Applications. X-Y Plotters. magnetic tape recording - Data loggers. Display devices: LED. LCD - Bar graph display - seven segments and dot matrix displays.	9
IV	**DIGITAL INSTRUMENTS** Digital Ammeter and Voltmeter - auto ranging, auto zeroing - Measurements of Frequency and Time Interval - DMM, Comparison between analog and digital techniques of measurement. Successive approximation and dual slope types of ADC - digital frequency counters - digital storage oscilloscopes - LCR meter.	9
V	**SMART INSTRUMENTS AND APPLICATIONS** Serial, parallel ports, USB–IEEE 488- Elements of Data Acquisition - Smart Sensor. - Smart/intelligent instruments, comparison with conventional type instruments - Role of measuring instruments and recorders in Industries - Applications of digital instruments.	9
	Total Instructional Hours	**45**

Course Outcome	CO1: Define the construction and working nature of A.C and D.C analog instruments. CO2: Summarize the signal generators and analyzers for various parameter measurements. CO3: Demonstrate the working of oscilloscope. recorders and display devices. CO4: Implement digital measuring instruments for applications. CO5: Build a computer controlled digital instruments and transducers for suitable industrial applications.

TEXT BOOKS:

T1 - Albert D.Helfrickand William D. Cooper. "Modern Electronic Instrumentation and Measurement Techniques", Prentice Hall of India, 2008.

T2 - Kalsi.H.S, "Electronic Instrumentation". Tata McGraw Hill. 2010.

REFERENCE BOOKS:

R1 - Sawhney. A.K, "A Course in Electrical and Electronics – Measurement and Instrumentation". 19th Edition, Dhanpat Rai & Sons, 2014.

R2 - Patranabis.D "Principles of Electronic Instrumentation",Prentice Hall of India Learning Pvt Ltd, 2009.

R3 - Rangan, C.S., Sarma G.R. and Mani V.S.V., "Instrumentation devices and systems", Tata McGraw Hill, New Delhi, 2008.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	3	1	-	-	-	-	-	-	2	2	3
CO2	3	3	3	3	1	-	-	-	-	-	-	2	2	3
CO3	3	3	3	2	1	-	-	-	-	-	-	2	3	3
CO4	3	3	3	3	1	-	-	-	-	-	-	2	3	3
CO5	3	3	2	2	1	-	-	-	-	-	-	2	3	3
Avg	3	3	2.6	2.6	1	-	-	-	-	-	-	2	2.6	3

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
BE	22EE3202	**Electric Circuit Analysis (Common to EEE/EIE)**	3	1	0	4

Course Objective	1. Analyze electric circuits and solve complex circuits 2. Impart knowledge on various network theorems in AC and DC circuits 3. Provide knowledge on resonance phenomenon and analyze coupled circuits 4. Analyze transient response of AC and DC inputs to RL,RC and RLC circuits 5. Draw phasor diagrams of voltage and current for three phase circuits and measure power and power factor.

Unit	Description	Instructional Hours
I	**BASIC CIRCUITS ANALYSIS** Ohm's Law – Kirchoff's laws – DC and AC Circuits – Resistors in series and parallel circuits – Mesh current and Node voltage method –Super Mesh-Super Node – Phasor Diagram – Power, Power Factor and Energy.	12
II	**NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC CIRCUITS** Network reduction: voltage and current division, source transformation – Dependent sources and Independent sources - star delta conversion. Thevenin's and Norton & Theorem – Superposition Theorem – Maximum power transfer theorem –Reciprocity Theorem-Millman's Theorem.	12
III	**RESONANCE AND COUPLED CIRCUITS** Series and Parallel resonance – frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Dot rule for coupled circuits - Tuned circuits – Single tuned circuits.	12
IV	**TRANSIENT RESPONSE** Transient response of RL, RC and RLC Circuits using Laplace transform for DC input - Time constants - Transient response of A.C. circuits for single loop circuit.	12
V	**THREE PHASE CIRCUITS** Three phase balanced / unbalanced voltage sources – analysis of three phase 3-wire and 4-wire circuits with star and delta connected, balanced & unbalanced loads – phasor diagram of voltages and currents – power and power factor measurements in three phase circuits using two wattmeter method.	12
	Total Instructional Hours	**60**

Course Outcome	CO1: Apply basic laws to electrical circuits. CO2: Solve electrical circuits using network theorems CO3: Explain the concept of resonance and solve coupled circuit problems CO4: Carryout problems in DC and AC transients CO5: Analyse and calculate three phase AC circuit parameters

TEXT BOOKS:

T1 William H. Hayt Jr. Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", Tata McGraw Hill publishers. 6th edition, New Delhi, 2003.

T2 Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", Tata McGraw Hill, 2007.

REFERENCE BOOKS:

R1 - Paranjothi SR, "Electric Circuits Analysis", New Age International Ltd., New Delhi, 1996.

R2 - Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series,Tata McGraw-Hill, 2001.

R3 - Chakrabati A, "Circuits Theory (Analysis and synthesis)", Dhanpath Rai & Sons, New Delhi, 1999.

R4 - Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, (2003).

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	3	1	-	-	-	-	-	-	2	3	3
CO2	3	3	3	3	1	-	-	-	-	-	-	2	3	3
CO3	3	3	3	2	1	-	-	-	-	-	-	2	2	2
CO4	3	3	3	3	1	-	-	-	-	-	-	2	2	2
CO5	2	3	2	2	1	-	-	-	-	-	-	2	3	2
Avg	2.8	2.8	2.6	2.6	1	-	-	-	-	-	-	2	2.6	2.4

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
BE	22EI3203	Sensors and Transducers	3	0	0	3

Course Objective

1. Understand the concepts of measurement systems.
2. Introduce the principle of various resistive Transducers.
3. Learn the various transducers used to measure the displacement.
4. Acquire the concepts and working on Capacitive Transducers.
5. Illustrate the function of smart sensors.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO MEASUREMENT SYSTEM AND TRANSDUCERS** General concepts and terminology of measurement system - Methods of measurements - Transducer Vs Sensor- Errors in measurement - Characteristics of Transducer - Calibration methods - Statistical error analysis. Classification of Transducers - Mathematical Model of Transducer - Zero, First and Second order Transducer - Response to Impulse. Step. Ramp and Sinusoidal inputs.	9
II	**RESISTIVE TRANSDUCERS** Resistance transducer - Principle of operation, construction, characteristics and application of Potentiometer, Strain Gauge, Load and Torque measurement. Thermistor, Resistance Temperature Detector, Thermocouple. Hot Wire Anemometer:	9
III	**INDUCTIVE TRANSDUCERS** Inductance transducer- Principle of operation, construction, characteristics and application of LVDT, RVDT, Synchros. Variable Reluctance Transducer, Eddy Current Transducer.	9
IV	**CAPACITIVE TRANSDUCERS** Capacitance Transducer - Variable Area Type. Variable Air Gap Type - Variable Permittivity Type; Capacitive Microphone - Frequency Response - Applications: Measurement of Pressure, Level, Thickness, Moisture and Density.	9
V	**MISCELLANEOUS TRANSDUCERS AND SMART SENSORS** Hall Effect Transducer - Piezoelectric Transducer - Magnetostrictive Transducer – Optical Displacement Transducer. Smart Sensors: Proximity Sensor – Film Sensor - SQUID Sensor - Biosensors - Safety Sensor– Introduction to MEMS and Nano sensors.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Interpret the basics of measurement systems and their characteristics.
CO2: Expertise in working and application of various resistive transducers.
CO3: Outline an adequate knowledge about various inductive transducers.
CO4: Make use of capacitive transducers on industrial parameters measurement.
CO5: Outline the role of different industrial transducers and smart sensors.

TEXT BOOKS:

T1 - Sawhney. A.K, "A Course in Electrical and Electronics Measurements and Instrumentation", 19th Edition, Dhanpat Rai & Company Private Limited, 2011.
T2 - Renganathan. S, "Transducer Engineering", Allied Publishers, Chennai, 2003.

REFERENCE BOOKS:

R1 - Ernest O.Doebelin. "Measurement systems", 6th Edition, Tata McGraw Hill, New Delhi, 2011.
R2 - Patranabis. D. "Sensors and Transducers", Prentice Hall of India, 2003.
R3 - D.V.S. Murty, "Transducers and Instrumentation". Prentice Hall India.2008

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	3	1	-	-	-	-	-	-	2	3	2
CO2	3	3	3	3	1	-	-	-	-	-	-	2	3	3
CO3	3	3	3	2	1	-	-	-	-	-	-	2	2	3
CO4	3	3	3	3	1	-	-	-	-	-	-	2	3	3
CO5	3	3	2	2	1	-	-	-	-	-	-	2	3	3
Avg	3	3	2.6	2.6	1	-	-	-	-	-	-	2	2.8	2.8

1-Low, 2-Medium, 3-High, "-" No

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI3251	Digital Electronics (Common to EEE and EIE)	2	1	2	4

Course Objective

1. To understand different methods used for the simplification of Boolean functions
2. To study combinational circuits
3. To learn synchronous sequential circuits.
4. To infer the concepts of asynchronous sequential circuits and Programmable Logic Devices
5. To interpret the fundamentals of HDL.

Unit	Description	Instructional Hours
I	**MINIMIZATION TECHINIQUES AND LOGIC GATES** Boolean algebra and laws – Demorgan's Theorem—Minimization of Boolean Expressions. Minterm - Maxterm- Sum of Product (SOP) – Product of Sum(POS) - Karnaugh map minimization - Don't care conditions. Simplification of Boolean expressions using logic gates : NAND and NOR - ***Design of Boolean Functions using K-map.***	9+3
II	**COMBINATIONAL CIRCUITS** Analysis and design of combinational circuits- Adders, Subtractors. Multiplier. -Code converters – Magnitude comparator – Decoder and Encoder- Multiplexer and De-multiplexer –***Design of Adder and Subtractor circuits.***	9+3
III	**SYNCHRONOUS SEQUENTIAL CIRCUITS** Sequential logic- SR, JK, D and T flip flops - level triggering and edge triggering. Asynchronous and Synchronous type - counters –Modulo counters, Shift registers. Design of synchronous sequential circuits – Moore and Melay models- state diagram-state reduction- state assignment. ***Design of Code converters: Excess-3 to BCD and vice-versa.***	9+3
IV	**ASYNCHRONOUS SEQUENTIAL CIRCUITS AND PROGRAMMABLE LOGIC DEVICES** Analysis of Asynchronous sequential logic circuits - Transition table, flow table - race conditions, hazards and errors in digital circuits. Introduction to Programmable Logic Devices: PROM – PLA – PAL - ***Design of race conditions in digital circuits.***	9+3
V	**HDL** Introduction to Hardware Description Language. HDL for combinational circuits: Adders - Subtractors – Decoder and Encoder- Multiplexer and De-multiplexer. HDL for Sequential Circuits: flip-flops – counters- Registers - ***Design of Multiplexer and De-multiplexer.***	9+3
	Total Instructional Hours	**60**

Course Outcome

CO1: Apply the knowledge acquired about Boolean functions.
CO2: Summarize the concepts of combinational circuits.
CO3: Transform the acquired skill in designing the synchronous sequential circuits.
CO4: Ability to understand and analyze the asynchronous sequential circuits.
CO5: Outline the concepts of HDL.

TEXT BOOKS:

T2 - Raj Kamal, 'Digital systems-Principles and Design', Pearson Education 1st Edition, 2012.
T2 - M. Morris Mano, 'Digital Design with an introduction to the VHDL', Pearson Education, 2013.

REFERENCE BOOKS:

R1-Floyd and Jain, 'Digital Fundamentals', 8th edition, Pearson Education, 2003.
R2-Anand Kumar, Fundamentals of Digital Circuits,PHI,2013.
R3-Charles H.Roth, Jr.LizyLizy Kurian John, 'Digital System Design using VHDL, Cengage,2013.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	2	3	1	-	-	-	-	-	-	2	2	2
CO2	2	3	3	3	1	-	-	-	-	-	-	2	2	3
CO3	3	3	3	2	1	-	-	-	-	-	-	2	3	2
CO4	3	3	3	3	1	-	-	-	-	-	-	2	3	3
CO5	3	3	2	2	1	-	-	-	-	-	-	2	3	2
Avg	2.6	2.8	2.6	2.6	1	-	-	-	-	-	-	2	2.4	2.4

1-Low, 2-Medium, 3-High, "-" No

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Programme	Course Code	Name of the Course	L	P	T	C
B.E	22EE3001	Electric Circuits Laboratory *(Common to EEE / EIE)*	0	0	4	2

Course Objective

1. To provide practical experience on verification of kirchoff's voltage law. kirchoff's current law and network theorems.
2. To design series and parallel resonant circuit and to analyse the simulation results.
3. To compare the time constant values of RL,RC circuits by conducting suitable experiments
4. To measure three phase power using two wattmeter method
5. To provide knowledge on signal measurements using CRO and DSO

Expt No	Description of the experiments	Total Practical Hours
1.	Experimental verification of Kirchhoff's laws	
2.	Simulation and experimental verification of Thevenin's Theorem.	
3.	Simulation and experimental verification Superposition Theorem	
4.	Simulation and experimental verification of Maximum Power transfer theorem.	
5.	Experimental determination of time constant of RL& RC electric circuits.	
6.	Experimental determination of frequency response of RLC circuits.	
7.	Design and Simulation of series resonance circuit.	
8.	Design and Simulation of parallel resonant circuits.	
9.	Simulation of three phase balanced and unbalanced star, delta network circuits.	
10.	Experimental determination of power in three phase circuits by two-watt meter method.	
11.	Study of CRO,DSO and measurement of sinusoidal voltage, frequency and power factor	
	Total Instructional Hours	45

Course Outcome

CO1:Verifyohm'slawandKirchoff'slaw
CO2: Understand and verify theorems
CO3:Performmeshand nodal analysis
CO4:UnderstandtransientresponseofRL,RCcircuitsforDCinput
CO5:Evaluate frequency response of series, parallel resonant circuits and tuned circuits

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	3	1	-	-	-	-	-	-	2	2	2
CO2	3	3	3	3	1	-	-	-	-	-	-	2	3	2
CO3	3	3	3	2	1	-	-	-	-	-	-	2	3	3
CO4	3	3	3	3	1	-	-	-	-	-	-	2	3	3
CO5	3	3	2	2	1	-	-	-	-	-	-	2	3	3
Avg	3	3	2.6	2.6	1	-	-	-	-	-	-	2	2.8	2.6

1-Low, 2-Medium, 3-High, "-" No

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI3002	Sensors and Transducers Laboratory	0	0	4	2

Course Objective

1. Analyze the suitable transducer to meet the requirements of industrial applications.
2. Infer the various techniques of resistance, capacitance and inductance measurements.
3. Assess the concept of measurement technique in various instruments.

Expt. No.	Description of the Experiments
1.	Displacement versus output voltage characteristics of a Potentiometric Transducer.
2.	Determination of Characteristic study of Strain Gauge.
3.	Determination of Characteristic study of Load cell.
4.	Step response Characteristics of Thermocouple.
5.	Static and Dynamic characteristics of RTD.
6.	Static and Dynamic characteristics of Thermistor.
7.	Measurement of Linear displacement using LVDT.
8.	Determination of Characteristics of Photoelectric or Photo Voltaic Transducer.
9.	Determination of Characteristics of LDR.
10.	Measurement of Voltage and Current using Hall Effect Transducer.
11.	Determination of Characteristics of Piezo-Electric Transducer.

Total Practical Hours 45

Course Outcome

CO1: Make use of sensors and transducers to measure the industrial parameters.
CO2: Analyze the characteristics of different transducers.
CO3: Discuss the various techniques of active and passive element measurements.
CO4: Represent the designing knowledge in signal conditioning circuits.
CO5: Impart knowledge to the students in handling the different kinds of transducers which they often meet in different aspects of transducers.

REFERENCES:

R1-John P. Bentley, "Principles of Measurement Systems", Pearson Education, Third Edition, 2009.
R 2- Laboratory manual prepared by the Department of Electronics and Instrumentation Engineering, 2016.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	3	1	-	-	-	-	-	-	2	3	3
CO2	3	3	3	3	1	-	-	-	-	-	-	2	3	3
CO3	3	3	3	2	1	-	-	-	-	-	-	2	2	3
CO4	3	3	3	3	1	-	-	-	-	-	-	2	3	3
CO5	3	3	2	2	1	-	-	-	-	-	-	2	3	3
Avg	3	3	2.6	2.6	1	-	-	-	-	-	-	2	2.8	3

1-Low, 2-Medium, 3-High, "-" No

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Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	22HE3071	Soft Skills and Aptitude - II	1	0	0	1

Course Objectives:
1. Solve Logical Reasoning questions of easy to intermediate level
2. Solve Quantitative Aptitude questions of easy to intermediate level
3. Solve Verbal Ability questions of easy to intermediate level
4. Display good writing skills while dealing with essays

Unit	Description	Instructional Hours
I	**Logical Reasoning** Clocks - Calendars - Direction Sense - Cubes - Data Interpretation: Tables, Pie Chart, Bar Graph - Data Sufficiency	9
II	**Quantitative Aptitude** Time and work: Work with different efficiencies, Pipes and cisterns, Work equivalence, Division of wages - Time, Speed and Distance: Basics of time, speed and distance, Relative speed, Problems based on trains, Problems based on boats and streams, - Profit and loss, Basic terminologies in profit and loss - Averages - Weighted average	12
III	**Verbal Ability** Sentence Correction: Subject-Verb Agreement, Modifiers, Parallelism, Pronoun-Antecedent Agreement, Verb Time Sequences, Comparisons, Prepositions, Determiners - Sentence Completion and Para-jumbles: Pro-active thinking, Reactive thinking (signpost words, root words, prefix suffix, sentence structure clues), Fixed jumbles, Anchored jumbles.	7
IV	**Writing skills for placements** Essay writing: Idea generation for topics, Best practices, Practice and feedback	2
	Total Instructional Hours	30

Course Outcome:

CO1: Students will avoid the various fallacies that can arise through the misuse of logic.
CO2: Students would opt for alternate methods to solve the problems rather than conventional methods.
CO3: Students will heighten their awareness of correct usage of English grammar in writing and speaking
CO4: Students will be concise and clear, using professional language for placements.

REFERENCE BOOKS:

R1: A New Approach To Reasoning Verbal & Non-Verbal By B.S. Sijwali
R2: How to prepare for data interpretation for CAT by Arun Sharma.
R3: How to Crack TEST OF REASONING in all competitive examinations by Jaikishan and Premkishan.
R4: Quantitative Aptitude for Competitive Examinations -Dr. R.S. Aggarwal, S. Chand
R5: Word Power Made Easy by Norman Lewis
R:6 Six weeks to words of power by Wilfred Funk

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Programme	Course Code	Name of the Course	L	T	P	C
BE	22HE3072	Fundamentals of JAVA Programming	2	0	0	2

Course Objective

1. To understand Object Oriented programming concepts like Data Abstraction, Encapsulation
2. To analyze different types of constructor, Inheritance and polymorphism
3. To understand and apply package, Interface and Applet concepts
4. To understand and apply exception and i/o handling
5. To know the fundamental concepts of collection framework and multithreading in solving real world problems

Unit	Description	Instructional Hours
I	**Introduction to Object Oriented Programming** Object Oriented Programming - Abstraction – objects and classes - Encapsulation- Inheritance - Polymorphism- OOP in Java – Characteristics of Java – The Java Environment - Java Source File -Structure – Compilation	6
II	**Java Fundamentals** Introduction to java programming – Features of java-Classes and objects - Arrays - Methods-Constructor-Access Specifier - Nested Classes-Inner Classes -Command line arguments.	6
III	**Inheritance, packages and Interface:** Inheritance types -Method overriding - Abstract Classes- Packages-Interfaces	6
IV	**Exceptions and I/O handling:** Exception handling fundamentals-I/O basics – Reading console input – Writing console output-Files	6
V	**Applets, AWT and Event Handling:** Applet classes-AWT-event handling–multithreaded programming- Collection framework	6
	Total Instructional Hours	**30**

Course Outcome

CO1: Identify and reproduce the features of Object Oriented programming paradigm.

CO2: Interpret the fundamental concepts of collection framework algorithms and its uses

CO3: Understand the basis of Package, multithreading, and interface concepts

CO4: Use I/O functionality to code basic file operations and experiment with exceptions handling

CO5: Apply the concepts of Applets, AWT and Event handling mechanism to solve a given problems.

TEXT BOOKS:

T1: Herbert Schildt, "Java : The Complete Reference", 9th edition, TMH, 2014.2017

T2: Paul Deitel, Harvey Deitel, "Java How To Program", 10th Edition, Prentice Hall Publications,2014.

REFERENCE BOOKS:

R1: Daniel Liang ,"Introduction to Java Programming", 9th Edition , Prentice Hall Publications,2015

Chairman - BoS
EIE - HiCET

ACADEMIC COUNCIL Chairman HINDUSTHAN COLLEGE OF ENGG & TECH

Dean (Academics)
HiCET

Hindusthan College of Engineering and Technology
(An Autonomous Institution, Affiliated to AnnaUniversity, Chennai
Approved by AICTE,NewDelhi &Accredited by NAAC with'A++'Grade)
Valley Campus, Pollachi Highways, Coimbatore, Tamilnadu.

Department of Electronics and Instrumentation Engineering

SYLLABUS REVISION DETAILS FOR THE REGULATION 2022 – 2023 BATCH - III SEMESTER						
S. NO	COURSE CODE/COURSE NAME	SUGGESTION BY EXPERTS	EXISTING CONTENT (IN THE AY2023-24 ODD)	REVISED CONTENT(FOR AY 2024-25 ODD)	TYPE OF REVISION DELETION/ INSERTION/ MODIFICATION	PERCENTAGE OF REVISION
NIL						
					Total Percentage Changes	NIL

New Course Introduced (2022 Regulation) – 2023 Batch - III Semester

S.No	Regulation	Course code with Name	Credits
NIL			

Chairman-BoS
Chairman BoS
EIE - HiCET

HINDUSTHAN COLLEGE OF ENGG & TECH ACADEMIC COUNCIL Chairman

Dean-Academics
Dean (Academics)
HiCET

DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.E ELECTRONICS AND INSTRUMENTATION ENGINEERING (UG)

REGULATION-2022

(For the students admitted during the academic year 2022-2023 and onwards)

SEMESTER I

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22MA1101	Matrices and Calculus (common to all branches)	BSC	3	1	0	4	4	40	60	100
2.	22EI1201	Fundamentals of Electrical, Electronics and Instrumentation Engineering	PCC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
3.	22HE1151	English for Engineers (Common to all branches)	HSC	2	0	2	3	4	50	50	100
4.	22CY1151	Chemistry for Circuit Engineering	BSC	2	0	2	3	4	50	50	100
5.	22CS1151	Problem Solving using C Programming	ESC	2	0	2	3	4	50	50	100
EEC COURSES (SE/AE)											
6.	22HE1071	Universal Human Values (Common to all branches)	AEC	2	0	0	2	3	40	60	100
7.	22HE1072	Entrepreneurship & Innovation (Common to all)	AEC	1	0	0	1	1	100	0	100
NON CREDIT - MANDATORY COURSE											
8.	22MC1091/ 22MC1092	தமிழரும் தொழில்நுட்பமும் / Indian Constitution	MC	2	0	0	0	2	100	0	100
			TOTAL	**15**	**5**	**6**	**19**	**27**	**370**	**330**	**700**

SEMESTER II

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22MA2102	Differential Equations and Laplace Transform	BSC	3	1	0	4	4	40	60	100
2.	22CY2101	Environmental Studies	ESC	2	0	0	2	3	40	60	100
3.	22PH2101	Basics of Material Science	BSC	2	0	0	2	3	40	60	100
THEORY WITH LAB COMPONENT											
4.	22HE2151	Effective Technical Communication (Common to all)	HSC	2	0	2	3	4	50	50	100
5.	22PH2151	Physics For Circuit Engineering	BSC	2	0	2	3	4	50	50	100
6.	22EI2251	Electronic Devices and Circuits	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	22ME2001	Engineering Practices (Common to all)	ESC	0	0	4	2	2	60	40	100
EEC COURSES (SE/AE)											
8.	22HE2071	Design Thinking(Common to all)	AEC	2	0	0	2	2	100	0	100
9.	22HE2072	Soft Skills and Aptitude-I(Common to all)	SEC	1	0	0	1	1	100	0	100
NON CREDIT - MANDATORY COURSE											
10.	22MC2091/ 22MC2092	தமிழர் மரபு /Heritage of Tamil	MC	2	0	0	0	2	100	0	100
11.	22MC2093	NCC */NSS / YRC / Sports / Clubs / Society Service - Enrollment (Common)	MC	All students shall enroll, on admission, in anyone of the personality and character development programmes and undergo training for about 80 hours							
			TOTAL	**19**	**1**	**8**	**22**	**27**	**520**	**380**	**900**

SEMESTER III

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22MA3102	Complex Analysis and Transforms	BSC	3	1	0	4	4	40	60	100
2.	22EI3201	Electronic Instrumentation	ESC	3	0	0	3	3	40	60	100
3.	22EE3202	Electric Circuit Analysis	PCC	3	1	0	4	4	40	60	100
4.	22EI3203	Sensors and Transducers	PCC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
5.	22EI3251	Digital Electronics	PCC	2	1	2	4	4	50	50	100
PRACTICAL											
6.	22EE3001	Electric Circuits Laboratory	ESC	0	0	4	2	4	60	40	100

7.	22EI3002	Sensors and Transducers Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
8.	22HE3071	Soft Skills and Aptitude -II (Common to all)	SEC	1	0	0	1	1	100	0	100
9.	22HE3072	Fundamentals of JAVA Programming	AEC	2	0	0	2	2	40	60	100
NON CREDIT - MANDATORY COURSE											
10.	22MC3191	Essence of Indian Traditional Knowledge	MC	2	0	0	0	2	100	0	100
			TOTAL	**19**	**3**	**10**	**25**	**31**	**570**	**430**	**1000**

SEMESTER IV

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22HE4101	IPR and Start-ups	HSC	2	0	0	2	2	40	60	100
2.	22EI4201	Electrical Machines	PCC	3	0	0	3	3	40	60	100
3.	22EE4202	Integrated Circuits and Its Applications	PCC	3	1	0	4	4	40	60	100
4.	22EI4203	Industrial Instrumentation - I	PCC	3	0	0	3	3	40	60	100
5.	22EI4204	Analytical Instrumentation	PCC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
6.	22EI4251	Electrical and Electronic Measurements	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	22EI4001	Electrical Machines Laboratory	PCC	0	0	4	2	4	60	40	100
8.	22EE4002	Integrated Circuits Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
9.	22HE4071	Soft Skills -III	SEC	1	0	0	1	1	100	0	100
			TOTAL	**18**	**1**	**10**	**23**	**28**	**470**	**430**	**900**

* Two weeks internship carries 1 credit and it will be done during Semester III summer vacation and same willbe evaluated in Semester IV.
If students unable to undergo in semester III, then the Internship I offered in the semester IV can be clubbed with Internship II (Total: 4 weeks-2 credits)

SEMESTER V

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22EI5201	Industrial Instrumentation -II	PCC	3	0	0	3	3	40	60	100
2.	22EE5202	Microprocessors and Microcontrollers (Common to EEE/EIE)	PCC	3	0	0	3	3	40	60	100
3.	22EI53XX	Professional Elective-1	PEC	3	0	0	3	3	40	60	100

4.	22EI53XX	Professional Elective-2	PEC	3	0	0	3	3	40	60	100
5.	22EI53XX	Professional Elective-3	PEC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
6.	22EI5251	Control Systems (Common to EEE/EIE)	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	22EI5001	Industrial Instrumentation Laboratory	PCC	0	0	4	1.5	3	60	40	100
8.	22EE5002	Microprocessors and Microcontrollers Laboratory (Common to EEE/EIE)	PCC	0	0	4	1.5	3	60	40	100
EEC COURSES (SE/AE)											
9.	22HE5071	Soft Skills -IV/Foreign languages	SEC	1	0	0	1	1	100	0	100
TOTAL				18	0	6	22	25	410	390	800

SEMESTER VI

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22EI6201	Process Control	PCC	3	0	0	3	3	40	60	100
2.	22HE6101	Professional Ethics	HSC	3	0	0	3	3	40	60	100
3.	22EI63XX	Professional Elective-4	PEC	3	0	0	3	3	40	60	100
4.	22EI63XX	Professional Elective-5	PEC	3	0	0	3	3	40	60	100
5.	22XX64XX	Open Elective – 1*	OEC	3	0	0	3	3	40	60	100
6.	22XX64XX	Open Elective – 2*	OEC	3	0	0	3	3	40	60	100
PRACTICAL											
7.	22EI6001	Process Control Laboratory	PCC	0	0	4	2	4	60	40	100
8.	22EI6002	Virtual Instrumentation and Data Acquisition Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
9.	22HE6071	Soft Skills – V	SEC	2	0	0	2	2	100	0	100
			TOTAL	**20**	**0**	**8**	**24**	**28**	**460**	**440**	**900**

SEMESTER VII

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22EI7201	Programmable Logic Controller and Its Applications	PCC	3	0	0	3	3	40	60	100
2.	22EI73XX	Professional Elective-6	PEC	3	0	0	3	3	40	60	100
3.	22XX7401	Open Elective – 3*	OEC	3	0	0	3	3	40	60	100
4.	22LS74XX	Open Elective – 4*	OEC	3	0	0	3	3	40	60	100

THEORY WITH LAB COMPONENT											
5.	22EI7251	VLSI Design	PCC	2	0	2	3	4	40	60	100
PRACTICAL											
6.	22EI7001	Industrial Automation Laboratory	PCC	0	0	4	1.5	3	60	40	100
7.	22EI7001	Instrumentation System Design Laboratory	PCC	0	0	4	1.5	3	60	40	100
EEC COURSES (SE/AE)											
8.	22EI7701	Internship Training	SEC	-	-	-	2	1	100	0	100
			TOTAL	**15**	**1**	**4**	**20**	**21**	**360**	**340**	**700**
* - Four weeks internship carries 2 credit and it will be done in before Semester VI summer vacation/placement training and same will be evaluated in Semester VII.											

SEMESTER VIII

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
EEC COURSES (SE/AE)											
1.	22EI8901	Project Work/Granted Patent	SEC	0	0	20	10	20	100	100	200
			TOTAL	**0**	**0**	**20**	**10**	**20**	**100**	**100**	**200**

Note:

* 1. As per the AICTE guideline, in Semester I, II, III & IV NCC one credit subject is added as Value Added Course with Extra Credit. Further, the students' who enrolled his/her name in HICET NCC and Air Wing are eligible to undergo this subject. The earned extra credits printed in the Consolidated Mark sheet as per the regulation.

2. NCC course level 1 & Level 2 will be added in the list of open elective subjects in the appropriate semester. Further, the students' who have opted NCC subjects in Semester I, II, III & IV are eligible to undergo NCC Open Elective Subjects.

3. The above-mentioned NCC Courses will be offered to the Students who are going to be admitted in the Academic Year 2021 – 22.

OPEN ELECTIVE I AND II
(EMERGING TECHNOLOGIES)

(To be offered for the students other than CSE, IT, AI&ML, ECE & BIOMEDICAL)

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PERWEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22AI6401	Artificial Intelligence and Machine Learning Fundamentals	OEC	2	0	2	4	3
2	22CS6401	Blockchain Technology	OEC	2	0	2	4	3
3	22EC6401	Cyber security	OEC	2	0	2	4	3
4	22EC6402	IoT Concepts and Applications	OEC	2	0	2	4	3
5	22IT6401	Data Science and Analytics	OEC	2	0	2	4	3
6	22BM6401	Augmented and Virtual Reality	OEC	2	0	2	4	3

OPEN ELECTIVE I AND II

(To be offered for the students other than AUTO, AERO, AGRI, MECH, MCTS, CIVIL, EEE, CHEMICAL, FOOD TECH, E&I)

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PERWEEK			TOTAL CONTAC TPERIOD S	CREDITS
				L	T	P		
1	22AE6401	Space Science	OEC	3	0	0	3	3
2	22MT6401	Introduction to Industrial Engineering	OEC	3	0	0	3	3
3	22MT6402	Industrial Safety and Environment	OEC	3	0	0	3	3
4	22CE6401	Climate Change and its Impact	OEC	3	0	0	3	3
5	22CE6402	Environment and Social Impact Assessment	OEC	3	0	0	3	3
6	22ME6401	Renewable Energy System	OEC	3	0	0	3	3
7	22ME6402	Additive Manufacturing systems	OEC	3	0	0	3	3
8	22EI6401	Introduction to Industrial Instrumentation and Control	OEC	3	0	0	3	3
9	22EI6402	Graphical Programming using Virtual Instrumentation	OEC	3	0	0	3	3
10	22AU6401	Fundamentals of Automobile Engineering	OEC	3	0	0	3	3
11	22AU6402	Automotive Vehicle Safety	OEC	3	0	0	3	3
12	22EE6401	Digital Marketing	OEC	3	0	0	3	3
13	22EE6402	Research Methodology	OEC	3	0	0	3	3
14	22FT6401	Traditional Foods	OEC	3	0	0	3	3

Note: Non Circuit Departments can add one Open Elective course in the above list to offer for the circuit branches

OPEN ELECTIVE III

Students shall choose any one of the open elective courses such that the course content or title not belong to their own programme.

(Note: Each programme in our institution is expected to provide one course only)

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PERWEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22EI7401	Smart Sensors for Engineering Applications	OEC	3	0	0	3	3
2	22EI7402	Electrical Energy Management and Audit	OEC	3	0	0	3	3

OPEN ELECTIVE IV

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PERWEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	22LS7401	General studies for competitive examinations	OEC	3	0	0	3	3
2	22LS7402	Human Rights, Women Rights and Gender equity	OEC	3	0	0	3	3
3	22LS7403	Indian ethos and Human values	OEC	3	0	0	3	3
4	22LS7404	Financial independence and management	OEC	3	0	0	3	3
5	22LS7405	Yoga for Human Excellence	OEC	3	0	0	3	3
6	22LS7406	Democracy and Good Governance	OEC	3	0	0	3	3
7	22LS7407	NCC Level - II	OEC	3	0	0	3	3

PROFESSIONAL ELECTIVE COURSES:VERTICALS

Vertical I Applied Instrumentation	**Vertical II Health care Instrumentation**	**Vertical III Advanced Measurements and Control**	**Vertical IV Electronics & Communication systems**	**Vertical V Control and Automation**	**Vertical VI Process Instrumentation**
22EI5301 Power plant Instrumentation	22EI5304 Bio-Medical Instrumentation	22EI5307 Micro Electro Mechanical Systems	22EI5310 Embedded Systems	22EI5313 Plant Automation and IIOT	22EI5316 Instrumentation and Control in paper Industries
22EI5302 Industrial Pollution Control	22EI5305 Telemetry and Telecontrol	22EI5308 Wireless Instrumentation	22EI5311 Communication Engineering	22EI5314 PC based Instrumentation	22EI5317 System Identification
22EI5303 Safety Instrumented Systems	22EI5306 Digital Image Processing	22EI5309 Wearable Technology	22EI5312 Fundamentals of Nanotechnology and Nanoelectronics	22EI5315 Introduction to Soft Computing	22EI5318 Industrial data Communication
22EI6301 Piping and Instrumentation Diagrams	22EI6303 Medical Robotics	22EI6305 Fiber optics and Laser Instrumentation	22EI6307 Digital Signal Processing	22EI6309 Advanced Control Theory	22EI6311 Project and Finance Management
22EI6302 Virtual Instrumentation	22EI6304 Diagnosis and Therapeutic Equipment	22EI6306 Machine Monitoring and Control	22EI6308 Industrial Electronics	22EI6310 Robotics and Automation	22EI6312 Instrumentation and Control in Petrochemical Industries
22EI7301 Computer Control of Process	22EI7302 Occupational Health and Safety Management	22EI7303 Computer Vision and Image Processing	22EI7304 Microcontroller Based System Design	22EI7305 Introduction to DCS	22EI7306 Instrumentation System design

Note: Students are permitted to choose all professional electives from any of the verticals.

DETAILS OF VERTICAL I: Applied Instrumentation

SL. NO.	COURSE C ODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22EI5301	Power plant Instrumentation	PEC	3	0	0	3	3
2.	22EI5302	Industrial Pollution Control	PEC	3	0	0	3	3
3.	22EI5303	Safety Instrumented Systems	PEC	3	0	0	3	3
4.	22EI6301	Piping and Instrumentation Diagrams	PEC	3	0	0	3	3
5.	22EI6302	Virtual Instrumentation	PEC	3	0	0	3	3
6.	22EI7301	Computer Control of Process	PEC	3	0	0	3	3

DETAILS OF VERTICAL II: Health care Instrumentation

SL. NO.	COURSE CODE	COURSE TITLE	CAT EGO RY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22EI5304	Bio-Medical Instrumentation	PEC	3	0	0	3	3
2.	22EI5305	Telemetry and Telecontrol	PEC	3	0	0	3	3
3.	22EI5306	Digital Image Processing	PEC	3	0	0	3	3
4.	22EI6303	Medical Robotics	PEC	3	0	0	3	3
5.	22EI6304	Diagnosis and Therapeutic Equipment	PEC	3	0	0	3	3
6.	22EI7302	Occupational Health and Safety Management	PEC	3	0	0	3	3

DETAILS OF VERTICAL III: Advanced Measurements and Control

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22EI5307	Micro Electro Mechanical Systems	PEC	3	0	0	3	3
2.	22EI5308	Wireless Instrumentation	PEC	3	0	0	3	3
3.	22EI5309	Wearable Technology	PEC	3	0	0	3	3
4.	22EI6305	Fiber optics and Laser Instrumentation	PEC	3	0	0	3	3
5.	22EI6306	Machine Monitoring and Control	PEC	3	0	0	3	3
6.	22EI7303	Computer Vision and Image Processing	PEC	3	0	0	3	3

DETAILS OF VERTICAL IV: Electronics & Communication systems

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22EI5310	Embedded Systems	PEC	3	0	0	3	3
2.	22EI5311	Communication Engineering	PEC	3	0	0	3	3
3.	22EI5312	Fundamentals of Nanotechnology and Nanoelectronics	PEC	3	0	0	3	3
4.	22EI6307	Digital Signal Processing	PEC	3	0	0	3	3
5.	22EI6308	Industrial Electronics	PEC	3	0	0	3	3
6.	22EI7304	Microcontroller Based System Design	PEC	3	0	0	3	3

DETAILS OF VERTICAL V: Control and Automation

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22EI5313	Plant Automation and IIOT	PEC	3	0	0	3	3
2.	22EI5314	PC based Instrumentation	PEC	3	0	0	3	3
3.	22EI5315	Introduction to Soft Computing	PEC	3	0	0	3	3
4.	22EI6309	Advanced Control Theory	PEC	3	0	0	3	3
5.	22EI6310	Robotics and Automation	PEC	3	0	0	3	3
6.	22EI7305	Introduction to DCS	PEC	3	0	0	3	3

DETAILS OF VERTICAL VI: Process Instrumentation

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22EI5316	Instrumentation and Control in paper Industries	PEC	3	0	0	3	3
2.	22EI5317	System Identification	PEC	3	0	0	3	3
3.	22EI5318	Industrial Data Communication	PEC	3	0	0	3	3
4.	22EI6311	Project and Finance Management	PEC	3	0	0	3	3
5.	22EI6312	Instrumentation and Control in Petrochemical Industries	PEC	3	0	0	3	3
6.	22EI7306	Instrumentation System design	PEC	3	0	0	3	3

Enrolment for B.E. / B. TECH. (HONOURS) / Minor Degree (optional)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours). a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only. For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes.

Clause 4.10 of Regulation 2022 is applicable for the Enrolment of B.E. / B. TECH. (HONOURS) / Minor Degree(Optional).

VERTICALS FOR MINOR DEGREE

- Heads are requested to provide one vertical from their program to offer for other program students to register for additional courses (18 Credits) to become eligible for the B.E./B.Tech. Minor Degree.

  Note: Each programme should provide verticals for minor degree –

ELECTRONICS AND INSTRUMENTATION ENGINEERING OFFERING MINOR DEGREE IN INSTRUMENTATION AND CONTROL

S No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1.	22EI5601	Sem 5: Transducer Engineering	MDC	3	0	0	3	3
2.	22EI6601	Sem 6: Measurements and Measuring Instruments	MDC	3	0	0	3	3
3.	22EI6602	Sem 6: Industrial Instrumentation	MDC	3	0	0	3	3
4.	22EI7601	Sem 7: Industrial data Communication	MDC	3	0	0	3	3
5.	22EI7602	Sem 7: Powerplant Instrumentation	MDC	3	0	0	3	3
6.	22EI8601	Sem 8: Industrial Automation	MDC	3	0	0	3	3

*MDC – Minor Degree Course

In addition to the above the following additional courses for Minor Degree can also be given to the student's common to all the branches.

Vertical I
Fintech and Block Chain

S. No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	22CS5601	Financial Management	MDC	3	0	0	3	3
2	22XXXX	Fundamentals of Investment	MDC	3	0	0	3	3
3	22XXXX	Banking, Financial Services and Insurance	MDC	3	0	0	3	3
4	22XXXX	Introduction to Blockchain and its Applications	MDC	3	0	0	3	3
5	22XXXX	Fintech Personal Finance and Payments	MDC	3	0	0	3	3
6	22XXXX	Introduction to Fintech	MDC	3	0	0	3	3

Vertical II
Entrepreneurship

S. No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	22BA5601	Foundations of Entrepreneurship	MDC	3	0	0	3	3
2	22BA6601	Introduction to Business Venture	MDC	3	0	0	3	3
3	22 BA6602	Team Building & Leadership Management for Business	MDC	3	0	0	3	3
4	22 BA7601	Creativity & Innovation in Entrepreneurship	MDC	3	0	0	3	3
5	22 BA7602	Principles of Marketing Management For Business	MDC	3	0	0	3	3
6	22 BA8601	Human Resource Management for Entrepreneurs	MDC	3	0	0	3	3
7	22BA8602	Financing New Business Ventures	MDC	3	0	0	3	3

Vertical III

Environment and Sustainability

S. No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	22CE5602	Sustainable infrastructure Development	MDC	3	0	0	3	3
2	22XXXX	Sustainable Agriculture and Environmental Management	MDC	3	0	0	3	3
3	22XXXX	Sustainable Bio Materials	MDC	3	0	0	3	3
4	22XXXX	Materials for Energy Sustainability	MDC	3	0	0	3	3
5	22XXXX	Green Technology	MDC	3	0	0	3	3
6	22XXXX	Environmental Quality Monitoring and Analysis	MDC	3	0	0	3	3

B.E (Hons) ELECTRONICS AND INSTRUMENTATION ENGINEERING

Vertical I **IoT and Smart Sensors**	**Vertical II** **Process Control**	**Vertical III** **Industrial Automation**
Sem 5: 22EI5203 Introduction to Internet of Things	**Sem 5:** 22EI5204 Instrumentation Practices in Industries	**Sem 5:** 22EI5205 Drives and control system for Automation
Sem 6: 22EI6202 Principle of Sensors and Signal Conditioning	**Sem 6:** 22EI6204 Adaptive control	**Sem 6:** 22EI6206 Applied Industrial Instrumentation
Sem 6: 22EI6203 Embedded systems for IoT	**Sem 6:** 22EI6205 Advanced Process Control	**Sem 6:** 22EI6207 Instrumentation in Building Automation
Sem 7: 22EI7202 IoT for Industry Automation	**Sem 7:** 22EI7204 Unit operation and control	**Sem 7:** 22EI7206 Machine vision system
Sem 7: 22EI7203 Optical sensors and photonics	**Sem 7:** 22EI7205 Advanced Instrumentation Systems	**Sem 7:** 22EI7207 SCADA systems and its applications
Sem 8: 22EI8201 Smart Instrumentation	**Sem 8:** 22EI8202 Industrial safety and Hazard Management	**Sem 8:** 22EI8203 Technological Trends in Automation

Vertical I
B.E (Hons)_Electronics and Instrumentation Engineering
with Specialization in IoT and Smart Sensors

S. No	Course Code	Course Title	Category	Periods Per week L	T	P	Total Contact Periods	Credits
1	22EI5203	Introduction to Internet of Things	PC	3	0	0	3	3
2	22EI6202	Principles of Sensors and Signal Conditioning	PC	3	0	0	3	3
3	22EI6203	Embedded systems for IoT	PC	3	0	0	3	3
4	22EI7202	IoT for Industry Automation	PC	3	0	0	3	3
5	22EI7203	Optical sensors and photonics	PC	3	0	0	3	3
6	22EI8201	Smart Instrumentation	PC	3	0	0	3	3

Vertical II
B.E (Hons)_Electronics and Instrumentation Engineering
with Specialization in Process Control

S. No	Course Code	Course Title	Category	Periods Per week L	T	P	Total Contact Periods	Credits
1	22EI5204	Instrumentation Practices in Industries	PC	3	0	0	3	3
2	22EI6204	Adaptive control	PC	3	0	0	3	3
3	22EI6205	Advanced Process Control	PC	3	0	0	3	3
4	22EI7204	Unit operation and control	PC	3	0	0	3	3
5	22EI7205	Advanced Instrumentation Systems	PC	3	0	0	3	3
6	22EI8202	Industrial safety and Hazard Management	PC	3	0	0	3	3

Vertical III
B.E (Hons)_Electronics and Instrumentation Engineering
with Specialization in Industrial Automation

S No	Course Code	Course Title	Category	Periods Per week L	T	P	Total Contact Periods	Credits
1	22EI5205	Drives and control system for Automation	PC	3	0	0	3	3
2	22EI6206	Applied Industrial Instrumentation	PC	3	0	0	3	3
3	22EI6207	Instrumentation in Building Automation	PC	3	0	0	3	3
4	22EI7206	Machine vision system	PC	3	0	0	3	3
5	22EI7207	SCADA systems and its applications	PC	3	0	0	3	3
6	22EI8203	Technological Trends in Automation	PC	3	0	0	3	3

SEMESTER-WISE CREDIT DISTRIBUTION

B.E. / B.TECH.PROGRAMMES										
S.No.	Course Area	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HSC	3	3	-	2	-	3	-	-	**11**
2	BSC	7	9	4	-	-	-	-	-	**20**
3	ESC	6	4	5	-	-	-	-	-	**15**
4	PCC	-	3	13	20	12	7	9	-	**64**
5	PEC	-	-	-	-	9	9	-	-	**18**
6	OEC	-	-	-	-	-	3	9	-	**12**
7	EEC	3	3	3	1	1	2	2	10	**25**
8	MC	√	√	√						
	Total	**19**	**22**	**25**	**23**	**22**	**24**	**20**	**10**	**165**

CREDIT DISTRIBUTION R2022

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	19	22	25	23	22	24	20	10	165

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EIE - HiCET

Dean Academics
Dean (Academics)
HiCET

Principal
PRINCIPAL
Hindusthan College Of Engineering & Technology
COIMBATORE - 641 032.

SEMESTER – V

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI5201	Industrial Instrumentation-II	3	0	0	3

Course Objective

1. Encapsulate the principle and operation of mechanical flow meter with installation techniques.
2. Illustrate the operation of electrical and other flow meter.
3. Understand the operation of quantity meters, air flow meters and mass flow meters.
4. Discuss displacement and angler measuring Instruments.
5. Learn the measurement of Viscosity, Humidity and Moisture.

Unit	Description	Instructional Hours
I	**MECHANICAL FLOW MEASUREMENT** Theory of fixed restriction variable head type flow meter- Orifice flow meter, Venturi tubes, Flow nozzle, Dall tube, - Installation of head flow meters.- Pitot tube - Differential pressure transmitters - Quantity meters, Inferential flow meters, Mass flow meters-Smart flow meter-Applications and practical challenges of orifice and venture meters in process industries.	9
II	**ELECTRICAL FLOW MEASUREMENT** Electromagnetic flow meter, Ultrasonic flow meter, Laser Doppler anemometer – Purge flow regulators, Cross correlation flow meter, Solid flow measurement, Vortex shedding flow meters – Flow switches – Anemometers –Mechanical anemometer. Flow meter calibration – Flow meter selection.	9
III	**QUANTITY METERS, AREA FLOW METERS AND MASS FLOW METERS** Positive displacement flow meters: Nutating disc, Reciprocating piston and Oval gear flow meters – Inferential meter – Turbine flow meter – Variable Area flow meter: Rotameter –theory, characteristics, installation and applications – Mass flow meter :– Angular momentum – Thermal, Coriolis type mass flow meters – Calibration of flow meters: – Application of flow meters in refineries, water supply and waste water treatment.	9
IV	**DISPLACEMENT & ANGLE MEASUREMENT** Classification – Plig and Snap gages, Vernier caliper, Dial indicator, Comparator, Optical Flats, Interferometer, Toolmakers microscope, Autocollimator, Coordinate autocollimator. Displacement transducer: Elastic, Sliding contact, Variable self inductance, Variable mutual inductance, LVDT, Rotational variable differential transformer. Angle measurement : Protractors, Sinebars, Goniometers, and Clinometers.	9
V	**TRANSMITTERS** Pneumatic transmitter: Operation - Electronic transmitter: Study of 2 wire and 4 wire transmitters – Operation of Electronics and Smart transmitters – Principle of operation of flow, level, temperature and pressure transmitters – Installation and Calibration of smart and conventional transmitters.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Understand on mechanical flow meters
CO2: Realize the operation of electrical and other flow meter.
CO3: Comprehend quantity flow meters, variable area flow meters, mass flow meters.
CO4: Choose the instruments for displacement and angle measurement
CO5: Acquire information on types of transmitters.

TEXT BOOKS:

T1 - E.O. Doebelin, "Measurement Systems – Application and Design", Tata McGraw Hill Ltd., 2011.
T2 - R.K. Jain, "Mechanical and Industrial Measurements", Khanna Publishers, New Delhi, 2011.

REFERENCE BOOKS:

R1 - K.Krishnaswamy and S.Vijayachitra "Industrial Instrumentation", New Age International, 2010.
R2 - D. Patranabis, "Principles of Industrial Instrumentation", 3rd Edition Tata McGraw Hill Ltd.,2017.
R3 - Liptak, B.G., Instrumentation Engineers Handbook (Measurement), CRC Press, 2005.
R4-Singh,S.K., Industrial Instrumentation and Control, Tata McGrawHill Education Pvt. Ltd., New Delhi, 2009.
R5-Jain, R.K., Mechanical and Industrial Measurements, Khanna Publishers, Delhi, 1999.

R6- Jayashankar, V., "Lecture Notes on Industrial Instrumentation", NPTEL, E-Learning Course, IIT Madras.

WEB REFERENCE:

1.https://nptel.ac.in/courses/108/105/108105064/

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	3	1	1	-	-	-	-	-	-	2	2	3
CO2	3	3	2	1	1	-	-	-	-	-	-	2	3	3
CO3	3	2	3	2	2	-	-	-	-	-	-	2	3	3
CO4	2	2	3	2	2	-	-	-	-	-	-	3	2	3
CO5	3	3	2	1	2	-	-	-	-	-	-	2	3	3
Avg	2.8	2.4	2.6	1.4	1.6	-	-	-	-	-	-	2.2	2.6	3

1-Low, 2-Medium, 3-High, "-" No correlation

Chairman - BoS
EIE - HiCET

Dean (Academics)
HiCET

Programme/ Sem	Course Code	Name of the Course	L	T	P	C
B.E. / V	22EE5202	Microprocessors and Microcontrollers (Common to EEE/EIE)	3	0	0	3

Course Objective

The student should be able to

1. Understand the fundamental components of 8085 architecture.
2. Understand the concept of peripheral's interfacing with assembly language programming
3. Study the fundamental architecture of 8051 microcontroller and its programming concepts.
4. Understand the fundamental and programming concepts of arduinouno controller
5. Learn the architecture study of advance microprocessors and microcontrollers

Unit	Description	Instructional Hours
I	**Intel 8085 PROCESSOR** 8085 architecture-- Pin diagram -Interrupts - Vendors in microprocessors - Addressing Modes - Instruction set - Stack and Subroutine Instructions - Simple Assembly Language Programming	9
II	**8085 INTERFACING** Study of Architecture and Programming of Peripheral IC's:8255 PPI, 8259 PIC, 8251 USART,8279 Keyboard Display Controller and 8253 Timer/ Counter.	9
III	**8051MICROCONTROLLER** Functional block diagram - Instruction format and addressing modes – Interrupt structure – Timer –I/O ports –Interfacing: LED – 7 segment display – Keypad - Simple programming	9
IV	**ARDUNIO UNO CONTROLLER** AVR Architecture – pin diagram – communication – Concept of digital and analog ports - Programming concepts IDE: Arduino data types – Variables and constants – Arrays and strings- Functions –Simple programming examples	9
V	**MICROCONTROLLER APPLICATIONS** Closed Loop Control of Servo Motor, Stepper Motor and Washing Machine Control - Arduino based Control of Traffic Lights, Home Automation System -Introduction to Raspberry pi.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, the learner will be able to

CO1: Study the architecture of 8085 microprocessor and programming concept involved in 8085.
CO2: Understand the commonly used peripheral/ interfacing IC's with its programming.
CO3: Understand the architecture and programming concepts of 8051 microcontroller.
CO4: Learn the advanced controller fundamentals and programming
CO5: Understand the applications and role of advanced microcontrollers

TEXT BOOKS:

T1 - R. S. Gaonkar, "Microprocessor Architecture Programming and Application", Penram International Publishing Private limited, 6th edition, Oct 2013.

T2 - . Jeremy Blum, "Exploring Arduino: Tools and Techniques for Engineering Wizardry", John Wiley & Sons, Inc.2nd Edition, Oct 2021

REFERENCE BOOKS:

R1 - . Muhammad Ali Mazidi, Janice GillispieMazidi, RolinD.Mckinlay, "The 8051 microcontroller and embedded systems using assembly and C", 2nd Edition, Pearson Education, 2011

R2- Krishna Kant, "Microprocessors and Microcontrollers", Prentice –Hall of India, New Delhi, 2017

R3 - J. M. Hughes, "Arduino: A Technical Reference", 1st Edition, O'Reilly Media, Inc, USA, 2016

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	3	1	1	-	-	-	-	-	-	2	2	3
CO2	3	3	2	1	1	-	-	-	-	-	-	2	3	2
CO3	3	2	3	2	2	-	-	-	-	-	-	2	3	2
CO4	2	2	3	2	2	-	-	-	-	-	-	3	2	3
CO5	3	3	2	1	2	-	-	-	-	-	-	2	3	2
Avg	2.6	2.4	2.6	1.4	1.6	-	-	-	-	-	-	2.2	2.6	2.4

1-Low, 2-Medium, 3-High, "-" No correlation

Chairman - BoS
EIE - HiCET

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HiCET

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI5251	Control Systems	2	0	2	3

Course Objective	1. Understand the basics of control system and its modeling. 2. Impart knowledge about time domain systems. 3. Facilitate on frequency domain analysis methods. 4. Establish methods of stability analysis and controller compensators. 5. Outline on state space and sampled data control systems.

Unit	Description	Instructional Hours
I	**CONTROL SYSTEM MODELLING** Control System: Terminology and Basic Structure - Open and closed loop systems – Transfer Function models – Mechanical and Electrical systems – Analogies: Force – voltage, Force - current & Torque – voltage, Torque - current – Synchros – AC and DC servomotors - ***Simulation of basic blocks of control system using MATLAB***	6+3
II	**TIME RESPONSE ANALYSIS** Block diagram reduction techniques – Signal flow graphs – Standard test signals – Order of a system –step, impulse response of first order systems – second order system – Time domain specifications – Effect on an additional zero and an additional pole - Static Error constants – Steady state error. ***Simulation of time response of First and Second order system using MATLAB***	6+3
III	**FREQUENCY RESPONSE ANALYSIS** Frequency response – Frequency domain specifications – Bode plot – Polar plot – M and N Circles - Phase margin and gain margin - Correlation between frequency and time domain specifications. ***Simulation of Bode plot using MATLAB, Simulation of Polar plot using MATLAB***	6+3
IV	**STABILITY ANALYSIS AND COMPENSATOR DESIGN** Characteristics equation – Routh Hurwitz criterion – Relative and conditional stability, Root locus, construction, stability criterion - Effects of P,PI,PID controllers - Compensator – Types – Lag, lead and lag-lead networks – Lag-Lead compensator design using Bode plot. ***Simulation of Root Locus using MATLAB***	6+3
V	**STATE MODELS AND SAMPLED DATA SYSTEMS** Concept of state and state models – State models for linear and time invariant Systems – State model of Armature and Field control system – Solution of state and output equation - Concept of Controllability and Observability. Introduction to digital control system, Introduction of Digital Controllers (Qualitative Treatment only). ***Problem simulation in MATLAB using state model***	6+3
	Total Instructional Hours	**45**

Course Outcome	CO1: Apply the gained knowledge for modeling of mechanical, electrical control systems. CO2: Analyze the different order systems with various inputs and their response. CO3: Estimate the various frequency domain specifications by phase analysis. CO4: Realize the various stability criterion techniques and compensators. CO5: Develop a state model of various systems and analyze their stability.

TEXT BOOKS:
T1 - Katsuhiko Ogata, "Modern Control Engineering", PHI, 6th Edition, 2015.
T2 - Nagarath, I.J. and Gopal, M., "Control Systems Engineering", New Age International Publishers, 2017.

REFERENCE BOOKS:
R1 - Richard C. Dorf and Robert H. Bishop, "Modern Control Systems", Prentice Hall of India, 2012.
R2 - M.Gopal, "Digital Control and State Variable Methods", Tata McGraw-Hill, New Delhi, 2003.
R3- Nagoor Kani A " Control Systems Engineering," RBA publications, Chennai, 2006.
R4-M.Gopal, "Control System: Principle and design", McGraw Hill Education, 2012.
R5 - NPTEL Video Lecture Notes on "Control Engineering "by Prof. Ramkrishna Pasumarthy, IIT Madras.

WEB REFERENCES:
1. https://nptel.ac.in/courses/108/106/108106098/
2. https://nptel.ac.in/courses/108/102/108102043/

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	3	1	-	-	-	-	-	-	2	3	3
CO2	3	3	3	3	1	-	-	-	-	-	-	2	3	3
CO3	3	3	3	2	1	-	-	-	-	-	-	2	3	3
CO4	3	3	3	3	1	-	-	-	-	-	-	2	3	3
CO5	3	3	2	2	1	-	-	-	-	-	-	2	3	3
Avg	3	3	2.6	2.6	1	-	-	-	-	-	-	2	2.6	3

1-Low, 2-Medium, 3-High, "-" No correlation

Chairman - BoS
EIE - HiCET

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HiCET

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI5001	Industrial Instrumentation Laboratory	0	0	4	1.5

Course Objective

1. Analyze various measurement schemes that meet the desired specifications and requirements.
2. Interpret the principles of level and flow measurements.
3. Demonstrate various bio medical equipments.

Expt. No.	Description of the Experiments
1.	Determination of discharge coefficient of a.Orifice plate. b. Venturi meter. c.Pitot Tube.
2.	Testing of pressure gauge using dead weight tester.
3.	Measurement of viscosity of test solutions using Saybolt Viscometer
4.	Characteristics of temperature measurement
5.	Level measurement using differential pressure transmitter
6.	Measurement of absorbance and transmittance of test solutions using UV – Visible spectrophotometer.
7.	Standardization of pH meter and measurement of pH values of sample solutions.
8.	Measurements of conductivity of test solutions.
9.	Study of Control valve characteristics.
10.	Real time measurement and analysis of ECG signal.
11.	Measurement of Pulse rate and SpO2 using Pulse Oximeter

Total Practical Hours 45

Course Outcome

CO1: Illustrate the characteristics of Pressure, Temperature, flow, level and viscosity measurements.
CO2: Analyze the measured value for displaying or controlling the physical variables
CO3: Categorise different field instruments for different applications.
CO4: Demonstrate the principles involved in different measuring techniques.
CO5: Examine the bio medical related measuring devices.

REFERENCES:

R1-William C. Dunn, "Fundamentals of Industrial instrumentation and Process Control, Mc-Graw Hill, Professional, Second Edition,2018.

R2- Laboratory manual prepared by the Department of Electronics and Instrumentation Engineering, 2017.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	1	-	-	-	-	2	-	-	2	3	3
CO2	3	2	2	1	-	-	-	-	2	-	-	2	3	3
CO3	3	3	2	1	-	-	-	-	2	-	-	2	2	3
CO4	3	3	2	1	-	-	-	-	2	-	-	3	3	2
CO5	2	3	3	1	-	-	-	-	2	-	-	2	2	3
Avg	2.8	2.2	2.2	1	-	-	-	-	2	-	-	2.2	2.6	2.8

1-Low, 2-Medium, 3-High, "-" No correlation

Chairman - BoS
EIE - HiCET

Chairman

Dean (Academics)
HiCET

Programme	Course Code	Name of the course	L	T	P	C
B.E	22EE5002	Microprocessors and Microcontrollers Laboratory (Common to EEE and EIE)	0	0	4	1.5

Course Objective

1. Understand the assembly language programming with simple examples using 8085.
2. Study the concept of peripheral's interfacing with assembly language programming using 8085.
3. Learn the assembly language programming with simple examples using 8051.
4. Practice the basic programming concept and interfacing sensor of Arduino.
5. Propose the concepts of Industrial drive interfacing concepts with programming.

Expt. No.	Description of the Experiments
1.	Arithmetic operations using 8085 microprocessor: 8-bit Basic Arithmetic operations.
2.	8085 Programming: Sorting Operations & Max / Min of numbers.
3.	A/D interfacing and D/A interfacing with microprocessor.
4.	Keyboard and 7-segment display interface with 8279 Interfacing.
5.	Programming demonstration of basic function with 8051 microcontroller execution.
6.	Simple basic programming of Arduino microcontroller.
7.	Digital and Analog interfacing using Arduino microcontroller.
8.	Interface the stepper motor to perform clockwise and anti-clock wise rotation.
9.	Traffic light control interfacing with 8051.
10.	Study on Raspberry pi.

Total Practical Hours 45

Course Outcome

CO1: Understand the 8085architecture and its programming execution.
CO2: Learn interfacing knowledge with different applications.
CO3: Study the simple and interfacing programming concepts of 8051.
CO4: Understand the Interfacing and basic programming concept of Arduino.
CO5: Understand the industrial application of microcontroller by various programming concepts.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	1	-	-	-	-	2	-	-	2	3	2
CO2	3	2	2	1	-	-	-	-	2	-	-	2	3	2
CO3	3	3	2	1	-	-	-	-	2	-	-	2	2	3
CO4	2	3	2	1	-	-	-	-	2	-	-	3	3	2
CO5	2	3	3	1	-	-	-	-	2	-	-	2	2	3
Avg	2.6	2.2	2.2	1	-	-	-	-	2	-	-	2.2	2.6	2.4

1-Low, 2-Medium, 3-High, "-" No correlation

Chairman - BoS
EIE - HiCET

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PROFESSIONAL ELECTIVE VERTICALS

Vertical I - Applied Instrumentation

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI5301	Power Plant Instrumentation	3	0	0	3

Course Objective

1. Discuss the various methods of power generation.
2. Analyzing the parameter for monitoring and controlling power plant
3. Distinguish the various control loops available in boiler
4. Discuss the operation of turbines and various control methods
5. Outline the operation of nuclear power plant

Unit	Description	Instructional Hours
I	**METHODS OF POWER GENERATION** Types of Power generation - Methods of power generation: – Hydro, Thermal, Nuclear, Solar and Wind power - Piping and instrumentation diagram of a thermal power plant, Fuel measurement-review of pressure and temperature measurement steam and water flow measurement.	9
II	**MEASUREMENTS IN POWER PLANTS** Measurement of feed water flow, air flow, steam flow and coal flow – Drum level measurement – Steam pressure and temperature measurement –Turbine speed and vibration measurement –Flue gas analyzer – Fuel composition analyzer.	9
III	**BOILER CONTROL I** Combustion of fuel and excess air – Firing rate demand – Steam temperature control – Control of deaerator – Drum level control – Single, two and three element control – Furnace draft control – implosion – flue gas dew point control – Trimming of combustion air – Soot blowing. Case study: failure analysis of furnace shell plate	9
IV	BOILER CONTROL II Burners for liquid and solid fuels – Burner management – Furnace safety interlocks – Coal pulverizer control – Combustion control for liquid and solid fuel fired boilers – air/fuel ratio control– fluidized bed boiler – Cyclone furnace. Case study: failure investigation of a high pressure	9
V	CONTROL MECHANISMS IN TURBINE Types of steam turbines –impulse and reaction turbines –compounding –Turbine governing system – Speed and Load control – Transient speed rise – Free governor mode operation – Automatic Load Frequency Control –Turbine oil system – Oil pressure drop relay– Oil cooling system – Turbine run up system. Applications of turbine in wind power, hydropower, in heat engines.	9
	Total Instructional Hours	**45**

Course Outcome

- CO1: Outline the various methods of power generation
- CO2: Correlate the important measurements of various parameter instruments associated with power plants
- CO3: Identify the appropriate control loop in boilers
- CO4: Appraise the burner and furnace management for boilers
- CO5: Outline the operation of turbine

TEXT BOOKS:

T1 - Sam Dukelow.G, "The control of Boilers", Instrument Society of America, 1991.
T2 - Krishnaswamy.Kand Ponnibala.M.,"Power Plant Instrumentation", PHI Learning Pvt. Ltd., 2013.

REFERENCE BOOKS:

R1 - Elonka.S.MandKohan.A.L,"Standard Boilers Operations", Mc Graw Hill, NewDelhi, 1994.
R2 - S.N.Singh, "Electrical Power Generation, Transmission and Distribution", Prentice Hall of India, 2011
R3 - P.K.Nag, "Power Plant Engineering", Tata Mc Graw-Hill Education, 4th edition, 2014.
R4 - Tamilmani,"Power Plant Instrumentation", Sams Publishers, 2016.

WEB REFERENCES:

1. https://nptel.ac.in/courses/112/107/112107291/

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	1	-	-	1	-	-	-	-	-	2	3	3
CO2	3	3	2	-	-	2	-	-	-	-	-	2	3	3
CO3	3	3	1	-	-	-	-	-	-	-	-	2	3	3
CO4	3	3	2	3	-	1	1	-	-	-	-	2	3	3
CO5	3	3	3	3	-	1	1	-	-	-	-	2	3	3
Avg	3	2.8	1.8	1.2	-	1	0.4	-	-	-	-	2	2.6	3

1-Low, 2-Medium, 3-High, "-" No correlation

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EIE - HiCET

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI5302	Industrial Pollution Control	3	0	0	3

Course Objective

1. Interpret the types of pollution and its Regulation.
2. Explain the sources and properties of pollutants.
3. Understand the methods of pollution control.
4. Impart knowledge on Solid waste management.
5. Explain different control techniques for hazardous waste management.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Man & Environment - Types of Pollution, Pollution control aspects, Industrial emissions-Liquids. Gases, Environmental Legislation - Environmental Acts and Rules - Standards for Ambient Air. Noise Emission and Effluents Water quality management in India. Air (Prevention & Control of Pollution) Act - Pollution control board and its guidelines.	9
II	**POLLUTANT SAMPLING AND MEASUREMENT** Classification and properties of air pollution - Air pollution sampling and measurement - Types - Collection of gaseous air pollutants - Stack sampling - Analysis of air pollutants: Sulphur dioxide, nitrogen oxide, carbon monoxide - Types of water pollutants: Synthetic Analysis of air pollutants: Treatment of liquid and gaseous effluent in industries	9
III	**POLLUTION CONTROL METHODS** Introduction to Air pollution and control - particulate emission control - Cyclone separators, fabric filters - ESP and their constructional details and design aspects. Scrubbers: types - Gaseous emission control by absorption and adsorption. Introduction to water pollution control - Aeration - Sedimentation - Filteration and its types - Membrane based water pollution control techniques.	9
IV	**INDUSTRIAL SOLID WASTE MANAGEMENT: HARZARDOUS WASTE** Nuclear wastes: health and environment effects, sources and disposal methods. Chemical wastes: health and environmental effects, treatment and disposal: treatment and disposal by industry, off site treatment and disposal, treatment practices in various countries. Biomedical wastes: types of wastes and their control.	9
V	**CONTROL METHODS OF HAZARDOUS WASTE MANAGEMENT** Sources and classification - Sources and characteristics of pollutants in fertilizer, paper and pulp industry, petroleum and pharmaceutical industries - Treatment methods: Biological, thermal treatment - Disposal methods: Municipal solid waste disposal - Land filling and Gasification and Incineration.	9
	Total Instructional Hours	**45**

Course Outcome	CO1:	Explain the sources and types of pollution and its Environmental act.
	CO2:	Identify the sources and control methods of Air and water pollution in industries.
	CO3:	Assess Water pollution control with source correction methods.
	CO4:	Categorize the nature of solid wastes and their sources
	CO5:	Select the appropriate treatment method required for treating waste water.

TEXT BOOKS:

T1 - Swamy A.V.M, "Industrial Pollution Control and Engineering", 1st Edition, Galgotia Publications, 2005.

T2 - Mahanjan S.P, "Pollution Control in Process Industries", 1st Edition, Tata-Mcgraw Hill, 1985.

REFERENCE BOOKS :

R1 - Rao. C.S., "Environmental Pollution and Control Engineering", 2nd Edition, Revised, New Age International, 2007

R2 - PrathapMouliP. "Air Pollution Control", 1st Edition, DivyaJyothi Publishers, 2003.

R3- Narayan Rao M., and Datta A.K, "Waste Water Treatment", 2nd Edition, Oxford Publication, 2005.

R4 - Pollution Control Law Series: Pollution Control Acts, Rules and Notification Issued There under, Central Pollution Control Board, Ministry of Environment and Forest ,Government of India. 2006.

Web References:

1. https://nptel.ac.in/courses/105102089.
2. https://nptel.ac.in/courses/122106030.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	3	1	1	2	1	-	-	-	2	2	3
CO2	2	2	3	3	1	1	2	1	-	-	-	2	2	3
CO3	2	3	3	2	1	1	2	1	-	-	-	2	2	3
CO4	3	3	3	3	1	1	2	1	-	-	-	2	3	2
CO5	3	3	2	2	1	1	2	1	-	-	-	2	3	3
Avg	2.6	2.8	2.6	2.6	1	1	2	1	-	-	-	2	2.4	2.8

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI5303	Safety Instrumented Systems	3	0	0	3

Course Objective

1. Enumerate the standards applied to process control and instrumentation.
2. Interpret the function of safety life cycle and hazard analysis.
3. Understand the role of prevention and mitigation layers and their design.
4. Distinguish various SIL determination methods
5. Demonstrate the selection of methodology for the designed safety instrumented system

Unit	Description	Instructional Hours
I	**INSTRUMENTATION STANDARDS** Instrumentation Standards - significance of codes and standards – overview of various types -Introduction of various Instrumentation standards – review, interpretation and significance of specific standards - examples of usage of standards on specific applications.	9
II	**INTRODUCTION TO SAFETY INSTRUMENTATION** Introduction to Safety Instrumented Systems – Hazards and Risk – Process Hazards Analysis(PHA) – Safety Life Cycle-Allocation of safety functions to protective layers-SIS design and engineering	9
III	**PROTECTION LAYERS** Prevention layers:-process plant design-process control system-alarm systems-physical protection. Mitigation layers:-containment system-scrubbers and flares-Fire and gas systems-Evacuation procedure.	9
IV	**SAFETY INTEGRITY LEVEL** Safety integrity levels- SIL determination methods-ALARP-Risk matrix-Risk graph-LOPA-examples for design of SIL	9
V	**SELECTION OF TECHNOLOGY** Relay systems-soli-state systems-microprocessor based systems-PLC based systems-safety PLCs-safety system complexity-communication with other systems	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Gain knowledge on different industrial standards
CO2: Gain knowledge on safety life cycle and function of protective layers.
CO3: Understand the function of prevention and mitigation layers
CO4: Select the SIL for given application.
CO5: Choose the required technology for the proposed safety instrumented system.

TEXT BOOKS:

T1 – Paul Gruhn, P.E., CFSE and Harry Cheddie, P.E., "Safety Instrumented Systems:Design, Analysis, and Justification", ISA, 2nd Edition, 2006.

T2- Safety - ANSI/ISA84.00.01-2004, "Part 1: Framework, Definitions, System Hardware and Software Requirements; ANSI/ISA84.00.01-2004", "Part 2: Functional Safety: Safety Instrumented Systems for the Process Industry Sector; ANSI/ISA84.00.01-2004", "Part 3: Guidance for the Determination of the Required Safety Integrity Levels- Informative". Standards - ANSI/ISA-75.01.01 -2002 (60534-2-1 Mod): Flow Equations for Sizing

REFERENCE BOOKS:

R1 – Safety Instrumented Systems Engineering Handbook Kenexis Consulting Corporation – Columbus, OH, 2010.

R2-Control Valves; ISA84 Process Safety Standards and User Resources, Second Edition, ISA, 2011; ISA88 Batch Standards and User Resources, 4th Edition, ISA, 2011.

WEB REFERENCE:

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Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	3	1	1	1	2	-	-	-	-	2	2	3
CO2	3	3	2	1	1	1	2	-	-	-	-	2	3	3
CO3	3	2	3	2	2	1	2	-	-	-	-	2	3	3
CO4	2	2	3	2	2	1	2	-	-	-	-	3	2	3
CO5	3	3	2	1	2	1	2	-	-	-	-	2	3	3
Avg	2.8	2.4	2.6	1.4	1.6	1	2	-	-	-	-	2.2	2.6	3

1-Low, 2-Medium, 3-High, "-" No correlation

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Vertical II - Healthcare Instrumentation

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI5304	Bio-Medical Instrumentation	3	0	0	3

Course Objective	1. Recall fundamentals of human physiology. 2. Discuss about the Biopotential and its electrode. 3. Outline the recording and monitoring biomedical instruments. 4. Infer the basic principles in medical imaging techniques. 5. Generalize about life assisting and therapeutic devices.

Unit	Description	Instructional Hours
I	**HUMAN PHYSIOLOGY** Human Body Overview: Introduction, Cell, Body fluids - Musculoskeletal. Gastrointestinal. Endocrine system. Heart and circulatory system – The human respiratory system The human nervous system., Kidney and blood flow - Biomechanics of bone - Biomechanics of soft tissues.	9
II	**BIO POTENTIALS AND BIOPOTENTIAL ELECTRODES** Sources of bio electric potential, EMG, ECG, ERG, EEG, Electrode Theory - Biopotential electrodes Body surface recording electrodes, Internal electrodes, Electrode arrays, Micro electrode Electrical safety in medical environment: shock hazards, leakage current-Instruments for checking safety parameters of biomedical equipment.	9
III	**RECORDING AND MONITORING INSTRUMENTS** Biomedical recorders – Patient monitoring systems – Arrhythmia and ambulatory monitoring instruments – Foetal monitoring instruments – Oximeters –Blood flowmeters – Cardiac output measurement – Pulmonary function analysers – Blood gas analyzers – Blood cell counters – Audiometers.	9
IV	**MODERN IMAGING SYSTEMS** X-ray machines and digital radiography –X-ray computed tomography – Nuclear medical imaging systems – Magnetic resonance imaging system- Ultrasonic Imaging systems – Thermal imaging systems, Endoscopy. Retinal Imaging - Imaging application in Biometric systems.	9
V	**THERAPEUTIC and ROBOTIC EQUIPMENTS** Cardiac pacemakers – Cardiac defibrillators – – Physitheraphy and electro theraphy equipment- Haemodialysis machines- Lithotriptors – – Ventilators – Radiotherapy equipment – Automatic drug delivery systems. ICCU patient monitoring system - Nano Robots - Robotic surgery.	9
	Total Instructional Hours	**45**

Course Outcome	CO1: Summarize the concepts of physiology. CO2: Elaboration on biopotential and electrodes. CO3: Understand the measurement techniques of biomedical recording and monitoring instruments. CO4: Elaborate the basic principles in imaging techniques. CO5: Infer basic knowledge in life assisting and therapeutic devices.

TEXT BOOKS:

T1 - R.S.Khandpur, "Hand Book of Bio-Medical instrumentation", Tata McGraw Hill, 2011.

T2 - Joseph J.Carr and John M .Brown, "Introduction to Biomedical Equipment Technology", Fourth edition, Pearson Education Inc, 2013.

REFERENCE BOOKS:

R1 –John G.Webster, "Medical Instrumentation: Application and Design",3rd Edition, Wiley Pvt Ltd., 2008.

R2–Leslie cromwell, Fred J Weibell, Erich A.Pfeiffer., "Bio medical Instrumentation and Measurements", 2nd edition, PHI Learning Pvt Ltd, 2012.

R3 – Myer Kutz, "Standard Handbook of Biomedical Engineering & Design",Mc Graw Hill, 2003.

R4 -M.Arumugam, "Bio-Medical Instrumentation", 2nd edition, Anuradha Publications, 2015.

WEB REFERENCE:

1.https://onlinecourses.swayam2.ac.in/nou23_bt05/preview

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	3	1	1	-	-	-	-	-	-	2	2	3
CO2	3	3	2	1	1	-	-	-	-	-	-	2	3	3
CO3	3	2	3	2	2	-	-	-	-	-	-	2	3	3
CO4	2	2	3	2	2	-	-	-	-	-	-	3	2	3
CO5	3	3	2	1	2	-	-	-	-	-	-	2	3	3
Avg	2.8	2.4	2.6	1.4	1.6	-	-	-	-	-	-	2.2	2.6	3

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI5305	Telemetry and Telecontrol	3	0	0	3

Course Objective	1. Infer the concepts of telemetry systems 2. List various types of modulation techniques and interpret the errors in transmission 3. Interpret the concepts of telemetry and remote control 4. Infer the modem protocols 5. Summarize the use of fiber optics for telemetry and control

Unit	Description	Instructional Hours
I	**TELEMETRY FUNDAMENTALS AND CLASSIFICATION** Intrinsic Telemetry Principles Introduction - Functional blocks of Telemetry system - Methods of Telemetry - Non Electrical, Electrical, Pneumatic, Frequency, Power Line Carrier Communication - State of the art-Telemetry standards	9
II	**MODULATION CODES** PAM – PFM - PTM - PCM 2- Bit Error Rate - Review of Modulation and Multiplexing: FM-AM, FM-FM, PAM-AM, PAM-FM, PCM-AM - Quantization and Conversion methods. Error in Quantization - Bandwidth Consideration.	9
III	**FDM Systems** IRIG standards in FDM systems in FDM Telemetry - SCO's, Mux and Demux Circuits - Detectors and Demodulators - Pulse Averaging - Quadrature FM and PLL, Mixers TDM systems (architecture)- TDM- PAM, PAM- PM, TDM- PCM systems – Synchronization - PCM generation - Differential PCM, PCM reception and detection	9
IV	**MODEMS** Digital modulation and Shift-keying - FSK - PSK – DPSK - QPSK - AM - Modem Protocols Satellite Telemetry - TT and C services – Subsystems - The earth station.	9
V	**OPTICAL TELEMETRY** Optical Telemetry Optical Fibers Cable – Sources and detectors – Transmitter and Receiving Circuits, Coherent Optical Fiber Communication System.	9
	Total Instructional Hours	**45**

Course Outcome	CO1: Students will be able to apply techniques of telemetry and telecontrol CO2: Classify the types of modulation techniques and interpret the errors in transmission CO3: Interpret the concepts of telemetry and remote control to real life applications CO4: Implement Modems & modem protocol. CO5: Illustrate the use of fiber optics for telemetry and control

TEXT BOOKS:

T1 - D. Patranabis, "Telemetry principles", Tata Mcgraw Hill, 2007.T2 - A.S. Tanenbaum, Computer Networks, Pearson, 2011.

REFERENCE BOOKS:

R1 - Gruenberg. L "Handbook of telemetry and remote control",McGraw Hill, New York, 2006.
R2 - Telecontrol Methods and Applications of Telemetry and Remote Control – by Swoboda G., Reinhold Publishing Corp., London, 1991

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	1	-	-	-	-	-	-	2	2	3
CO2	3	3	3	2	2	-	-	-	-	-	-	2	3	3
CO3	3	2	3	2	2	-	-	-	-	-	-	2	3	3
CO4	3	3	2	2	2	-	-	-	-	-	-	3	2	3
CO5	3	3	3	2	2	-	-	-	-	-	-	2	3	3
Avg	3	2.8	2.6	2	1.8	-	-	-	-	-	-	2.2	2.6	3

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI5306	Digital Image Processing	3	0	0	3

Course Objective

1. Interpret the fundamentals of digital image.
2. Infer the basics of image enhancement technique.
3. Apply the image restoration and segmentation technique.
4. Analyze the wavelets and image reconstruction process.
5. Infer the image representation and Recognition technique.

Unit	Description	Instructional Hours
I	**DIGITAL IMAGE FUNDAMENTALS** Digital Image Representation - Elements of Digital Image Processing system -Elements of Visual Perception - Image Sampling and Quantization - Relationship between Pixels - Color Models.	9
II	**IMAGE ENHANCEMENT** Spatial Domain: Point Operation, Histogram Modelling, Basics of Spatial Filtering - Smoothing and Sharpening Spatial Filter - Multispectral Image Enhancement.	9
III	**IMAGE RESTORATION AND SEGMENTATION** Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering Segmentation: Detection of Discontinuities–Edge Linking and Boundary detection – Region based segmentation-Morphological processing- erosion and dilation. Applications: Medical Image Analysis-Satellite and Remote Sensing Images	9
IV	**WAVELETS AND IMAGE COMPRESSION** Wavelets – Subband coding - Multiresolution expansions - Compression: Fundamentals – Image Compression models – Error Free Compression – Variable Length Coding – Bit-Plane Coding – Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Compression Standards.	9
V	**IMAGE REPRESENTATION AND RECOGNITION** Boundary representation – Chain Code – Polygonal approximation, signature boundary segments – Boundary description – Shape number – Fourier Descriptor, moments- Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching. Application - Security and Surveillance: Facial Recognition, and Activity Detection	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Summarize the fundamentals of digital image processing.
CO2: Apply the spatial and multispectral enhancement techniques in an image.
CO3: Construct the segmentation algorithm for restoration of digital image.
CO4: Establish the image compression techniques.
CO5: Assess the image Representation and Recognition techniques.

TEXT BOOKS:
T1 -Anil Jain.K"Fundamentals of Digital Image Processing", Prentice Hall of India Learning Pvt.Ltd,2011.
T2 - Rafeal C. Gonzalez, Richard E. Woods "Digital Image Processing" Third Edition, Pearson Education, 2016.
REFERENCE BOOKS:
R1 - S.Jayaraman, E.Esakkirajan and T.Veerkumar, "Digital Image Processing" Tata McGraw Hill Education Private Ltd, 2009.
R2 - William K. Pratt, "Digital Image Processing: PIKS Scientific Inside", Wiley Student Edition, 2010.
R3- Munesh.C.Trivedi and Dr. Sanjay. M. Shah, "Digital Image Processing", Khanna publications, 2012.
R4 - Kenneth R Castleman "Digital Image Processing", Pearson education 2007.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	1	-	-	-	-	-	-	2	2	3
CO2	3	3	3	2	2	-	-	-	-	-	-	2	2	3
CO3	3	2	3	2	2	-	-	-	-	-	-	2	2	3
CO4	3	3	2	2	2	-	-	-	-	-	-	3	2	3
CO5	3	3	3	2	2	-	-	-	-	-	-	2	2	3
Avg	3	2.8	2.6	2	1.8	-	-	-	-	-	-	2.2	2	3

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI5307	Micro Electro Mechanical Systems	3	0	0	3

Course Objective	1. Infer the basic concepts in MEMS. 2. Recall the working of sensors and actuators. 3. Interpret the micro fabrication and manufacturing technique. 4. Infer the design of a micro system. 5. List various applications of polymer and optical MEMS.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO MEMS** Intrinsic Characteristics of MEMS - Multidisciplinary Nature of Micro System Design and Manufacture - Silicon based MEMS Processes - New Materials - Review of Electrical and Mechanical Concepts in MEMS - Scaling Laws in Miniaturization.	9
II	**SENSORS AND ACTUATORS** Working Principles of Micro Systems, Micro Sensors- Acoustic Sensor, Biomedical Sensor, Chemical Sensor,Optical Sensor, Pressure Sensor, Thermal Sensor, Micro Actuation Techniques - Actuation using Thermal Forces, SMA, piezoelectric effect, Actuation using electrostatic forces - Micro Gripper, Micro Motor, Micro Valve, Micro Accelerometers.	9
III	**MICRO FABRICATION AND MICRO MANUFACTURING TECHNIQUES** Materials for Micro Systems, Photolithography, Oxidation, Diffusion, CVD, PVD, etching, Micro Manufacturing: Bulk Micro Manufacturing, Surface Micromachining, LIGA Process, Packaging Techniques: Die Preparation, Surface Bonding, Sealing.	9
IV	**MICRO SYSTEMS DESIGN** Introduction - Design Considerations - Process Design - Mechanical Design, Mechanical design using Finite Element Method - Design of Micro Fluidic Network Systems.	9
V	**POLYMER AND OPTICAL MEMS** Polymers in MEMS - Polimide - SU-8 - Liquid Crystal Polymer (LCP) - PDMS -PMMA - Fluorocarbon - Optical MEMS – Lenses and Mirrors, Actuators for Active Optical MEMS	9
	Total Instructional Hours	**45**

Course Outcome	CO1: Summarize the concepts of semiconductors and solid mechanics to fabricate MEMS device. CO2: Analyze the suitable sensors and actuators for various applications. CO3: Outline the rudiments of micro fabrication techniques. CO4: Illustrate the design of micro system. CO5: Implement polymer and optical MEMS in various applications.

TEXT BOOKS:

T1 - Tai Ran Hsu, "MEMS & Micro systems Design and Manufacture" Tata McGraw Hill, New Delhi, 2002.
T2 - Nitaigour Premchand Mahalik "MEMS" Tata McGraw Hill,2007.

REFERENCE BOOKS:

R1 - NadimMaluf,"An Introduction to Micro Electro Mechanical System Design", Artech House, 2000.
R2 - Mohamed Gad-el-Hak, Editor, "The MEMS Handbook", CRC press Baco Raton, 2000.
R3 - Julian w. Gardner, Vijay K. Varadan, Osama O. Awadelkarim, "Micro Sensors MEMS and Smart Devices", John Wiley & Son LTD,2002.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	1	-	-	-	-	-	-	2	2	3
CO2	3	3	3	2	2	-	1	-	-	-	-	2	3	3
CO3	3	2	3	2	2	-	1	-	-	-	-	2	3	3
CO4	3	3	2	2	2	-	-	-	-	-	-	3	2	3
CO5	3	3	3	2	2	-	-	-	-	-	-	2	3	3
Avg	3	2.8	2.6	2	1.8	-	0.4	-	-	-	-	2.2	2.6	3

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI5308	Wireless Instrumentation	3	0	0	3

Course Objective	1. Introduce the technologies and applications for emerging domain of wireless instrumentation. 2. Impart knowledge about design and development in WSN protocol. 3. Elaborate the issues related to wireless instrumentation implementation 4. Familiarize the various energy harvesting techniques 5. Outline the applications in various fields

Unit	Description	Instructional Hours
I	**INTRODUCTION** Smart Instrumentation (Materials, automation system sensing and Sensors, Wireless Sensor Networks, Communication in a WSN, important design constraints of a WSN like Energy, Self Management, Wireless Networking, Decentralized Management, Design Constraints, Security.	9
II	**NODE ARCHITECTURE** The sensing subsystem, Analog to Digital converter, the processor sub system, architectural overview, microcontroller, digital signal processor, communication interfaces, serial peripheral interface, inter integrated circuit, the IMote node architecture, The XYZ node architecture, the Hogthrob node architecture.	9
III	**FUNDAMENTALS OF WIRELESS DIGITAL COMMUNCATION** Basic components, source encoding, the efficiency of a source encoder, pulse code modulation and delta modulation, channel encoding, types of channels, information transmission over a channel, error recognition and correction, modulation, modulation types, quadratic amplitude modulation, signal propagation	9
IV	**POWER SOURCES ENERGY HARVESTING** Solar and Lead acid batteries- RF Energy /Harvesting-Energy Harvesting from vibration- Thermal Energy Harvesting-Energy Management Techniques Calculation for Battery Selection.	9
V	**APPLICATIONS** Structural health monitoring - sensing seismic events, single damage detection using natural frequencies, multiple damage detection using natural frequencies, multiple damage detection Using mode shapes, coherence, piezo electric effect, precision agriculture, active volcano, underground mining	9
	Total Instructional Hours	**45**

Course Outcome	CO1: Infer the concepts of wireless instrumentation for various performance parameters. CO2: Observe the design and development of node architecture CO3: Realize the role of internet of things in wearable system CO4: Identify the different energy involvement for wearable techniques CO5: Familiarize in various wireless monitoring and security aspects

TEXT BOOKS:

T1 - Fundamentals of wireless sensor networks : theory and practice", Waltenegus Dargie, Christian Poellabauer, A John Wiley and Sons, Ltd., Publication

T2 - Smart Sensors, Measurement and Instrumentation , Subhas Chandra Mukhopadhyay, Springer Heidelberg, New York, Dordrecht London, 2013

REFERENCE BOOKS:

R1 - Uvais Qidwai, Smart Instrumentation: A data flow approach to Interfacing", Chapman & Hall; 1st Edn, December 2013

R2 - Wireless Sensor Networks: Architectures and Protocols, Edgar H. Callaway Jr. and Edgar H. Callaway

R3 - Wireless Sensors and Instruments: Networks, Design and Applications, Halit Eren, CRC Press, Taylor and Francis,2016

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1. https://onlinecourses.nptel.ac.in/noc21_ee66/preview
2. https://archive.nptel.ac.in/courses/117/102/117102062/

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	1	-	-	1	-	-	-	-	-	2	3	3
CO2	3	3	2	-	-	2	-	-	-	-	-	2	3	3
CO3	3	3	1	-	-	-	-	-	-	-	-	2	3	3
CO4	3	3	2	3	-	1	1	-	-	-	-	2	3	3
CO5	3	3	3	3	-	1	1	-	-	-	-	2	3	3
Avg	3	2.8	1.8	1.2	-	1	0.4	-	-	-	-	2	2.6	3

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22E15309	Wearable Technology	3	0	0	3

Course Objective

1. Understand the basics of sensor requirement for wearable systems.
2. Impart knowledge about various wearable case studies.
3. Facilitate the role of IoT in wearable devices
4. Elucidate the level of energy involvement in wearable systems
5. Outline the communication and security aspects

Unit	Description	Instructional Hours
I	**WEARABLE SENSORS** Need for wearable systems. Sensors for wearable systems-Inertia movement sensors, Respiration activity sensor, , pneumography, Wearable ground reaction force sensor, GSR, Radiant thermal sensor, Wearable motion sensors, CMOS –Based Biosensors, E-Textiles, Bio compatibility	9
II	**WEARABLE DEVICES** Role of Wearables, Attributes of Wearables, The Meta Wearables – Textiles and clothing, Social Aspects: Interpretation of Aesthetics, Adoption of Innovation, On-Body Interaction; Case Study: Google Glass, health monitoring, Wearables: Challenges and Opportunities, Future and Research Roadmap.	9
III	**ROLE OF IOT IN WEARBLE DEVICE** Smart connectivity and Big picture of IoT-smart devices, networks, Wireless technologies and need for data analysis. Evolution of wearable technology, Wearable IoT use cases- Smart watches , Android wear, Smart glasses, fitness trackers, health care devices, cameras, smart clothing.	9
IV	**ENERGY HARVESTING FOR WEARABLE DEVICE** Solar cell, Vibration based, Thermal based, Human body as a heat source for power generation, Hybrid thermoelectric photovoltaic energy harvests, Thermopiles.	9
V	**WIRELESS HEALTH SYSTEMS** Need for wireless monitoring, Definition of Body area network, BAN and Healthcare, Technical Challenges- System security and reliability, BAN Architecture – Introduction, Wireless communication techniques	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Infer the concepts of sensors for wearable devices.
CO2: Observe the various challenges through case studies
CO3: Realize the role of internet of things in wearable system
CO4: Identify the different energy involvement for wearable techniques
CO5: Familiarize in various wireless monitoring and security aspects

TEXT BOOKS:

T1 - Hang,Yuan-Ting, "Wearable medical sensors andsystems",Springer-2013.
T2 -Subhas C. Mukhopadhyay, "Wearable Electronics Sensors-For Safe and Healthy Living", Springer International Publishing, 2015.

REFERENCE BOOKS:

R1 - Guang-Zhong Yang(Ed.), "Body Sensor Networks, "Springer,2006.
R2 - David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, —IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017
R3- Edward Sazonov, Michael R Neuman, "Wearable Sensors: Fundamentals, Implementation and Applications" Elsevier, 2014
R4- Arshdeep Bahga, Vijay Madisetti, "Internet of Things-A hands-on approach", Universities Press,2015

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2. https://nptel.ac.in/courses/108106193

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	1	-	-	1	-	-	-	-	-	2	3	3
CO2	3	3	2	-	-	2	-	-	-	-	-	2	3	3
CO3	3	3	1	-	-	-	-	-	-	-	-	2	3	3
CO4	3	3	2	3	-	1	1	-	-	-	-	2	3	3
CO5	3	3	3	3	-	1	1	-	-	-	-	2	3	3
Avg	3	2.8	1.8	1.2	-	1	0.4	-	-	-	-	2	2.6	3

1-Low, 2-Medium, 3-High, "-" No correlation

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Vertical IV - Electronics & Communication systems

Programme	Course Code	Name of the Course	L	T	P	C
		Embedded Systems				
B.E.	22EI5310		3	0	0	3

Course Objective	1. Understand the general purpose system and embedded system. 2. Describe the components and compilation techniques in an embedded system. 3. Impart Knowledge in Various processor scheduling algorithms. 4. Differentiate the RTOS concepts to design and develop real time projects. 5. Develop Process flow to design and implement an embedded system using case studies.

Unit	Description	Instructional Hours
I	**BASICS OF EMBEDDED SYSTEM** Basics of Developing and Functional building block of embedded system - Characteristics of embedded system applications - Structural units in Embedded processor -Challenges in embedded system design.	9
II	**EMBEDDED SYSTEM ARCHITECTURE** PIC Microcontroller – Architecture of PIC 16F8xx -Supervisor mode, Exceptions & Traps, Co-processors, - CPU bus - Memory devices - I/O devices -Assembly and linking - Basic compilation techniques – Program optimization – FSR – Reset action – Oscillatory Circuit	9
III	**EMBEDDED OPERATION SYSTEM** Introduction to RTOS, Multiple tasks and multiple processes - Context switching - Operating system - Scheduling policies - Task communication - Inter process communication mechanisms - Introduction to µC/ OS II.	9
IV	**DEVELOPMENT ENVIRONMENT AND PERFORMANCE ISSUSES** Embedded Product Development Life Cycle- objectives, different phases of EDLC, Modeling of EDLC; issues in Hardware-software Co-design; Energy and power - Evaluating operating system performance -Real time kernels- issues in real time kernel-Structure of a real-time kernel.	9
V	**APPLICATIONS** Development and debugging –Testing - Program validation and Testing, - Distributed embedded architecture Design examples: Cell phones, Digital Still Cameras, Elevator Controller, Smart card applications	9
	Total Instructional Hours	**45**

Course Outcome	CO1: Understand The Basic Structure of Embedded Processors. CO2: Acquire the knowledge in the architecture of Embedded System. CO3: Articulate the knowledge in operating systems for embedded process. CO4: Outline RTOS concepts and issues in embedded system design process. CO5: Demonstrate the design and implementation process of real time products

TEXT BOOKS:

T1 - J.Wayne Wolf, "Computers as Components: Principles of Embedded Computer Systems Design", Reed Elsevier Publications, Gurgaon, Haryana, 2008

T2 - Rajkamal, "Embedded Systems – Architecture, Programming and Design", Tata McGraw-Hill, New Delhi, 2010

REFERENCE BOOKS:

R1 –David E Simon, "An Embedded Software Primer", Pearson Education India, New Delhi, 2004.

R2 – Sriram V Iyer, Pankaj Gupta, "Embedded Real-time Systems Programming", Tata McGraw-Hill,2012.

R3 – Ajay V Deshmukh," Microcontroller Theory and Applications" Tata McGraw Hill,2012.

R4 -K.V.K..Prasad,"Embedded Real-Time Systems: Concepts, Design and Programming" Dream tech 2012.

WEB REFERENCE:

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Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	1	-	-	-	-	-	-	-	1	3	2
CO2	3	2	2	1	-	-	-	-	-	-	-	1	3	2
CO3	3	3	2	1	-	-	-	-	-	-	-	1	2	3
CO4	3	3	2	1	-	-	-	-	-	-	-	2	2	2
CO5	2	3	3	1	-	-	-	-	-	-	-	2	2	3
Avg	2.8	2.2	2.2	1	-	-	-	-	-	-	-	1.2	2.2	2.2

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI5311	Communication Engineering	3	0	0	3

Course Objective	1. Interpret the basic concepts involved in amplitude modulation. 2. Discuss about the angle and discrete modulation systems. 3. Analyze the source code information theory and coding techniques. 4. Discuss the multiple access techniques involved in wire and wireless Communication. 5. Categorize the evolution of communication systems.

Unit	Description	Instructional Hours
I	**AMPLITUDE MODULATION** Amplitude Modulation - Generation of AM waves - DSB- DSB/SC – SSB -VSB - AM Transmitter - AM Receiver - TRF, Super Heterodyne Receivers.	9
II	**ANGLE AND DISCRETE MODULATION SYSTEMS** Phase and Frequency Modulation – Narrow and Wide band FM –Generation of FM Waves - Introduction to Pulse Modulation – PAM, PWM, PPM - Sampling and Quantization - Comparisons of Pulse Modulation Technique.	9
III	**INFORMATION THEORY AND CODING** Primary Communication - Entropy - Shannon Fano Coding - Huffman Coding - Line Encoding - BW-SNR Trade Off Codes - Error Control Codes: Convolution Codes and Linear Block Codes.	9
IV	**MULTIPLE ACCESS TECHNIQUE** Spread Spectrum and Multiple Access Techniques: FDMA - TDMA - CDMA - SDMA - Applications in Wire and Wireless Communication.	9
V	**EVOLUTION OF COMMUNICATION TECHNOLOGY** Evolution of communication technologies:2G,3G,4G,5G, Global System for Mobile Communications (GSM). GPS –Satellite Communication – Optical Communication	9
	Total Instructional Hours	**45**

Course Outcome	CO1: Describe the concept and generation methods involved in amplitude modulation system. CO2: Compare the phase, frequency and pulse modulation techniques. CO3: Determine the amount of information in a high bit rate transmission. CO4: Elaborate the multiple access techniques involved in communication. CO5: Innovate various medium for digital communication.

TEXT BOOKS:

T1 - Simon Haykin, "An Introduction to Analog and Digital Communication Systems", 2nd Edition, Wiley,2012.
T2-Theodore S Rappaport, "Wireless Communications: Principles and Practice", 2nd Edition, Pearson Education, 2007.

REFERENCE BOOKS:

R1 – Simon Haykin, "Communication Systems", 4thEdition, John Wiley & Sons, 2014.
R2 – Taub H and Schilling D.L, "Principles of Communication Systems", 4th Edition, Tata McGraw Hill, 2014.
R3 –B.Sklar "Digital communications: Fundamentals and Applications", 2nd Edition, Pearson Education, 2012.
R4 -B.P.Lathi, "Modern Digital and Analog Communication Systems", 3rd edition, Oxford University Press, 2007.

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Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3	2	3	1	-	-	-	-	-	-	2	3	3
CO2	3	3	3	3	1	-	-	-	-	-	-	2	3	3
CO3	3	3	3	2	1	-	-	-	-	-	-	2	3	3
CO4	3	3	3	3	1	-	-	-	-	-	-	2	3	3
CO5	2	3	3	2	1	-	-	-	-	-	-	2	3	3
Avg	2.6	3	2.8	2.6	1	-	-	-	-	-	-	2	3	3

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
BE	22EI5312	Fundamentals of Nanotechnology and Nanoelectronics	3	0	0	3

Course Objective	1. Understand the concepts of Nanotechnology. 2. Extend the knowledge on nanomaterials and technologies 3. Impart knowledge about diversified nanosystems. 4. Infer about the fundamentals of single electron and few electron phenomena. 5. Outline on latest trends in Nanotechnology.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Nanomaterials and Nanotechnology: an overview - Why Nano materials ? - Scale, Structure, and Behavior – An Evolutionary Perspective : A Brief History of Materials – Nanomaterials and Nanostructures in Nature –Nanomaterials in Art and Cultural Heritage - Introduction to Nanoelectronics - Classical Particles, Classical Waves and Quantum Particles.	9
II	**NANO MATERIALS** Classification of Nanomaterials- Size Effects – Properties of Nanomaterials : Mechanical Properties – Thermal Properties –Electrical Properties – Magnetic Properties – Optical Properties- Acoustic Properties – Special Cases ie., Carbon Nanotubes and Nanocomposites - Synthesis of Nanoscale Materials and Structures : Methods of Making 0-D, 1-D, 3-D Nanomaterials.	9
III	**DIVERSITY IN NANOSYSTEMS** Fullerenes – Carbon Nanotubes – Self assembled Monolayers – Gas Phase Clusters – Semiconductor Quantum Dots – Monolayer protected Metal Nanoparticles – Core shell Nanoparticles – Nanoshells.	9
IV	**SINGLE-ELECTRON AND FEW ELECTRON PHENOMENA AND DEVICES** Tunnel Junctions and Applications of Tunneling : Tunneling through a potential barrier – Potential Energy Profiles for material interfaces –Applications of Tunneling. Coulomb Blockade and the Single-Electron Transistor : Coulomb Blockade – The single-Electron Transistor –Other SET and FET structures	9
V	**ADVANCEMENTS IN NANOTECHNOLOGY** Classical and Semiclassical nano particles - Carbon Nanotubes and Nanowires –Transport of Spin, and Spintronics.Nanobiology – Nanosensors – Nanomedicines- Molecular Nanomachines – Nanotribology.	9
	Total Instructional Hours	**45**

Course Outcome	CO1: Define the nanoscopic material and its applications. CO2: Summarise various materials used for nano applications. CO3 : Demonstrate the technology of diversity in nanosystems. CO4 : Appraise the concepts of tunneling and single electron transistor devices. CO5 : Select the suitable nano technology methods for an application.

TEXT BOOKS:

T1- Vladimir V. Mitin, Viatcheslav A.Kochelap, Michael A. Sroscio, "Introduction to Nanoelectronics – Science, Nanotechnology, Engineering, and Application",Cambridge University Press,2011.

T2 - T.Pradeep, "NANO: The Essentials – Understanding Nanoscience and Nanotechnology", Tata McGraw Hill Education Private Limited, New Delhi, 2013

REFERENCE BOOKS:

R1 - Anatoli Korkin, Jan Labanowski,Evgeni Gusev, and Serge Luryi, Nanotechnology for Electronic Materials and Devices", Springer(India) Private Limited, New Delhi,2011.

R2 - Michael F. Ashby, Paulo J. Ferreira, Daniel L. Schodek, "Nanomaterials, Nanotechnologies and Design - An Introduction for Engineers and Architects", Elsevier & Butterworth-Heinemann, 2011.

R3 - Richard Booker and Earl Boysen, " Nanotechnology", Wiley-Dreamtech India (P) Ltd., New Delhi, 2008.

R4 - Charles P.Poole Jr, Frank J.Owens, "Introduction to Nanotechnology", Wiley India (P) Ltd.,2008.

Web Resources:

1. https://archive.nptel.ac.in/courses/113/106/113106093/
2. https://www.coursera.org/learn/nanotechnology1

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	3	1	-	1	1	-	-	-	2	2	3
CO2	3	2	3	2	1	-	1	1	-	-	-	2	2	3
CO3	3	3	3	2	1	-	1	1	-	-	-	2	3	2
CO4	3	3	3	3	1	-	1	1	-	-	-	2	2	2
CO5	3	3	2	2	1	-	1	1	-	-	-	2	3	3
Avg	3	2.8	2.6	2.4	1	-	1	1	-	-	-	2	2.2	2.6

1-Low, 2-Medium, 3-High, "-" No correlation

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Vertical V - Control and Automation

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI5313	Plant Automation and IIOT	3	0	0	3

Course Objective	1. Understand the basics and elements of Automation. 2. Impart knowledge about Industrial IoT. 3. Familiarize on industrial sensors and actuators. 4. Outline about IoT communication devices. 5. Classify on various applications of IoT in industries.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO PLANT AUTOMATION** Automation overview, Requirement of automation systems, Architecture of Industrial Automation system, Introduction of PLC and Supervisory control and data acquisition (SCADA) and DCS - Role of computers in measurement and control, Elements of computer aided measurement and control, man-machine interface: HMI,MMI -Computer aided process control.	9
II	**BASICS OF INDUSTRIAL IOT** Introduction, IIOT vs Automation, challenges in IIOT, Applications – Industrial Internet system: three waves of innovation - industrial revolution – The industrial internet: three key elements, intelligent machines, data analytics, people at work, applications of industrial internet.	9
III	**INDUSTRIAL SENSING AND ACTUATION** Introduction, Need of sensing for Industry, Sensors for measuring industrial parameters – Requirements for Industrial Standards – Industrial sensing: Smart sensor, configurations involved in smart sensors, functions and examples – Cyber physical systems – 5C architecture of Cyber physical system – Challenges of Industrial processes in IIOT.	9
IV	**INDUSTRIAL COMMUNICATION** Industrial Ethernet: MODBUS-TCP,EtherCat, EtherNet/IP, Profinet,TSN, Fieldbus:RTU, Interbus. CC-Link. DeviceNet,Communication Infrastructure: Wired connectivity, Wireless connectivity – RS232. RS485 - Industrial Gateways.	9
V	**APPLICATIONS** Healthcare, Power Plants, Inventory Management & Quality Control, Plant Safety and Security (Including AR and VR safety applications), Facility Management, IoT smart city, Robot surveillance, Smart irrigation.	9
	Total Instructional Hours	**45**

Course Outcome	CO1:	Explain the concepts of Automation and its elements.
	CO2:	Define the IIOT and its various systems.
	CO3:	Estimate the various frequency domain specifications by phase analysis.
	CO4:	Establish the communication devices to industrial applications.
	CO5:	Demonstrate the various Industrial IoT case studies.

TEXT BOOKS:

T1 - E.A.Parr, Newnes ,NewDelhi,"Industrial Control Handbook",3rd Edition, 2000.
T2 - Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat , Industrial Internet of Things: Cyber manufacturing Systems, Springer, 2017

REFERENCE BOOKS:

R1 - Arshdeep Bahga, Vijay Madisetti, Internet of Things: A Hands-On Approach, Universities Press, 2015.
R2- Krishna Kant, "Computer - Based Industrial Control", 2nd Edition, Prentice Hall, New Delhi, 2011.
R3 - Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Thing, CISCO Press, 2017.
R4- Ramon pallas-areny, John G. Webster, sensors and signal Conditioning, A Wiley Publication., 2001
R5 - NPTEL Video Lecture Notes on "Control Engineering "by Prof. Ramkrishna Pasumarthy, IIT Madras.

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2. https://www.coursera.org/learn/industrial-internet-of-things

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	3	1	-	-	-	-	-	-	2	3	3
CO2	3	3	3	3	1	-	-	-	-	-	-	2	3	3
CO3	3	3	3	2	1	-	-	-	-	-	-	2	2	3
CO4	3	3	3	3	1	-	-	-	-	-	-	2	2	3
CO5	3	3	2	2	1	-	-	-	-	-	-	2	3	3
Avg	3	3	2.6	2.6	1	-	-	-	-	-	-	2	2.6	3

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI5314	PC Based Instrumentation	3	0	0	3

Course Objective	1. To understand the principles of data acquisition and the components used in DAS 2. To analyze the conversion logic employed in the different ADC's and DAC's. 3. To design Design and develop the PC based DAQ systems. 4. Familiarize PC Hardware and interfacing bus protocols. 5. To recognize various interfacing issues of DAC's & ADC's to a PC.

Unit	Description	Instructional Hours
I	**INTRODUCTION AND PC ORGANISATION** Introduction - Necessity and functions of computers - Level of automation and economy of computer control - Centralized computer control Vs distributed computer control – Motherboard components – Microprocessors - Memory – System Resources – I/O Ports – Peripherals.	9
II	**PRINCIPLES OF DATA ACQUISITION** Sampling Concepts – Sampling and Reconstruction- Shannon Sampling Theorem – Aliasing – Interpolation - D/A Converters – Basic Inputs and Outputs- Digital to Analog Conversion Techniques – Characteristics of DAC –A / D Converters - Integrating ADC- Successive Approximation ADC – Characteristics of DAC - Data Acquisition Systems.	9
III	**GENERAL PURPOSE INTERFACE BUS (GPIB)** Overview of GPIB – GPIB system- Implementation – Pins and Signals – Handshake protocol - GPIB commands – Primary Commands – secondary commands – End of Message - Data - GPIB programming – EPROM Routines-Program Language Interface - IEEE – 488.2 – commands and Queries- control sequences- protocols- SCPI-generalized instrument model- command structure - HS 488 protocol.	9
IV	**SERIAL COMMUNICATIONS AND STANDARDS** Serial Communications Format – Error Checking – Encoding – Compression - Serial communication modes – Serial Interface Standards – RS 232 - RS 422 - RS 485 – Microcontroller Serial Interface – UART interface – I^2Bus – USB – IEEE1394.	9
V	**NETWORK DATA COMMUNICATION** Analog Transmission – Hybrid Communication – Digital Communication – Local Area Networks – OSI model – LAN Types – TCP / IP – Network Devices - HART communication – Modes – Protocol Layers – Fieldbuses – MODBUS – PROFIBUS- DeviceNet and ControlNet.	9
	Total Instructional Hours	**45**

Course Outcome	CO1 : Understand the principles of data acquisition, characteristics and specifications of various components CO2: Analyze the conversion logic employed in the different ADC's and DAC's. CO3 : Familiarize PC Hardware and interfacing bus protocols. CO4 : Recognize various interfacing issues of DAC's & ADC's to a PC. CO5 : Design and develop the PC based DAQ systems.

TEXT BOOKS:

T1 - Mathivanan: PC based Instrumentation concepts and Practice –PHI, 2007
T2 - Kevin James; PC interfacing and data acquisition –Newnes publications Ltd., 2000

REFERENCE BOOKS:

R1 - John park and Steve Mackay - Practical data acquisition for Instrumentation and control systems - Newness publication 2003.
R2 - G.B.Clayton; Data Converters',the Macmillan Press Ltd.1983
R3 - . E.R. Hnatek Users Handbook of D/A and A/D Converters'.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	3	-	-	-	-	-	-	-	-	2	3	3
CO2	3	3	3	-	-	-	-	-	-	-	-	2	3	3
CO3	3	3	3	-	-	-	-	-	-	-	-	2	3	3
CO4	3	2	3	-	-	-	-	-	-	-	-	2	3	3
CO5	3	3	2	-	-	-	-	-	-	-	-	2	3	3
Avg	3	2.6	2.8	-	-	-	-	-	-	-	-	2	3	3

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI5315	Introduction to Soft Computing	3	0	0	3

Course Objective

1. Classify the various soft computing frame works
2. Interpret the design concepts of neural networks.
3. Develop fuzzy logic and fuzzy systems
4. Outline mathematical background for optimized genetic programming
5. Demonstrate neuro-fuzzy hybrid systems and its applications

Unit	Description	Instructional Hours
I	**INTRODUCTION** Soft Computing Constituents-From Conventional AI to Computational Intelligence- Artificial neural network: Introduction. characteristics- learning methods – taxonomy – Evolution of neural networks applications. Fuzzy logic: Introduction - crisp sets- fuzzy sets - crisp relations and fuzzy relations: cartesian product of relation - classical relation. fuzzy relations. tolerance and equivalence relations. non-iterative fuzzy sets.	9
II	**NEURAL NETWORKS** McCulloch-Pitts neuron - linear separability - hebb network - supervised learning network: perceptron networks - adaptive linear neuron, multiple adaptive linear neuron. BPN. RBF. TDNNassociative memory network: BAM, hopfield networks, iterative auto associative memory network & iterative associative memory network –unsupervised learning networks: Kohonen self-organizing feature maps, LVQ – CP networks, ART network.	9
III	**FUZZY LOGIC** Membership functions: features, fuzzification, methods of membership value assignments - Defuzzification: lambda cuts - methods - fuzzy arithmetic and fuzzy measures: fuzzy arithmetic - extension principle - fuzzy measures - measures of fuzziness -fuzzy integrals - fuzzy rule base and approximate reasoning :decomposition of rules, aggregation of fuzzy rules, fuzzy reasoning-fuzzy inference -fuzzy decision making.	9
IV	**GENETIC ALGORITHM** Genetic algorithm- Introduction - biological background - traditional optimization and search techniques - Genetic basic concepts - operators – Encoding scheme – Fitness evaluation – crossover - mutation - genetic programming – multilevel optimization – real life problem- advances in GA.	9
V	**HYBRID SOFT COMPUTING TECHNIQUES & APPLICATIONS** Neuro-fuzzy hybrid systems - genetic neuro hybrid systems - genetic fuzzy hybrid and fuzzy genetic hybrid systems - simplified fuzzy ARTMAP - Applications: A fusion approach of multispectral images with SAR, optimization of traveling salesman problem using genetic algorithm approach, soft computing based hybrid fuzzy controllers.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Apply various soft computing concepts for practical applications
CO2: Design suitable neural network for real time problems
CO3: Utilize fuzzy rules and reasoning to develop decision making and expert system
CO4: Explain the importance of optimization techniques and genetic programming
CO5: Infer the various hybrid soft computing techniques and apply in real time problems

TEXT BOOKS:

T1-J.S.R.Jang, C.T. Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI / Pearson Education 2004.
T2 - S.N.Sivanandam and S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt Ltd, 2011.

REFERENCES:

R1 - S.Rajasekaran and G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis & Applications", Prentice-Hall of India Pvt. Ltd., 2006.
R2 - George J. Klir, Ute St. Clair, Bo Yuan, "Fuzzy Set Theory: Foundations and Applications" Prentice Hall, 1997.
R3 - David E. Goldberg, "Genetic Algorithm in Search Optimization and Machine Learning" Pearson Education India, 2013.

R4 - James A. Freeman, David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques, Pearson Education India, 1991.

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Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	3	1	-	-	-	-	-	-	2	3	3
CO2	3	3	3	3	1	-	-	-	-	-	-	2	3	3
CO3	3	2	3	2	1	-	-	-	-	-	-	2	3	3
CO4	3	3	3	3	1	-	-	-	-	-	-	2	3	3
CO5	2	2	3	2	1	-	-	-	-	-	-	2	3	3
Avg	2.8	2.6	2.8	2.6	1	-	-	-	-	-	-	2	3	3

1-Low, 2-Medium, 3-High, "-" No correlation

Chairman - BoS
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Vertical VI - Control and Automation

Programme	Course Code	Name of the Course	L	T	P	C
BE	22EI5316	Instrumentation and Control in Paper Industries	3	0	0	3

Course Objective

1. Categorize the process parameters involved in paper making.
2. Differentiate the properties of paper and its measurement methods.
3. Analyse methods for measurement of consistency.
4. Infer about the working and quality parameters of paper making machine.
5. Analyse various control aspects involved in paper production.

Unit	Description	Instructional Hours
I	**PAPER MAKING PROCESS** Description of The Process - Measurements of various parameters involved in paper making process - Control Operations - various types of controls involved in paper making process - computer applications.	9
II	**PAPER PROPERTIES AND ITS MEASUREMENT** Physical, electrical, optical and chemical properties of paper - compressive test method-quality measurement method - optical testing-ultrasonic measurement - standards in testing.	9
III	**CONSISTENCY MEASUREMENT** Dry and wet end instrumentation - Definition of consistency - Techniques for head box consistency measurement - Stock consistency measurement and control instrumentation.	9
IV	**PAPER MAKING MACHINE** Functioning of Paper making machine - Quality parameters - moisture, basic weight, caliper, brightness, colour, ash content, strength, gloss and tensile strength - parameters monitoring	9
V	**CONTROL MECHANISM** Pumps and control valves used in paper industry, flow box and wet end variables, evaporator feedback and feed forward control, lime mud density control - Machine and cross direction control technique - consistency, moisture and basic weight control - dryer control - computer based control systems - mill wide control	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Apply the process learnt in real time application.
CO2: Summarise various properties of paper and it's testing methods.
CO3 : Demonstrate the consistency of paper through the learnt methodologies.
CO4 : Appraise about the quality parameters associated in production of paper.
CO5 : Point out the appropriate control technique involved in production of paper.

TEXT BOOKS:

T1 - B.G Liptak, "Instrumentation in Process Industries", Chilton Book Company, 2003
T2 - P.E.Sankaranarayanan, "Pulp and Paper Industries- Technology and Instrumentation", Kotharis Desk book series, 1995.

REFERENCE BOOKS:

R1 - Britt K.W, "Handbook of Pulp and Paper Technology", Reinbold Company Second Edition, 2004.
R2 - James P.Casey , "Pulp and Paper Chemistry and Chemical Technology", John Wiley and sons, 1981.
R3 - Randolph Norris Shreve and George, "Shreve's Chemical Process Industries", McGraw Hill International Student Edition, Singapore,1985.
R4 - Robert H. Perry, Green D.W. and Maloney J.O., Perry's Chemical Engineers, Handbook, McGraw HillInc,, 7th ed, 1998

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	3	1	-	-	-	-	-	-	2	3	3
CO2	3	2	3	3	1	-	-	-	-	-	-	2	2	3
CO3	2	3	3	2	1	-	-	-	-	-	-	2	3	3
CO4	3	3	3	3	1	-	-	-	-	-	-	2	3	3
CO5	3	3	2	2	1	-	-	-	-	-	-	2	3	3
Avg	2.8	2.8	2.6	2.6	1	-	-	-	-	-	-	2	2.8	3

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
BE	22EI5317	System Identification	3	0	0	3

Course Objective	1. Understand about System Identification methods. 2. Explain adaptive system tuning and parameter estimation. 3. Discuss about system identification and it's model. 4. Illustrate the various non-linear identification methods. 5. Employing adaptive systems design in modern control environments.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO SYSTEM IDENTIFICATION** Introduction. Need for Identification - Identification based on differential equations. Laplace transforms, frequency responses, difference equations. Stationary, auto-correlation, cross correlation. power spectra. Random and deterministic signals for system identification: pulse, step, pseudo random binary sequence (PRBS), signal spectral properties.	9
II	**ADAPTIVE CONTROL** Adaptive Control - use of Adaptive control - definitions - classification - Model Reference Adaptive Systems - different configurations - direct and indirect MRAC - Continuous time MRAC systems - Model Reference Adaptive System Design based on Gradient method.	9
III	**PARAMETRIC AND NON-PARAMETRIC IDENTIFICATION** Parametric Methods: Linear Models - State space Models - Least square estimation - Parameter estimates for linear models - The recursive least square method - recursive prediction error methods - Maximum likelihood. Non-Parametric Methods: Transient response and frequency analysis - Correlation analysis - Spectral analysis.	9
IV	**NON-LINEAR IDENTIFICATION** Open and closed loop identification: Approaches - Direct and indirect identification - Joint input-output identification - Wiener models - Volterra Models - Non linear identification using Neural Networks and Fuzzy Logic.	9
V	**PRACTICAL ASPECTS IN ADAPTIVE CONTROL AND APPLICATIONS** Stability – Convergence - Averaging, Applications: Inverted Pendulum, Robotic manipulators, heat exchanger, Distillation column, Electric drives, Satellite altitude control, Space craft control.	9
	Total Instructional Hours	**45**

Course Outcome	CO1: Use the identification methods to specific system and functions. CO2: Design the controller by using STR and gain scheduling adaptive system. CO3: Estimate the controller parameters for parametric and non-parametric identification schemes. CO4: Elaborate advanced identification models for non-linear systems. CO5: Implement adaptive and system identification concept for various application domain.

TEXT BOOKS:

T1 - Soder storm T and Peter Stoica, "System Identification", Prentice Hall of India ,1989.
T2 - Karl J Astrom and Bjorn Wittenmark, "Adaptive Control", Pearson Education Inc, Second Edition, 2008.

REFERENCE BOOKS :

R1 - Ljung L, "System Identification: Theory for the user", Prentice Hall of India, 1999.
R2- Sankar Sastry,Marc Bodson, "Adaptive Control – Stability, convergence and Robustness", Prentice Hall of India,1989.
R3 - Arun K.Tangirala, "Principles of System Identification: Theory and Practice", CRC Press, 2014.
R 4 - Y.Zhu, Multivariable System Identification for Process Control, Pergamon, 2001

Web Reference:

1. https://archive.nptel.ac.in/courses/103/106/103106149/

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	3	1	-	-	-	-	-	-	2	3	2
CO2	3	2	3	3	1	-	-	-	-	-	-	2	2	3
CO3	2	3	3	2	1	-	-	-	-	-	-	2	3	3
CO4	3	3	3	3	1	-	-	-	-	-	-	2	3	3
CO5	3	3	2	2	1	-	-	-	-	-	-	2	3	3
Avg	2.8	2.8	2.6	2.6	1	-	-	-	-	-	-	2	2.8	2.8

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI5318	Industrial Data Communication	3	0	0	3

Course Objective	1. Understand the fundamentals of data networks. 2. Gain knowledge on various internetworking standards. 3. Analyze the modes of data transfer. 4. Impart knowledge about the importance of MODBUS, PROFIBUS and other communication protocol in networking. 5. Observe the use of industrial Ethernet in various applications.

Unit	Description	Instructional Hours
I	**DATA NETWORK FUNDAMENTALS** Networks hierarchy and switching - Open System Interconnection model - Data link control protocol - Media access protocol - Command / response - Token passing - CSMA/CD, TCP/IP	9
II	**INTERNET WORKING and RS 232, RS 485** Bridges - Routers - Gateways - Standard ETHERNET and ARCNET configuration special requirement for networks used for control - RS 232, RS 485 configuration Actuator Sensor (AS) – interface, Devicenet	9
III	**HART AND FIELDBUS** Introduction - Evolution of signal standard - HART communication protocol - HART networks - HART commands - HART applications - Fieldbus - Introduction - General Fieldbus architecture - Basic requirements of Fieldbus standard - Fieldbus topology - Interoperability - Interchangeability - Introduction to OLE for process control (OPC).	9
IV	**MODBUS AND PROFIBUS PA/DP/FMS AND FF** MODBUS protocol structure - function codes – troubleshooting Profibus, Introduction, Profibus protocol stack, Profibus communication model - communication objects - system operation - troubleshooting - review of foundation fieldbus - Data Highway	9
V	**INDUSTRIAL ETHERNET AND WIRELESS COMMUNICATION** Industrial Ethernet, 10 Mbps Ethernet, 100 Mbps Ethernet - Radio and wireless communication, components of radio link - radio spectrum and frequency allocation - radio MODEMs-Introduction to wireless HART and ISA100	9
	Total Instructional Hours	**45**

Course Outcome	CO1 : Outline the basics of data networks. CO2 : Associate appropriate internetworking standards for data transfer. CO3 : Understand the importance of HART and field bus in networking. CO4 : Appraise about MODBUS, PROFIBUS and other communication protocol in networking. CO5 : Outline various standards and applications of wireless communication

TEXT BOOKS:
T1 - Steve Mackay, Edwin Wrijut, Deon Reynders, John Park, "Practical Industrial Data Networks Design, Installation and Troubleshooting", Newnes Publication, Elsevier First Edition, 2004
T2 - William Buchanan, "Computer Buses", CRC Press, 2000.

REFERENCE BOOKS:
R1 - Andrew S. Tanenbaum, David J. Wetherall, "Computer Networks", Prentice Hall of India Pvt. Ltd., 5th Edition. 2011.
R2 - Theodore S Rappaport, "Wireless Communication: Principles and Practice", Prentice Hall of India 2nd Edition, 2001.
R3 - William Stallings, "Wireless Communication & Networks", Prentice Hall of India, 2nd Edition, 2005.

WEB REFERENCES:
1.https://youtu.be/8x0y3QU7hTA?si=CouR_9YCKZWlivKQ

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	3	1	-	-	-	-	-	-	2	3	3
CO2	3	3	3	3	1	-	-	-	-	-	-	2	3	3
CO3	3	3	3	2	1	-	-	-	-	-	-	2	3	3
CO4	3	3	3	3	1	-	-	-	-	-	-	2	3	3
CO5	2	2	2	2	1	-	-	-	-	-	-	2	3	3
Avg	2.8	2.8	2.6	2.6	1	-	-	-	-	-	-	2	3	3

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	22HE5071	Soft Skills - IV	1	0	0	1

Course Objectives:

1. To employ soft skills to enhance employability and ensure workplace and career success.
2. To interpret things objectively, to be able to perceive and interpret trends to make generalizations and be able to analyze assumptions behind an argument/statement.

Unit	Description	Instructional Hours
I	**Introduction to Soft Skills:** Introduction- Objective -Hard vs Soft Skills - Measuring Soft Skills- Structure of the Soft Skills -Self management-Critical thinking-Reflective thinking and writing- p2p Interaction	10
II	**Art of Communication:** Verbal Communication - Effective Communication - Active listening – Paraphrasing - Feedback - Non Verbal Communication – Roles-Types- How nonverbal communication can go wrong- How to Improve non verbal Communication - Importance of feelings in communication - dealing with feelings in communication.	10
III	**World of Teams:** Self Enhancement - importance of developing assertive skills- developing self confidence – developing emotional intelligence - Importance of Team work – Team vs. Group - Attributes of a successful team – Barriers involved - Working with Groups – Dealing with People- Group Decision Making.	10
	Total Instruction Hours	30

Course Outcome:

CO1: Students will have clarity on their career exploration process and to match their skills and interests with a chosen career path.

CO2: Students will develop knowledge, skills, and judgment around human communication that facilitate their ability to work collaboratively with others

CO3: Students will understand how teamwork can support leadership skills

Department of Electronics and Instrumentation Engineering

SYLLABUS REVISION DETAILS FOR THE REGULATION 2022 – 2022 BATCH - V SEMESTER						
S. NO	COURSE CODE/COURSE NAME	SUGGESTION BY EXPERTS	EXISTING CONTENT (IN THE AY2023-24 ODD)	REVISED CONTENT(FOR AY 2024-25 ODD)	TYPE OF REVISION DELETION/ INSERTION/ MODIFICATION	PERCENTAGE OF REVISION
NIL						
					Total Percentage Changes	NIL

New Course Introduced (2022 Regulation) – 2022 Batch - V Semester

S.No	Regulation	Course code with Name	Credits
1.	2022	22EI5201 – Industrial Instrumentation -II	3
2.	2022	22EE5202 - Microprocessors and Microcontrollers	3
3.	2022	22EI5251 - Control Systems	3
4.	2022	22EI5001 - Industrial Instrumentation Laboratory	1.5
5.	2022	22EE5002 - Microprocessors and Microcontrollers Laboratory	1.5
6.	2022	22EI5301 – Power plant Instrumentation	3
7.	2022	22EI5302 – Industrial Pollution Control	3
8.	2022	22EI5303 – Safety Instrumented Systems	3
9.	2022	22EI5304 – Bio-medical Instrumentation	3
10.	2022	22EI5305 – Telemetry and Telecontrol	3
11.	2022	22EI5306 – Digital Image Processing	3

Department of Electronics and Instrumentation Engineering

12.	2022	22EI5307 – Micro Electro Mechanical Systems	3
13.	2022	22EI5308 – Wireless Instrumentation	3
14.	2022	22EI5309 – Wearable Technology	3
15.	2022	22EI5310 – Embedded Systems	3
16.	2022	22EI5311 – Communication Engineering	3
17.	2022	22EI5312 – Fundamentals of Nanotechnology and Nanoelectronics	3
18.	2022	22EI5313 – Plant Automation and IIOT	3
19.	2022	22EI5314 – PC based Instrumentation	3
20.	2022	22EI5315 – Introduction to Soft Computing	3
21.	2022	22EI5316 – Instrumentation control in Paper Industries	3
22.	2022	22EI5317 – System Identification	3
23.	2022	22EI5318 – Industrial Data Communication	3

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DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.E. ELECTRONICS AND INSTRUMENTATION ENGINEERING (UG)

REGULATION-2019 WITH AMENDMENT

(For the students admitted during the academic year 2021-2022 and onwards)

SEMESTER I

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21HE1101	Technical English	HS	2	1	0	3	40	60	100
2	21MA1103	Calculus and Differential Equations	BS	3	1	0	4	40	60	100
THEORY WITH LAB COMPONENT										
3	21PH1151	Applied Physics	BS	2	0	2	3	50	50	100
4	21CY1151	Chemistry for Engineers	BS	2	0	2	3	50	50	100
5	21CS1151	Python Programming and Practices	ES	2	0	2	3	50	50	100
6	21ME1152	Engineering Drawing	ES	1	0	4	3	50	50	100
PRACTICAL										
7	21HE1001	Language Competency Enhancement Course-I	HS	0	0	2	1	100	0	100
MANDATORY COURSES										
8	21HE1072	**Career Guidance Level – I** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
9	21HE1073	Entrepreneurship & Innovation	EEC	1	0	0	0	100	0	100
			Total :	**15**	**2**	**12**	**20**	**580**	**320**	**900**

As Per AICTE Norms 3 Weeks Induction Programme is Added in the First Semester as an Audit Course

SEMESTER II

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21HE2101	Business English for Engineers	HS	2	1	0	3	40	60	100
2	21MA2102	Complex Variables and Transform Calculus	BS	3	1	0	4	40	60	100
THEORY WITH LAB COMPONENT										
3	21PH2151	Material Science	BS	2	0	2	3	50	50	100
4	21CY2151	Environmental Studies	BS	2	0	2	3	50	50	100
5	21EI2151	Circuit Theory	ES	2	0	2	3	50	50	100
6	21CS2152	Essentials of C and C++ Programming	ES	2	0	2	3	50	50	100
PRACTICAL										
7	21ME2001/ 21EE2001	Engineering Practices	ES	0	0	4	2	60	40	100
8	21HE2001	Language Competency Enhancement Course-II	HS	0	0	2	1	100	0	100
MANDATORY COURSES										
9	21HE2072	**Career Guidance Level – II** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
			Total :	**15**	**2**	**14**	**22**	**540**	**360**	**900**

SEMESTER III

S.No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21MA3102	Fourier Analysis and Transforms	BS	3	1	0	4	40	60	100
2	21EI3201	Electronic Devices and Circuits	PC	3	1	0	4	40	60	100
3	21EI3202	Sensors and Transducers	PC	3	0	0	3	40	60	100
4	21ME3231	Fluid Mechanics and Thermal Engineering	PC	3	0	0	3	40	60	100
THEORY WITH LAB COMPONENT										
5	21EI3251	Electrical and Electronic Measurements	PC	2	0	2	3	50	50	100
PRACTICAL										
6	21EI3001	Electronic Devices and Circuits Laboratory	PC	0	0	3	1.5	60	40	100
7	21EI3002	Sensors and Transducers Laboratory	PC	0	0	3	1.5	60	40	100
MANDATORY COURSES										
8	21MC3191	Indian Constitution	MC	2	0	0	0	100	0	100
9	21HE3072	**Career Guidance Level – III** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
10	21HE3073	Leadership Management Skills	EEC	1	0	0	0	100	0	100
			Total	**19**	**2**	**8**	**20**	**550**	**450**	**1000**

SEMESTER IV

S.No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21MA4101	Numerical Methods	BS	3	1	0	4	40	60	100
2	21EI4201	Electrical Machines	PC	3	1	0	4	40	60	100
3	21EI4202	Integrated Circuits and Its Applications	PC	3	0	0	3	40	60	100
4	21EI4203	Industrial Instrumentation – I	PC	3	0	0	3	40	60	100
THEORY WITH LAB COMPONENT										
5	21EI4251	Digital Logic Circuits	PC	2	1	2	4	50	50	100
PRACTICAL										
6	21EI4001	Electrical Machines Laboratory	PC	0	0	3	1.5	60	40	100
7	21EI4002	Integrated Circuits Laboratory	PC	0	0	3	1.5	60	40	100
MANDATORY COURSES										
8	21MC4191	Essence of Indian tradition knowledge/Value Education	MC	2	0	0	0	100	0	100
9	21HE4072	**Career Guidance Level – IV** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
10	21HE4073	Ideation Skills	EEC	2	0	0	0	100	0	100
			Total	**20**	**3**	**8**	**21**	**550**	**450**	**1000**

SEMESTER V

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21EI5201	Industrial Instrumentation – II	PC	3	0	0	3	40	60	100
2	21EI5202	Control Systems	PC	3	1	0	4	40	60	100
3	21EI5203	Microprocessors and Microcontrollers	PC	3	0	0	3	40	60	100
4	21EI5204	Analytical Instrumentation	PC	3	0	0	3	40	60	100
5	21EI53XX	**Professional Elective -I**	PE	3	0	0	3	40	60	100
THEORY WITH LAB COMPONENT										
6	21EI5251	Programmable Logic Controllers and SCADA	PC	2	0	2	3	50	50	100
PRACTICALS										
7	21EI5001	Industrial Instrumentation Laboratory	PC	0	0	3	1.5	60	40	100
8	21EI5002	Microprocessors and Microcontrollers Laboratory	PC	0	0	3	1.5	60	40	100
MANDATORY COURSES										
9	21HE5071	Soft Skills - I	EEC	1	0	0	1	100	0	100
10	21HE5072	Design Thinking	EEC	1	0	0	1	100	0	100
			Total	**19**	**1**	**8**	**24**	**475**	**525**	**1000**

SEMESTER VI

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21EI6181	Industrial Safety Management	HS	3	0	0	3	40	60	100
2	21EI6201	Process Control	PC	3	0	0	3	40	60	100
3	21EI6202	Discrete Time and Signal Processing	PC	3	0	0	3	40	60	100
4	21EI63XX	**Professional Elective - II**	PE	3	0	0	3	40	60	100
5	21XX64XX	**Open Elective– I**	OE	3	0	0	3	40	60	100
THEORY WITH LAB COMPONENT										
6	21EI6251	Embedded Systems	PC	2	0	2	3	50	50	100
PRACTICALS										
7	21EI6001	Process Control Laboratory	PC	0	0	3	1.5	60	40	100
8	21EI6002	Virtual Instrumentation Laboratory	PC	0	0	3	1.5	60	40	100
MANDATORY COURSES										
9	21EI6701	Internship Training	EEC	0	0	0	1	0	100	100
10	21HE6071	Soft Skills - II	EEC	1	0	0	1	100	0	100
11	21HE6072	Intellectual Property Rights (IPR)	EEC	1	0	0	1	100	0	100
			Total	**19**	**0**	**8**	**24**	**475**	**625**	**1100**

SEMESTER VII

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21EI7201	Computer Control of Process	PC	3	0	0	3	40	60	100
2	21EI7202	Industrial Electronics	PC	3	0	0	3	40	60	100
3	21EI73XX	**Professional Elective-III**	PE	3	0	0	3	40	60	100
4	21XX74XX	**Open Elective – II**	OE	3	0	0	3	40	60	100
THEORY WITH LAB COMPONENT										
5	21EI7251	Bio-Medical Instrumentation	PC	2	0	2	3	50	50	100
PRACTICALS										
6	21EI7001	Computer Control of Process Laboratory	PC	0	0	3	1.5	60	40	100
7	21EI7002	Instrumentation System Design Laboratory	PC	0	0	3	1.5	60	40	100
PROJECT WORK										
8	21EI7901	Project Work – Phase I	EEC	0	0	4	2	50	50	100
			Total	**14**	**0**	**12**	**20**	**300**	**500**	**800**

SEMESTER VIII

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21EI83XX	**Professional Elective –IV**	PE	3	0	0	3	40	60	100
2	21EI81XX	**Professional Elective- V**	PE	3	0	0	3	40	60	100
PROJECT WORK										
3	21EI8901	Project Work – Phase II	EEC	0	0	16	8	100	100	200
			Total	**6**	**0**	**16**	**14**	**150**	**250**	**400**

TOTAL NO OF CREDITS: 165

LIST OF PROFESSIONAL ELECTIVES

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
PROFESSIONAL ELECTIVE I										
1	21EI5301	Power Plant Instrumentation	PE	3	0	0	3	40	60	100
2	21EI5302	Communication Theory	PE	3	0	0	3	40	60	100
3	21IT5331	Fundamentals of Java Programming	PE	3	0	0	3	40	60	100
4	21EI5303	Industrial Chemical Process	PE	3	0	0	3	40	60	100
5	21EI5304	Operating Systems	PE	3	0	0	3	40	60	100
PROFESSIONAL ELECTIVE II										
1	21EI6301	VLSI Design	PE	3	0	0	3	40	60	100
2	21EI6302	Micro Electro Mechanical Systems	PE	3	0	0	3	40	60	100
3	21EI6303	Industrial Data Communication	PE	3	0	0	3	40	60	100
4	21EI6304	Digital Image Processing	PE	3	0	0	3	40	60	100
5	21EI6305	Introduction to Soft Computing	PE	3	0	0	3	40	60	100
PROFESSIONAL ELECTIVE III										
1	21EI7301	Non-Linear Control System	PE	3	0	0	3	40	60	100
2	21EI7302	Industrial IoT	PE	3	0	0	3	40	60	100
3	21EI7303	Robotics and Automation	PE	3	0	0	3	40	60	100
4	21EI7304	Microcontroller Based System Design	PE	3	0	0	3	40	60	100
5	21EI7305	Neural Networks and Fuzzy Systems	PE	3	0	0	3	40	60	100
PROFESSIONAL ELECTIVE IV										
1	21EI8301	Fiber Optics and Laser Instruments	PE	3	0	0	3	40	60	100
2	21EI8302	Instrumentation in Petrochemical Industries	PE	3	0	0	3	40	60	100
3	21EI8303	Instrumentation System Design	PE	3	0	0	3	40	60	100
4	21EI8304	Artificial Intelligence and Machine Learning	PE	3	0	0	3	40	60	100
5	21EI8305	Instrumentation and Control in Paper Industry	PE	3	0	0	3	40	60	100

(Note: Z stands for semester; students can't choose twice the course)

PROFESSIONAL ELECTIVE V										
S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
1	21EI8181	Disaster Management	PE	3	0	0	3	40	60	100
2	21EI8182	Total Quality Management	PE	3	0	0	3	40	60	100
3	21EI8183	Professional Ethics for Engineers	PE	3	0	0	3	40	60	100
4	21EI8184	Principles of Management	PE	3	0	0	3	40	60	100
5	21EI8185	Patent, Copyright and Competition Law	PE	3	0	0	3	40	60	100

LIST OF OPEN ELECTIVES

ELECTRONICS AND INSTRUMENTATION ENGINEERING										
S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
1	21EI6401	Smart Sensors for Engineering Applications	OE	3	0	0	3	40	60	100
2	21EI6402	Electrical Energy Management and Audit	OE	3	0	0	3	40	60	100
3	21EI7401	Introduction to Programmable Logic Controllers	OE	3	0	0	3	40	60	100
LIFE SKILL COURSES										
4	21LSZ401	General Studies for Competitive Examinations	OE	3	0	0	3	40	60	100
5	21LSZ402	Human Rights, Women's Rights and Gender Equality	OE	3	0	0	3	40	60	100
6	21LSZ403	Indian Ethos and Human Values	OE	3	0	0	3	40	60	100
7	21LSZ404	Indian Constitution and Political System	OE	3	0	0	3	40	60	100
8	21LSZ405	Yoga for Human Excellence	OE	3	0	0	3	40	60	100
NCC COURSES (Only for the students' who have opted NCC subjects in Semester I, II. III & IV are eligible)										
9	21HEZ401	NCC course level 1	OE	3	0	0	3	40	60	100
10	21HEZ402	NCC course level 2	OE	3	0	0	3	40	60	100

Enrolment for B.E. / B. TECH. (HONOURS) / Minor Degree (optional)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only. For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes.

Clause 4.10 of Regulation 2022 is applicable for the Enrolment of B.E. / B. TECH. (HONOURS) / Minor Degree(Optional).

VERTICALS FOR MINOR DEGREE

- Heads are requested to provide one vertical from their program to offer for other program students to register for additional courses (18 Credits) to become eligible for the B.E./B.Tech. Minor Degree.

  Note: Each programme should provide verticals for minor degree –

ELECTRONICS AND INSTRUMENTATION ENGINEERING OFFERING MINOR DEGREE IN INSTRUMENTATION AND CONTROL

S No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1.	21EI5601	Sem 5: Transducer Engineering	MDC	3	0	0	3	3
2.	21EI6601	Sem 6: Measurements and Measuring Instruments	MDC	3	0	0	3	3
3.	21EI6602	Sem 6: Industrial Instrumentation	MDC	3	0	0	3	3
4.	21EI7601	Sem 7: Industrial data Communication	MDC	3	0	0	3	3
5.	21EI7602	Sem 7: Powerplant Instrumentation	MDC	3	0	0	3	3
6.	21EI8601	Sem 8: Industrial Automation	MDC	3	0	0	3	3

*MDC – Minor Degree Course

In addition to the above the following additional courses for Minor Degree can also be given to the student's common to all the branches.

Vertical I Fintech and Block Chain	Vertical II Entrepreneurship	Vertical III Environment and Sustainability
21CS5602-Financial Management	21BA5601-Foundations of Entrepreneurship	21CE5602-Sustainable infrastructure Development
Fundamentals of Investment	Introduction to Business Venture	Sustainable Agriculture and Environmental Management
Banking, Financial Services and Insurance	Team Building & Leadership Management for Business	Sustainable Bio Materials
Introduction to Blockchain and its Applications	Creativity & Innovation in Entrepreneurship	Materials for Energy Sustainability
Fintech Personal Finance and Payments	Principles of Marketing Management for Business	Green Technology
Introduction to Fintech	Human Resource Management for Entrepreneurs	Environmental Quality Monitoring and Analysis
	Financing New Business Ventures	

Vertical I

Fintech and Block Chain

S No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	21CS5601	Financial Management	MDC	3	0	0	3	3
2	21XXXX	Fundamentals of Investment	MDC	3	0	0	3	3
3	21XXXX	Banking, Financial Services and Insurance	MDC	3	0	0	3	3
4	21XXXX	Introduction to Blockchain and its Applications	MDC	3	0	0	3	3
5	21XXXX	Fintech Personal Finance and Payments	MDC	3	0	0	3	3
6	21XXXX	Introduction to Fintech	MDC	3	0	0	3	3

Vertical II

Entrepreneurship

S No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	21BA5601	Foundations of Entrepreneurship	MDC	3	0	0	3	3
2	21BA6601	Introduction to Business Venture	MDC	3	0	0	3	3
3	21BA6602	Team Building & Leadership Management for Business	MDC	3	0	0	3	3
4	21BA7601	Creativity & Innovation in Entrepreneurship	MDC	3	0	0	3	3
5	21BA7602	Principles of Marketing Management For Business	MDC	3	0	0	3	3
6	21BA8601	Human Resource Management for Entrepreneurs	MDC	3	0	0	3	3
7	21BA8602	Financing New Business Ventures	MDC	3	0	0	3	3

Vertical III

Environment and Sustainability

S No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	21CE5232	Sustainable infrastructure Development	MDC	3	0	0	3	3
2	21XXXX	Sustainable Agriculture and Environmental Management	MDC	3	0	0	3	3
3	21XXXX	Sustainable Bio Materials	MDC	3	0	0	3	3
4	21XXXX	Materials for Energy Sustainability	MDC	3	0	0	3	3
5	21XXXX	Green Technology	MDC	3	0	0	3	3
6	21XXXX	Environmental Quality Monitoring and Analysis	MDC	3	0	0	3	3

B.E (Hons) ELECTRONICS AND INSTRUMENTATION ENGINEERING

Vertical I IoT and Smart Sensors	Vertical II Process Control	Vertical III Industrial Automation
21EI5205 Introduction to Internet of Things	21EI5206 Instrumentation Practices in Industries	21EI5207 Drives and Control system for Automation
21EI6203 Principle of Sensors and Signal Conditioning	21EI6205 Adaptive control	21EI6207 Applied Industrial Instrumentation
21EI6204 Embedded systems for IoT	21EI6206 Advanced Process Control	21EI6208 Instrumentation in Building Automation
21EI7203 IoT for Industry Automation	21EI7205 Unit operation and control	21EI7207 Machine vision system
21EI7204 Optical sensors and photonics	21EI7206 Advanced Instrumentation Systems	21EI7208 SCADA systems and its applications
21EI8201 Smart Instrumentation	21EI8202 Industrial safety and Hazard Management	21EI8203 Technological Trends in Automation

Vertical I

B.E (Hons) Electronics and Instrumentation Engineering

with Specialization in IoT and Smart Sensors

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	21EI5205	Sem 5: Introduction to Internet of Things	PC	3	0	0	3	4	40	60	100
2.	21EI6203	Sem 6: Principle of Sensors and Signal Conditioning	PC	3	0	0	3	4	40	60	100
3.	21EI6204	Sem 6: Embedded systems for IoT	PC	3	0	0	3	4	40	60	100
4.	21EI7203	Sem 7: IoT for Industry Automation	PC	3	0	0	3	4	40	60	100
5.	21EI7204	Sem 7: Optical sensors and photonics	PC	3	0	0	3	4	40	60	100
6.	21EI8201	Sem 8: Smart Instrumentation	PC	3	0	0	3	4	40	60	100

Vertical II

B.E (Hons) Electronics and Instrumentation Engineering with Specialization in Process Control

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	21EI5206	Sem 5: Instrumentation Practices in Industries	PC	3	0	0	3	4	40	60	100
2.	21EI6205	Sem 6: Adaptive control	PC	3	0	0	3	4	40	60	100
3.	21EI6206	Sem 6: Advanced Process Control	PC	3	0	0	3	4	40	60	100
4.	21EI7205	Sem 7: Unit operation and control	PC	3	0	0	3	4	40	60	100
5.	21EI7206	Sem 7: Advanced Instrumentation Systems	PC	3	0	0	3	4	40	60	100
6.	21EI8202	Sem 8: Industrial safety and Hazard Management	PC	3	0	0	3	4	40	60	100

Vertical III

B.E (Hons) Electronics and Instrumentation Engineering

with Specialization in Industrial Automation

S.No	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	21EI5207	Sem 5: Drives and control system for Automation	PC	3	0	0	3	4	40	60	100
2.	21EI6207	Sem 6: Applied Industrial Instrumentation	PC	3	0	0	3	4	40	60	100
3.	21EI6208	Sem 6: Instrumentation in Building Automation	PC	3	0	0	3	4	40	60	100
4.	21EI7207	Sem 7: Machine vision system	PC	3	0	0	3	4	40	60	100
5.	21EI7208	Sem 7: SCADA systems and its Applications	PC	3	0	0	3	4	40	60	100
6.	21EI8203	Sem 8: Technological Trends in Automation	PC	3	0	0	3	4	40	60	100

Legends

BS – Basic Science Course

HS – Humanities and Social Science including Management Course

ES – Engineering Science Course

PC – Professional Core Course

PE – Professional Elective Course

OE – Open Elective Course

VA – Value Added Course

MC – Mandatory Course

EEC – Employability Enhancement Courses

CIA – Continues Internal Assessment

ESE – End Semester Examinations

SEMESTER-WISE CREDIT DISTRIBUTION

B.E. / B.TECH. PROGRAMMES										
S.No.	**Course Area**	**Credits per Semester**								**Total Credits**
		I	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	
1	HS	04	04	-	-	-	03	-	-	11
2	BS	10	10	04	04	-	-	-	-	28
3	ES	06	05	-	-	-	-	-	-	11
4	PC	-	03	16	17	19	12	12		79
5	PE	-	-	-	-	03	03	03	06	15
6	OE	-	-	-	-	-	03	03	-	06
7	EEC	-	-	-	-	02	03	02	08	15
	Total	**20**	**22**	**20**	**21**	**24**	**24**	**20**	**14**	**165**

CREDIT DISTRIBUTION R 2019

Semester	I	II	III	IV	V	VI	VII	VIII	**Total**
Credits	20	22	20	21	24	24	20	14	**165**

Chairman BoS

Dean Academics

Principal

Chairman - BoS
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PRINCIPAL
Hindusthan College Of Engineering & Technology
COIMBATORE - 641 032.

Department of Electronics and Instrumentation Engineering

SYLLABUS REVISION DETAILS FOR THE REGULATION 2019 with Amendment – 2021 BATCH - VII SEMESTER

S. NO	COURSE CODE/COURSE NAME	SUGGESTION BY EXPERTS	EXISTING CONTENT (IN THE AY2023-24 ODD)	REVISED CONTENT(FOR AY 2024-25 ODD)	TYPE OF REVISION DELETION/ INSERTION/ MODIFICATION	PERCENTAGE OF REVISION
NIL						
					Total Percentage Changes	NIL

New Course Introduced (Regulation 2019 with Amendment) – 2021 Batch - VII Semester

S.No	Regulation	Course code with Name	Credits
1.	2022	21EI7203 – IoT for Industry Automation	3
2.	2022	21EI7204 – Optical sensors and photonics	3
3.	2022	21EI7205 – Unit Operation and Control	3
4.	2022	21EI7206 – Advanced Instrumentation Systems	3
5.	2022	21EI7207 – Machine vision system	3
6.	2022	21EI7208 – SCADA systems and its Applications	3
7.	2022	21EI7601 – Industrial Data Communication	3
8.	2022	21EI7602 – Power plant Instrumentation	3

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SEMESTER – VII

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21EI7201	Computer Control of Process	3	0	0	3

Course Objective

1. Infer the basic concepts of sampled data control system
2. Interpret the response, design concepts and stability of sampled data system.
3. Discuss on process modeling and identification
4. Understand the concept of model based control.
5. Outline the fundamentals of multi variable control system

Unit	Description	Instructional Hours
I	**ELEMENTS OF COMPUTER PROCESS CONTROL - I** Review of conventional process control -Single loop computer control - Mathematical representation of the sampling process- Z-Transforms, Inverse Z transforms, methods -Pulse transfer functions – Data holds - Modified Z transforms.	9
II	**ELEMENTS OF COMPUTER PROCESS CONTROL – II** Open loop and closed loop response of sampled data system - Dead beat and Dahlin controller design - Stability of sampled data control systems: Jurys stability test and Schur cohn stability test- Design problems.	9
III	**PROCESS MODELLING AND IDENTIFICATION** Theoretical process modeling: Development, Examples, Parameter estimation and Validation. Parametric and non parametric models - Process Identification: Principle of empirical modeling - System identification: LSE, RLSE.	9
IV	**MODEL BASED COMPUTER CONTROL** Adaptive control principles: Scheduled adaptive control -Model reference adaptive control - Self adaptive- **Model based control:** Direct synthesis - First order systems - Model Predictive control - Internal model control (IMC) - Dynamic matrix control - Introduction to Fuzzy logic control.	9
V	**MULTI VARIABLE PROCESS CONTROL** Introduction to multi variable systems, Multi loop control, Pairing of inputs – Interaction analysis and single and multi loop design – Relative gain array(RGA) - Decoupler - Design of multivariable controller.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Summarize the need of computer in process industry.
CO2: Demonstrate the use of z transforms for signal processing applications.
CO3: Analyse and identify the linear and nonlinear process.
CO4: Design the model based controller for any process.
CO5: Explain the concepts of multivariable regulatory control

TEXT BOOKS:
T1 - P.B.Deshpandeand R.H.Ash,"Computer Process Control", International Society of Automation publication, USA,1995
T2 - Babatunde A.Ogunnaike and W.Harmon ray, "Process dynamics, modeling and control". Oxford university press, 1994.
REFERENCE BOOKS:
R1 –Shanthi Sasidharan, "Computer control of process", CBA Publishers, Third edition, 2015.
R2 – M.Chidambaram, "Computer control of processes", Narosa publishing house, 2006.
R3 – Dale Seborg. E. Thomas. F, Edgar, Duncan. A, Mellichamp, "Process Dynamics and Control",Willey India, 2006.
R4- Karl J Astrom and Bjorn Wittenmark, "Adaptive Control", Pearson Education Inc, Second Edition, 2008.
WEB REFERENCES:
1.https://nptel.ac.in/courses/103/106/103106149/
2.https://nptel.ac.in/courses/103/103/103103037/

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3	2	3	1	1	-	-	-	-	-	2	3	3
CO2	3	3	3	3	1	1	-	-	-	-	-	2	3	3
CO3	3	3	3	2	1	1	-	-	-	-	-	2	2	2
CO4	3	3	3	3	1	1	-	-	-	-	-	2	3	2
CO5	3	2	2	2	1	1	-	-	-	-	-	2	3	3
Avg	2.8	2.8	2.6	2.6	1	1	-	-	-	-	-	2	2.8	2.6

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21EI7202	Industrial Electronics	3	0	0	3

Course Objective	1. Discuss the operation of power semiconductor devices and their switching characteristics 2. Design controlled converter circuits. 3. Differentiate the operation of various chopper circuits. 4. Analyse the operation of inverter circuits for 120° mode and180° mode operation. 5. Classify AC to AC converter circuits based on its operation.

Unit	Description	Instructional Hours
I	**POWER SEMICONDUCTOR DEVICES** Power Diode, SCR, TRIAC, GTO, BJT, MCT, MOSFET, IGBT, Power Integrated Circuits(PIC's) - Static and Dynamic characteristics - Triggering and commutation circuit for SCR - Design of Driver and snubber circuit-protection circuits- Simulation tools.	9
II	**PHASE CONTROLLED CONVERTERS** 2 pulse, 3 pulse and 6 pulse converters - performance parameters - Effect of source inductance - Dual converters - steady state analysis-Introduction to matrix converters and cycloconverters.	9
III	**DC TO DC CONVERTER** Step down and step up chopper - control strategy - Commutation in choppers - Switched mode regulators - Buck, Boost, Buck- Boost converter - Resonant Converters and its topologies..	9
IV	**INVERTERS** Inverters Basics - PWM techniques - Single phase and Three Phase Voltage Source Inverters (120° mode and180° mode) - Current Source Inverter - Voltage and Harmonic Control - Space Vector Modulation techniques for inverters- introduction to multilevel inverters..	9
V	**DRIVES AND CONTROL** Static and Dynamic equations of dc and ac machines – Electrical breaking – Rectifier and chopper control of DC drives – Principles of v/f control of AC drives – Open loop and Closed loop schemes for DC and AC drives(Block diagram approach only) – Introduction to vector control of AC drives.	9
	Total Instructional Hours	**45**

Course Outcome	CO1: Outline the operation of power semiconductor devices and their switching characteristics. CO2: Illustrate the operation of power electronic rectifier circuits. CO3: Identify the appropriate chopper circuit for various applications. CO4: Choose the appropriate mode of operation of inverter. CO5: Compile the operation of AC to AC converters.

TEXT BOOKS:

T1 - M. H .Rashid, "Power Electronics: Circuits, Devices and Applications". Pearson Education, Fourth Edition, New Delhi, 2017.

T2 - P. S. Bhimbra "Power Electronics", Khanna Publishers, FourthEdition, 2017.

REFERENCE BOOKS:

R1 –Joseph Vithayathil, "Power Electronics, Principles and Applications", McGraw Hill ,7th Reprint, 2015.

R2 – Ned Mohan, Tore. M. Undel and, William. P. Robbins, "Power Electronics: Converters, Applications and Design", John Wiley and sons, Third Edition, 2018

R3 – M. D. Singh and K.B. Khanchandani, "Power Electronics," McGraw Hill India, 2014.

R4 - MS Jamil Asghar " Power Electronics", PHI Learning 2009.

WEB REFERENCE:

https://nptel.ac.in/courses/108/102/108102145/

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	2	3	1	1	-	-	-	-	-	2	3	3
CO2	3	3	3	3	1	1	-	-	-	-	-	2	3	3
CO3	3	3	3	2	1	1	-	-	-	-	-	2	3	2
CO4	3	3	3	3	1	1	-	-	-	-	-	2	3	2
CO5	3	2	2	2	1	1	-	-	-	-	-	2	3	3
Avg	2.8	2.6	2.6	2.6	1	1	-	-	-	-	-	2	3	2.6

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21EI7251	Bio-Medical Instrumentation	2	0	2	3

Course Objective	1. Recall fundamentals of human physiology. 2. Discuss about the Biopotential and its electrode. 3. Outline the recording and monitoring biomedical instruments. 4. Infer the basic principles in medical imaging techniques. 5. Generalize about life assisting and therapeutic devices.

Unit	Description	Instructional Hours
I	**HUMAN PHYSIOLOGY** Human Body Overview: Introduction. Cell, Body fluids - Musculoskeletal, Gastrointestinal, Endocrine system. Heart and circulatory system – The human respiratory system The human nervous system. **Identify and assemble the parts in Respiratory, Nervous, Circulatory, Musculoskeletal & Gastro intestinal system models.**	6+3
II	**BIO POTENTIALS AND BIOPOTENTIAL ELECTRODES** Sources of bio electric potential, EMG, ECG, ERG, EEG, Electrode Theory - Biopotential electrodes Body surface recording electrodes, Internal electrodes, Electrode arrays, Micro electrode **Electrical safety in medical environment: shock hazards, leakage current-Instruments for checking safety parameters of biomedical equipment. Identify and measure the signals from the biopotential electrodes.**	6+3
III	**RECORDING AND MONITORING INSTRUMENTS** Biomedical recorders – Patient monitoring systems – Arrhythmia and ambulatory monitoring instruments – Foetal monitoring instruments – Oximeters –Blood flowmeters – Cardiac output measurement – Pulmonary function analysers – Blood gas analyzers – Blood cell counters – Audiometers. **Experimental study of recording and monitoring of ECG or EMG or ERG or EEG.**	6+3
IV	**MODERN IMAGING SYSTEMS** X-ray machines and digital radiography –X-ray computed tomography – Nuclear medical imaging systems – Magnetic resonance imaging system- Ultrasonic Imaging systems – Thermal imaging systems. Retinal Imaging - Imaging application in Biometric systems. **Identification, inference & diagnostic study of imaging reports from X-Ray, Ultrasonic and Thermal Imaging systems.**	6+3
V	**THERAPEUTIC and ROBOTIC EQUIPMENTS** Cardiac pacemakers – Cardiac defibrillators – – Physitheraphy and electro theraphy equipment-Haemodialysis machines- Lithotriptors – – Ventilators – Radiotherapy equipment – Automatic drug delivery systems. ICCU patient monitoring system - Nano Robots - Robotic surgery **Field study report on certain Recording & Monitoring instruments, Imaging systems & Therapeutic equipments at Hospital.**	6+3
	Total Instructional Hours	**45**

Course Outcome	CO1: Summarize the concepts of physiology. CO2: Elaboration on biopotential and electrodes. CO3: Understand the measurement techniques of biomedical recording and monitoring instruments. CO4: Elaborate the basic principles in imaging techniques. CO5: Infer basic knowledge in life assisting and therapeutic devices.

TEXT BOOKS:

T1 - R.S.Khandpur, "Hand Book of Bio-Medical instrumentation", Tata McGraw Hill, 2011.

T2 - Joseph J.Carr and John M .Brown, "Introduction to Biomedical Equipment Technology", Fourth edition, Pearson Education Inc, 2013.

REFERENCE BOOKS:

R1 –John G.Webster, "Medical Instrumentation: Application and Design",3rd Edition, Wiley Pvt Ltd., 2008.

R2–Leslie cromwell, Fred J Weibell, Erich A.Pfeiffer., "Bio medical Instrumentation and Measurements", 2nd edition, PHI Learning Pvt Ltd, 2012.

R3 – Myer Kutz. "Standard Handbook of Biomedical Engineering & Design",Mc Graw Hill, 2003.

R4 -M.Arumugam, "Bio-Medical Instrumentation", 2nd edition, Anuradha Publications, 2015.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	2	3	1	1	-	-	-	-	-	2	2	3
CO2	3	3	3	3	1	1	-	-	-	-	-	2	2	3
CO3	3	3	3	2	1	1	-	-	-	-	-	2	3	2
CO4	3	3	3	3	1	1	-	-	-	-	-	2	3	2
CO5	2	2	2	2	1	1	-	-	-	-	-	2	3	3
Avg	2.6	2.6	2.6	2.6	1	1	-	-	-	-	-	2	2.6	2.6

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21EI7001	Computer Control of Process Laboratory	0	0	3	1.5

Course Objective

1. Simulation of the linear systems for various physical processes.
2. Design and simulate the computer based controller algorithms.
3. Categorized response of computer control for liquid and thermal systems.
4. Outline the basic PLC programming logic with timers and counters
5. Be familiar with applications of PLC Programming.

Expt. No.	Description of the Experiments
1.	Digital Simulation of Linear system.
2.	Simulate the response of the following discrete system a. First Order Discrete System With and Without Dead time. b. Second Order Discrete System With and Without Dead time.
3.	Design and simulation of Dead beat controller algorithms.
4.	Design and simulation of Dahlin's controller algorithms.
5.	Design of Lag and Lead Compensator using Bode Plot.
6.	Design and simulation of IMC/MPC structure for higher order systems.
7.	Design and simulation the response of a system with and without fuzzy logic controller.
8	Response of computer controlled liquid level system with PID algorithm.
9.	Response of computer controlled thermal system with PID algorithm.
10.	Programming for pneumatic stamping control system using PLC.
11.	Programming for Chemical Mixing Process and Bottle filling system using PLC.
12.	Programming for spray painting system using PLC.

Total Practical Hours 45

Course Outcome

CO1: Compare various linear system simulated responses.
CO2: Evaluate the discrete controller parameters using different tuning process.
CO3: Compile various discrete controller algorithms for different systems.
CO4: Practice of basic PLC programming using ladder diagram.
CO5: Demonstrate PLC based control applications and it's working in real time.

REFERENCES:

R1-George Stephanopoulos, Chemical Process Control: An Introduction to theory and Practice, Pearson Education, 2008
R2- Laboratory manual prepared by the Department of Electronics and Instrumentation Engineering, 2017.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	2	3	2	1	-	-	2	-	-	2	3	3
CO2	3	3	3	3	2	1	-	-	2	-	-	2	3	3
CO3	3	3	3	2	2	1	-	-	2	-	-	2	3	2
CO4	3	3	3	3	2	1	-	-	2	-	-	2	3	2
CO5	3	2	2	2	2	1	-	-	2	-	-	2	3	3
Avg	2.8	2.6	2.6	2.6	2	1	-	-	2	-	-	2	3	2.6

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21EI7002	Instrumentation System Design Laboratory	0	0	3	1.5

Course Objective	1. To gain knowledge in designing electronic circuits. 2. To predict the performance of various instruments. 3. To design appropriate controller for various instruments.

Expt. No.	Description of the Experiments
1.	Design of Instrumentation Amplifier
2.	Design of Active Filters a. Low Pass and High Pass b. Band Pass and Band Reject
3.	Design of Regulated Power Supply
4.	Design of V/I And I/V Converters
5.	Design of a. Linearizing Circuits for Thermocouple. b. Cold Junction Compensation Circuit for Thermocouple.
6.	Design of Signal Conditioning Circuit for a. Strain Gauge. b. RTD.
7.	Design of Orifice Plate and Rotameter.
8	Design of Control Valve Flow Lift Characteristics(with and without positioner)
9.	Design of PID Controller (Using Operational Amplifier)
10.	Design of A Multi Channel Data Acquisition System
11.	Design of Multi Range DP Transmitter
12.	Characteristics of Control Valve Sizing

Total Practical Hours 45

Course Outcome	CO1 : Design various types of filter circuits and amplifiers. CO2 : Suggest a suitable power supply circuit. CO3 : Able to analyse the performance of thermocouple, strain gauge and RTD. CO4 : Plot the performance of control valve. CO5 : Design a data acquisition system.

REFERENCES:

R1-Gregory K Mc Millan Douglas M Considine, —Process/ Industrial Instruments and Controls Handbook, Tata McGraw Hill, 2009.

R2- Laboratory manual prepared by the Department of Electronics and Instrumentation Engineering, 2017.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	2	3	1	1	-	-	2	-	-	2	3	3
CO2	3	3	3	3	1	1	-	-	2	-	-	2	3	3
CO3	3	3	3	2	1	1	-	-	2	-	-	2	3	2
CO4	3	3	3	3	1	1	-	-	2	-	-	2	3	2
CO5	3	2	2	2	1	1	-	-	2	-	-	2	3	3
Avg	2.8	2.6	2.6	2.6	1	1	-	-	2	-	-	2	3	2.6

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21EI7901	Project Work - Phase I	0	0	4	2

Course Objectives	1. Apply a gained knowledge and methodology to select a good project and able to work in a team. 2. Transform the ideas behind the project into a product. 3. Validate the technical report.

A candidate shall be permitted to work on projects in an Industrial / Research Organization, on the recommendations of the Head of the Department concerned.

A project must be selected either from research literature published list or the students themselves may propose suitable topics in consultation with their guide.

The aim of the project work is to strengthen the comprehension of principles by applying them to a new problem which may be the design and manufacture of a device, a research investigation or a design problem.

The project work shall be supervised by a supervisor of the department, (and an expert in industry if it is a industrial project), and the student shall be instructed to meet the supervisor periodically and to attend the review committee meeting for evaluation of the progress.

In case of candidates not completing Phase-I of project work successfully, the candidates can undertake Phase-I again in the subsequent semester. In such cases the candidates can enroll for Phase-II, only after successful completion of Phase-I.

The Project report shall be prepared and submitted according to the approved guidelines as given by the Controller of Examination and bonafied duly signed by Supervisor and the Head of the Department.

Course Outcome	CO1: Realize the skills acquired in the previous semesters to solve complex engineering problems. CO2: Develop an innovative model / prototype of an idea related to the field of specialization. CO3: Create the work individually to identify, troubleshoot and build products for environmental and Societal issues. CO4: Create effective presentation of ideas with clarity. CO5: Evaluate surveys towards developing a product which helps in life time learning.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	2	3	1	2	-	-	2	2	2	2	3	3
CO2	2	3	3	3	1	2	-	-	2	2	2	2	2	3
CO3	3	3	3	2	1	2	-	-	2	2	2	2	3	2
CO4	3	3	3	3	1	2	-	-	2	2	2	2	2	2
CO5	3	2	2	2	1	2	-	-	2	2	2	2	2	3
Avg	2.6	2.6	2.6	2.6	1	2	-	-	2	2	2	2	2.4	2.6

1-Low, 2-Medium, 3-High, "-" No correlation

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Professional Elective III

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21EI7301	Non-Linear Control System	3	0	0	3

Course Objective	1. Understand the common non-linearities which exist among all the systems. 2. Generalise describing function based approach of non-linear analysis. 3. Explain about Lyapunov Theory and it's methods 4. Discover on Linearization schemes on SISO, MIMO systems. 5. Highlight on Sliding Mode Control.

Unit	Description	Instructional Hours
I	**INRODUCTION TO NON-LINEAR CONTROLTHEORY** Linear versus nonlinear systems - Common Nonlinear behavior, Examples - Types of Nonlinearities - Autonomy - Equilibrium points of nonlinear systems, Feedback Linearization, Series Approximation Methods.	9
II	**DESCRIBING FUNCTION** Describing function analysis: Fundamentals, common nonlinearities (saturation, dead - zone, on - off Non - linearity, backlash, hysteresis) and their describing functions. Compensation and design of nonlinear system using describing function, Limit Cycle.	9
III	**LYAPUNOV THEORY** Lyapunov's stability, concept, Lyapunov's Direct Method - Positive definite Functions and Lyapunov Functions - Krasovski's Method - Variable Gradient Method - Control Design based on Lyapunov's Direct Method.	9
IV	**FEEDBACK LINEARIZATION** Feedback Linearization and the Canonical Form - Mathematical Tools-Input - State Linearization of SISO Systems - input-Output Linearization of SISO Systems - Generating a Linear Input - Output Relation–Stabilization and Tracking - Feedback Linearization of MIMO Systems.	9
V	**SLIDING MODE CONTROL** Sliding Surfaces - Continuous approximations of Switching Control laws - The Modeling and Performance Trade-Offs - MIMO Systems – examples. Case Study - Sliding mode approach to speed control of dc motors, applications.	9
	Total Instructional Hours	**45**

Course Outcome	CO1:	Classify the linear/non-linear system theory and their types.
	CO2:	Understand and analyze the various non-linear systems with describing functions.
	CO3:	Appraise the stability for various nonlinear functions using lyapunov method.
	CO4:	Design the SISO, MIMO system with feedback linearization.
	CO5:	Implement sliding mode control approach to various non-linear applications

TEXT BOOKS:

T1 - Katsuhiko Ogata, "Modern Control Engineering", Pearson Education, 5th Edition 2010.
T2 -Torkel Glad and Lennart Ljung, "Control Theory – Multivariable and Nonlinear Methods", Taylor & Francis, 2002.

REFERENCE BOOKS:

R1 - Jean-Jacques E. Slotine, Weiping Li, "Applied nonlinear Control", Prentice Hall of India , 2004.
R2 - Richard C Dorf and Robert H Bishop, "Modern Control Systems," 11th Edition, Pearson,2008.
R3 - A.Nagoor Kani, "Advanced Control System", 2nd Edition, RBA publications, 2014.

WEB REFERENCE:

https://nptel.ac.in/courses/108/106/108106024/

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	2	3	1	1	-	-	-	-	-	2	3	3
CO2	3	3	3	3	1	1	-	-	-	-	-	2	3	3
CO3	3	3	3	2	1	1	-	-	-	-	-	2	3	2
CO4	3	3	3	3	1	1	-	-	-	-	-	2	3	2
CO5	3	2	2	2	1	1	-	-	-	-	-	2	3	3
Avg	2.8	2.6	2.6	2.6	1	1	-	-	-	-	-	2	3	2.6

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21EI7302	Industrial IoT	3	0	0	3

Course Objective	1. Outline the basic concepts of Industrial Internet of Things. 2. Illustrate the different network technologies and protocols. 3. Educate the concepts of middleware components. 4. Relate the security and privacy issues in IIoT. 5. Interpret IIoT and Cyber manufacturing systems.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Introduction – Industrial Internet use -cases - Technical and business innovators of the industrial - internet – IIoT reference architecture – Industrial Internet Architecture Framework (IIAF)- Functional View point – Three -Tier topology – Key function characteristics.	9
II	**NETWORK TECHNOLOGY AND PROTOCOLS** Proximity network – WSN Edge Node – Legacy Industrial Protocols – Modern communication protocols – wireless communication technologies - Single Node Architecture – Hardware Components,Network delay modeling– Gateways – Access Network.	9
III	**IIoT MIDDLEWARE CONCEPTS** Middle ware Transport protocols : TCP/IP, UDP,RTP CoAP – Middleware software patterns-Publish/Subscribe pattern: MQTT,XMPP,AMQP,DDS,DTN - Middleware platforms – IIoT WAN technologies.	9
IV	**SECURITY AND PRIVACY IN IIoT** Security analysis and advanced threats – Secured Interconnection mechanisms – Advanced Protection techniques – Privacy issues in Industrial connected networks – Application Scenarios.	9
V	**IIOT AND CYBER MANUFACTURING SYSTEMS** Industrial Cyber-Physical Systems – Modelling for CPS and CMS – Architectural Design Patterns for CMS and IIoT – User Driven CPS – IIoT in healthcare, power plant and process industries.	9
	Total Instructional Hours	**45**

Course Outcome	CO1: Summarize the basic concepts of IIoT. CO2: Explain the different network technologies and protocols. CO3: Describe about the middleware patterns and platforms. CO4: Interpret the security and privacy issues in IIoT. CO5: Recognize the pattern for IIoT and Cyber Manufacturing Systems.

TEXT BOOKS:

T1 - Alasdair Gilchrist, "Industry 4.0- The Industrial Internet of Things", Apress, First Edition, 2016.

T2 - Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat, "Industrial Internet of Things – Cyber manufacturing Systems", Springer- Series in wireless Technology, 2017.

REFERENCE BOOKS:

R1 - Cristina Alcaraz, "Security and Privacy Trends in the Industrial Internet of Things", Springer – Advanced Sciences and Technologies for security applications, 2019

R2 - Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", First Edition, CRC Press, 2013.

R3 - Andrian McEwen, Hakim Cassimally, "Designing the Internet of Things", First Edition, John Wiley &Sons Ltd,2014.

WEB REFERENCES:

1.https://nptel.ac.in/courses/106/105/106105166/

2.https://nptel.ac.in/courses/106/105/106105195/

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	2	3	1	1	1	-	-	-	-	2	3	3
CO2	3	3	3	3	1	1	1	-	-	-	-	2	3	3
CO3	3	3	3	2	1	1	1	-	-	-	-	2	3	2
CO4	3	3	3	3	1	1	1	-	-	-	-	2	3	2
CO5	3	2	2	2	1	1	1	-	-	-	-	2	3	3
Avg	2.8	2.6	2.6	2.6	1	1	1	-	-	-	-	2	3	2.6

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21EI7303	Robotics and Automation	3	0	0	3

Course Objective

1. Infer the fundamentals of robotics.
2. Recall the concepts of sensors and vision system.
3. Outline the working of robot dynamics and grippers.
4. Write program for developing a robot.
5. Enumerate robotics applications and its principles..

Unit	Description	Instructional Hours
I	**INTRODUCTION TO ROBOTS** Origin & various generation of robot – Laws of robots - Robotic System Components - Classification of robots – Need of sensors in robots - Degree of freedom – End effectors – Robotic manipulators - Need for automation – types of automation - robot part's and their functions- need for robots-applications.	9
II	**ROBOT KINEMATICS** Forward kinematics, inverse kinematics and the difference: forward kinematics and inverse Kinematics of Manipulators with two, three degrees of freedom (in 2 dimensional), four degrees of freedom (in 3 dimensional) – Trajectory planning – Robot Dynamics - Homogeneous transformation matrices, translation and rotation matrices Dennavit and Hartenberg transformation.	9
III	**ROBOT DRIVE SYSTEMS AND END EFFECTORS** Pneumatic Drives – Hydraulic Drives – Mechanical Drives – Electrical Drives – D.C. Servo Motors, Stepper Motor, A.C. Servo Motors – Salient Features, Applications and Comparison. Various Control schemes of robots - End Effectors – Grippers – selection and design considerations of a gripper - gripper force calculation and analysis.	9
IV	**SENSORS IN ROBOTICS** Force sensors, touch and tactile sensors, proximity sensors, non-contact sensors, safety considerations in robotic cell, proximity sensors, Robotic Machine vision system - camera, frame grabber, sensing and digitizing image data – signal conversion, image storage, lighting techniques, image processing and analysis – data reduction, segmentation, feature extraction, object recognition, applications – Inspection, identification, visual serving and navigation.	9
V	**PROGRAMMING AND APPLICATIONS OF ROBOT** Teach pendant programming, lead through programming, robot programming languages – VAL programming – Motion Commands, Sensors commands, End-Effectors Command, and simple programs - Intelligent Robots - Role of robots in inspection, assembly, material handling, underwater, space and medical fields.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Illustrate the fundamentals of robots.
CO2: Apply knowledge on sensors and robotic vision system.
CO3: Develop robots with differential motion and control.
CO4: Build programs for robots in various applications.
CO5: Familiarize on Various Robotic programming and applications.

TEXT BOOKS:

T1 -M.P.Groover, M.Weiss, R.N. Nageland N. G.Odrej, "Industrial Robotics", McGraw-Hill,1996.
T2 - Deb S R and Deb S, —Robotics Technology and Flexible Automation‖, Tata McGraw Hill Pvt. Ltd, 2010.

REFERENCE BOOKS:

R1 - D.K. Pratihar, "Fundamentals of Robotics", Narosa Publishing House, New Delhi ,2017
R2 - K.S Fu, R.C Gonzalez, C.S.G Lee, " Robotics", McGraw-Hill 1987.
R3 - Ghosh, "Control in Robotics and Automation: Sensor Based Integration", Allied Publishers,1999.
R4 – J.J Craig, "Introduction to Robotics", Addison-Wesley 1986.

WEB REFERENCE:

https://onlinecourses.nptel.ac.in/noc20_me56/preview

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	2	3	1	1	-	-	-	-	-	2	2	3
CO2	3	3	3	3	1	1	-	-	-	-	-	2	2	3
CO3	3	3	3	2	1	1	-	-	-	-	-	2	3	2
CO4	3	3	3	3	1	1	-	-	-	-	-	2	3	2
CO5	3	2	2	2	1	1	-	-	-	-	-	2	2	3
Avg	2.8	2.6	2.6	2.6	1	1	-	-	-	-	-	2	2.4	2.6

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21E17304	Microcontroller Based System Design	3	0	0	3

Course Objective

1. Infer the fundamental components of the PIC microcontroller.
2. Educate the PIC micro controller Interrupts and Timers.
3. Integrate the concept of peripherals and interfacing of microcontroller-based embedded systems.
4. Propose the architecture of arm processor
5. Introduce the concept of arm organization

Unit	Description	Instructional Hours
I	**INTRODUCTION TO PIC MICROCONTROLLER** Introduction to PIC Microcontroller – PIC 16C6x and PIC16C7x Architecture – PIC16cxx – Pipelining - Program Memory considerations – Register File Structure - Instruction Set - Addressing modes – Simple Operations.	9
II	**INTERRUPTS AND TIMER** PIC micro controller Interrupts -- External Interrupts – Timers – Timer modules – Front panel I/O-Soft Keys – State machines and key switches – Display of Constant and Variable strings.	9
III	**PERIPHERALS AND INTERFACING** I^2C Bus for Peripherals Chip Access – Bus operation-- Bus subroutines – Serial EEPROM – Baud rate selection – LCD and keyboard Interfacing – ADC – DAC -- and Sensor Interfacing.	9
IV	**INTRODUCTION TO ARM PROCESSOR** ARM Architecture – ARM programmer's model – ARM Development tools -- Memory Hierarchy – ARM Assembly Language Programming – Simple Examples – Architectural Support for Operating systems.	9
V	**ARM ORGANIZATION** 3-Stage Pipeline ARM Organization – 5 Stage Pipeline ARM Organization – ARM Instruction Execution -- ARM Implementation – ARM Instruction Set – ARM coprocessor interface – Embedded ARM Applications	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Understand the working of the architecture for PIC microcontrollers
CO2: Identify the factors for data transfer in interrupts and understand the timer function of PIC microcontroller
CO3: Observe the peripherals and interfacing of microcontroller-based embedded systems.
CO4: Interpret the ARM Architecture and Assembly Language Programming
CO5: Employ the role of arm organization

TEXT BOOKS:

T1 -Peatman,J.B., "Design with PIC Micro Controllers"PearsonEducation,3rdEdition, 2004.
T2 - Furber,S., "ARM System on Chip Architecture" Addison Wesley trade Computer Publication, 2000.

REFERENCE BOOKS:

R1 - Mazidi, M.A.,"PIC Microcontroller" Rollin Mckinlay, Danny causey Printice Hall of India, 2007.
R2-Ajay V.Deshmukh, "Microcontroller - Theory and application".PHI 2002.
R3 - Valder – Perez, "Microcontroller – Fundamentals and Applications with Pic," Yeesdee Publishers, Tayler & Francis, 2013.
R4-C.Ravichandran. M. Arulaalan, "Microcontroller Based System Design," Suchitra Publications. 2016.

WEB REFERENCES:

1. https://nptel.ac.in/courses/106/105/106105193/
2. https://nptel.ac.in/courses/108/102/108102045/

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	2	3	1	1	-	-	-	-	-	2	3	3
CO2	3	3	3	3	1	1	-	-	-	-	-	2	3	3
CO3	3	3	3	2	1	1	-	-	-	-	-	2	3	2
CO4	3	3	3	3	1	1	-	-	-	-	-	2	3	2
CO5	3	2	2	2	1	1	-	-	-	-	-	2	3	3
Avg	2.8	2.6	2.6	2.6	1	1	-	-	-	-	-	2	3	2.6

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21EI7305	Neural Networks and Fuzzy Systems	3	0	0	3

Course Objective

1. Introduce about neural networks for pattern classification and association.
2. Classify on various neural network.
3. To learn about fuzzy systems.
4. Gain knowledge about fuzzy logic control design.
5. Build application on neural networks and fuzzy systems.

Unit	Description	Instructional Hours
I	**NEURAL NETWORKS – I** Artificial neural network (ANN): Introduction, fundamental concept, basic models of ANN, terminologies, McCulloch pitts neuron, Linear seperability, Hebb Network. Supervised learning Network: Perceptron networks, Adaline, back propagation network, radial basis function network.	9
II	**NEURAL NETWORKS - II** Associative memory networks: Training algorithms for pattern association. Auto associative, Hetero associative, Bidirectional associative memories- Hopfield and iterative auto associative memory networks. Unsupervised Learning networks: Fixed weight competitive nets, Kohenen self organizing feature map, Counter propagation network, Adaptive resonance theory network.	9
III	**FUZZY SYSTEMS- I** Introduction to fuzzy logic, classical sets, fuzzy sets. Classical relations and fuzzy relations-Tolerance and equivalence relation. - Membership functions – Defuzzification.	9
IV	**FUZZY SYSTEMS -II** Fuzzy arithmetic and fuzzy measures- Fuzzy rule base and approximate reasoning - Fuzzy decision making - Fuzzy logic control systems.	9
V	**APPLICATIONS OF FUZZY LOGIC AND NEURAL NETWORKS** Engineering and miscellaneous applications of fuzzy: Civil, mechanical, industrial, computer, robotics, medicine and economics. Neural network for pattern classification and pattern association.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Infer the concepts of artificial neural networks.
CO2: Summarize the various neural networks architectures and its training algorithms
CO3: Discover the concept of fuzzy logic set theory.
CO4: Implement the fuzzy mechanism for suitable control problems.
CO5: Design the neural network/fuzzy logic control for real time applications.

TEXT BOOKS:

T1 – Laurene V. Fausett, "Fundamentals of Neural Networks:Architectures, algorithms and applications", Pearson Education, New Delhi, 2004.
T2 - Timothy J Ross, "Fuzzy Logic with Engineering Applications", John Willey and Sons, 2005.

REFERENCE BOOKS:

R1 – S.N.Sivanandam, S.N Deepa., "Principles of soft computing" ,2nd edition, Wiley India Pvt Ltd , 2013.
R2 – George J.Klir, Bo.Yuan, "Fuzzy Sets and Fuzzy logic: Theory and Applications", PHI,2012
R3 - Zimmerman H.J., "Fuzzy set theory and its Applications", Allied Publishers, 2001.
R4 - Jack M. Zurada, "Introduction to Artificial Neural Systems", PWS Publishing Co, 2002.

WEB REFERENCE :

https://nptel.ac.in/courses/127/105/127105006

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	2	3	1	1	-	-	-	-	-	2	2	3
CO2	3	3	3	3	1	1	-	-	-	-	-	2	2	3
CO3	3	3	3	2	1	1	-	-	-	-	-	2	2	2
CO4	3	3	3	3	1	1	-	-	-	-	-	2	3	2
CO5	3	2	2	2	1	1	-	-	-	-	-	2	2	3
Avg	2.8	2.6	2.6	2.6	1	1	-	-	-	-	-	2	2.2	2.6

1-Low, 2-Medium, 3-High, "-" No correlation

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Open Elective

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21EI7401	Introduction to Programmable Logic Controllers	3	0	0	3

Course Objective	1. Understand the basics of PLC and its components. 2. Impart knowledge on developing PLC logical programs for various conditions. 3. Gain knowledge on various PLC instruction sets. 4. Establish the communication protocols used in PLC's. 5. Outline the importance on PLC and SCADA for industrial automation

Unit	Description	Instructional Hours
I	**INTRODUCTION TO PLC** History of Programmable Logic controller – need for PLC – PLC sizes - modular and fixed PLC – PLC architecture – Hardware components : input and output modules(Analog and digital I/O) – power supply – PLC memory - PLC wiring diagram – Latching relays.	9
II	**PROGRAMMING OF PLC** Basics of PLC programming – types: Ladder logics(LD),Functional block diagram(FBD),Sequential function chart(SFC),Structured Text(ST) and Instruction List(IL) . PLC Timers: ON Delay, OFF Delay and Retentive Timers- Counters: UP Counter, DOWN Counter and UP DOWN Counters - ladder examples.	9
III	**PLC INSTRUCTIONS** Program control instructions – Data handling and Data manipulation instructions - Math instructions - Sequencer and shift register – program subroutines - motor controls - programming examples	9
IV	**COMMUNICATION AND NETWORKING** PLC communication ports – serial communications – RS232 – standard requirements – communication between several PLCs – PLC field bus – Profibus – PLC troubleshooting - Introduction to Supervisory control and data acquisition systems (SCADA) and DCS. (Qualitative treatment only).	9
V	**PLC APPLICATIONS AND AUTOMATION** PLC traffic light control – stepper motor control – Elevator control – Bottle filling system – Pneumatic Stamping system – PLC in process control systems. Need for automation in industries – FMS – Role of PLC and SCADA in industrial automation.	9
	Total Instructional Hours	45

Course Outcome	CO1: Describe the architecture of PLCs with the analogy of relay logic components. CO2: Develop the ladder logic program for any applications. CO3: Characterize the different instructions available in PLC and implement them. CO4: Classify the communication protocols used in PLC and to establish network with other systems. CO5: Summarize the impact on PLC and SCADA for various industrial automation processes.

TEXT BOOKS:

T1 - Frank D. Petruzella, "Programmable Logic Controllers", McGraw-Hill Companies, 3rd Edition, 2013.

T2 - John W. Webb and Ronald A.Reis, "Programmable Logic Controllers – Principles and Applications", Prentice Hall Inc., New Jersey, 3rdEdition, 1995.

REFERENCE BOOKS:

R1 – John R. Hackworth and Frederick D. Hackworth Jr, "Programmable Logic Controllers", Pearson Education, New Delhi, 2004.

R2 - David Bailey, Edwin Wright, "Practical SCADA for Industry", Elsevier, 2003.

R3 - W. Bolton, "Programmable logic controllers", Elsevier Ltd, 2015

R4- R KRajput, "Robotics and Industrial Automation", S Chand Publishers, Revised edition 2014.

WEB REFERENCE:

https://nptel.ac.in/courses/112/102/112102011

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	2	3	1	1	-	-	-	-	-	2	3	3
CO2	3	3	3	3	1	1	-	-	-	-	-	2	2	3
CO3	3	3	3	2	1	1	-	-	-	-	-	2	2	2
CO4	3	3	3	3	1	1	-	-	-	-	-	2	3	2
CO5	3	2	2	2	1	1	-	-	-	-	-	2	3	3
Avg	2.8	2.6	2.6	2.6	1	1	-	-	-	-	-	2	2.6	2.6

1-Low, 2-Medium, 3-High, "-" No correlation

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LIFE SKILL COURSES – OPEN ELECTIVE

Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech.	21LS6401	General Studies for Competitive Examinations	2	1	0	3

Course Objectives	1. To provide awareness to the students about higher education entrance exams and various types of jobs offered both in the Central and State Government.(CAT, GMAT, GRE, IBPS, IELTS, UPSC, SSC, RRB, TNPSC, GATE, IES, TNEB, AFCAT, DRDO, ISRO, INCOME TAX,LIC...) 2. To help the students to choose the area where they are interested. 3. To develop competitive skills through various types of objective tests. 4. To train them by conducting aptitude test based on verbal and quantitative skills.

UNIT	DESCRIPTION	INSTRUCTIONAL HOURS
I	NUMERICAL ABILITY Simplification and Approximation – Algebra – Number System- Averages – Ratio andProportion – Partnership – Allegation or Mixture – Problem on Ages - Percentages - Profitand Loss – Time and Work – Pipes and Cisterns – Time, Speed and Distance – Problems on Trains .Boats and Streams - Permutation and Combination- Probability- DataInterpretation- Simple Interest and Compound Interest – Geometry , Trigonometry andMensuration – Progressions.	18
II	REASONING ABILITY Alphanumeric series - Reasoning Analogies – Coding-Decoding – Blood Relations -Directions – Calendars –Clocks – Data Sufficiency – Deductive Reasoning - Input-Output – Order & Ranking – Seating Arrangements –Visual Reasoning – Cubes and cuboids -Critical Reasoning – Syllogism – Venn Diagram – Puzzles.	10
III	LANGUAGE COMPETENCY Reading Comprehensions – Cloze Test – Sentence Completion – Match the Columns –Error Detection – Jumbled word/Paragraphs – Vocabulary& Grammar – One Word Substitution – Idioms and Phrases – Antonyms and Synonyms – Sentence Correction –Misfit/Out of Context sentence.	10
IV	COMPUTER ACQUAINTANCESHIP Internet – Memory – Keyboard Shortcuts – Computer Abbreviation – Microsoft Office –Computer Hardware – Computer Software – Operating System – Networking – Computer Fundamentals /Terminologies.	3
V	GENERAL AWARENESS Geography – Culture – History – Economic Science – Scientific Research – General Policy– Awards and Honours – Books and Authors – Static GK - Current Affairs	4
	Total Instructional Hours	45

Course Outcomes	Upon completion of the course, students can be able to CO1: Thinking critically and applying basic mathematics skills to interpret data, draw conclusions, and solve problems; developing proficiency in numerical reasoning; Application of quantitative reasoning in aptitude tests. CO2: The ability to identify and define problems/issues, recognizing their complexity, andconsidering alternative viewpoints and solutions to use the critical skills of observation, analysis, evaluation. CO3: Understanding and reasoning using concepts framed in words; Critical verbal reasoning; Reading Comprehension; Application of verbal reasoning in aptitude tests. CO4: Students will possess the basic understanding of computer hardware and software, utilizing web technologies, basic understanding of network principles, Keyboard Shortcuts and various Operating System. CO5: Students will be updated with awareness and knowledge regarding the occurrences around the world.

REFERENCES BOOKS:

R1: Quantitative Aptitude for Competitive Examinations – AbhijithGuptha

R2: The Pearson Guide to Quantitative Aptitude - Dinesh Khattar

R3: Analytical Reasoning and Logical Reasoning- Peeyush Bharadwaj R4: A New Approach to Reasoning - B.S. Sijwali& S. SijwaliArihant R5: Word Power made easy - Norman Lewis

R6: Verbal Ability & Reading Comprehension for the CAT – Arun Sharma, Meenakshi Upadhyay - Mcgraw-hill Education

R7: Computer Awareness - Arihant Publication

R8: General Knowledge and General Awareness - ArihantManhar Pandey

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Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech.	21LS6402	Human rights, Women rights and Gender Equality	3	0	0*	3

Course Objectives

1. To sensitize the Engineering students to various aspects of Human Rights
2. To make them understand the world level perspective related to Human Rights
3. To identify the constitutional rights of women
4. To understand the various political rights and laws related to women
5. To understand the gender equality concepts

UNIT	DESCRIPTION	INSTRUCTIONAL HOURS
I	**Introduction** Human Rights – Evolution of the concept of Human Rights - Meaning, origin and Development. Notion and Classification of Rights – Natural, Moral and Legal Rights, Civil and Political rights. Economic, Social and Cultural Rights - Theories of Human Rights - Philosophical foundations of Human Rights	9
II	**Human Rights national and international perspective** Human Rights in India – Constitutional Provisions / Guarantees – Redressal Mechanisms at National and International levels – Constitutional Remedies and Directions of state policy - Geneva Convention of 1864. Universal declaration of Human Rights, 1948. UN agencies to monitor and compliance – UNHRC (United Nations Human Rights Commission)	9
III	**CONSTITUTIONAL RIGHTS OF WOMEN IN INDIA** Indian constitution relating to women - Fundamental rights - Directive principles of state policy - right to equality - rights against exploitation, the right to constitutional remedy - University Declaration of Human Rights - Enforcement of Human Rights for Women and Children - Role of Cells and Counseling Centers - Legal AID cells, Help line, State and National level Commission	9
IV	**POLITICAL RIGHTS OF WOMEN IN INDIA AND LAWS** Political Rights of Women in India - Electoral process - women as voters - candidates and leader - pressure group, Representation of women in local self government – women in Rural and urban local bodies – Reservation of women – Laws against violence & Sexual crimes: eve teasing – rape - indecent representation of women - immoral trafficking	9
V	**GENDER EQUALITY** Gender roles: Biological vs cultural determinism – Private vs public dichotomy – Gender division of labour and asymmetric role structure Gender role socialization and formation of identity –Occupational segregation and wage discrimination – Gender stereotyping in work place – Human development indicators and gender disparity	9
	Total Instructional Hours	**45**

Course Outcomes

Upon completion of the course, students can be able to

CO1: Engineering students will have the basic knowledge of human rights
CO2: Initiates the students to know the various national and international perspectives of human rights
CO3: Gives an orientation on the various rights of women
CO4: Makes them to understand the role of women in politics
CO5: Provides a direction on gender equalities

TEXT BOOKS

1. Kapoor S.K, "Human Rights under International Law and Indian Laws", Central Agency, 2014
2. ArunaGoel. (2004). "Violence and Protective Measures for Women Development and Empowerment". Deep & Deep, New Delhi.

REFERENCES BOOKS:

1. Chandra U "Human Rights" Allahabad Law Agency, Allahabad 2014
2. UpandraBaxi "The Future of Human Rights, Oxford Univeristy Press, New Delhi
3. Menonnivedita (2004). "Recovering Subversion: Feminist Politics beyond the Law". Permanent Black, Delhi.
4. Cornick, J.C. and Meyers, M.K. (2009) Gender Equality: Transforming Family Divisions of Labor. New York: Version.

Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech.	21LS6403	Indian Ethos and Human Values	3	0	0	3

Course objectives

1. To learn about Indian ethos and its importance today
2. To know about business concepts and philosophies from various perspectives.
3. To know the Indian philosophical system of knowing oneself.
4. To understand values and its significance.
5. To know ethics from western and Indian perspective.

UNIT	DESCRIPTION	INSTRUCTIONAL HOURS
I	**INDIAN ETHOS** Indian Ethos – Models of management in Indian socio-political environment. Indian work ethos and principles of Indian Management – Goals of Life- Teachings of important Indian Spiritual leaders..	9
II	**BUSINESS CONCEPTS AND PHILOSOPHIES** Economics of giving - Western economic system. Developing and implementing gross national happiness - Sabbath economics - Islamic economics and Banking	9
III	**CONSTITUTIONAL RIGHTS OF WOMEN IN INDIA** Indian constitution relating to women - Fundamental rights - Directive principles of state policy - right to equality - rights against exploitation, the right to constitutional remedy - University Declaration of Human Rights - Enforcement of Human Rights for Women and Children - Role of Cells and Counseling Centers - Legal AID cells, Help line, State and National level Commission	9
IV	**POLITICAL RIGHTS OF WOMEN IN INDIA AND LAWS** Political Rights of Women in India - Electoral process - women as voters - candidates and leader - pressure group, Representation of women in local self government – women in Rural and urban local bodies – Reservation of women – Laws against violence & Sexual crimes: eve teasing – rape - indecent representation of women - immoral trafficking	9
V	**GENDER EQUALITY** Gender roles: Biological vs cultural determinism – Private vs public dichotomy – Gender division of labour and asymmetric role structure Gender role socialization and formation of identity –Occupational segregation and wage discrimination – Gender stereotyping in work place – Human development indicators and gender disparity	9
	Total Instructional Hours	**45**

Course Outcomes

Upon completion of the course, students can be able to

CO1: To impart knowledge on Indian Ethos for inspirational life
CO2: To apply Business concepts and philosophies for broader perspective in society
CO3: To familiarize students about Indian philosophy system to handle life efficiently
CO4: To apply values in day to day functioning for better standard of life.
CO5: To conceptualize ethics from western and Indian perspective

TEXT BOOKS

T1- Nandagopal.R and Ajith Sankar R.N. Indian Ethos and Values in Management, ISBN – 978-0-07-106779-9. Tata McGraw Hill Education Private Ltd, 2011.

T2-Khandelwal.N.M, Indian Ethos and Values for Managers, ISBN 978-93-5024-452-4, 3rd Edition, Himalaya Publishing House, 2011.

REFERENCES BOOKS:

R1-Management Thoughts in Thirukkural by K. Nagarajan – ANMOL Publications PVT Ltd 4374/4B Ansari Road, New Delhi 110 002. 2010

R2-Dr. Radhakrishnan Pillai, Corporate Chanakya, ISBN 978-81-8495-133-2, Jaico Publishing House, 2016

R3-Soham, LEEP (Life Empowerment and Enrichment Program). ISBN 9788175977259 Central Chinmaya Mission Trust, 2017. .

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Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech.	21LS6404	Indian Constitution and Political System	3	0	0	3

Course Objectives

1. Teach history and philosophy of Political Science.
2. Describe the Indian Constitution and fundamental rights.
3. Summarize powers and functions and Emergency rule of Indian government.
4. Explain Local Governance.
5. Converse the challenges to Indian Democracy

UNIT	DESCRIPTION	INSTRUCTIONAL HOURS
I	**INTRODUCTION** Meaning, Nature and Scope of Political Science – Significance of Political Science as a Discipline - Approaches to the study of Political Science – Key Concepts: State, Nation and Sovereignty - Political Science as a Science or an Art .	9
II	**CONSTITUTION OF INDIA &FUNDAMENTAL RIGHTS** Meaning of the constitution law and constitutionalism -- Historical perspective of the constitution of India – salient features and characteristics of the constitution of India. Scheme of the fundamental rights – fundamental duties and its legislative status – The directive principles of state policy –Rights of women and Children - Constitutional Remedies for citizens	9
III	**PARLIAMENTARY FORM OF GOVERNMENT AND EMERGENCY PROVISIONS** The constitution powers and the status of the president in India. – Amendment of the constitutional powers and procedures – Emergency provisions: National emergency, President rule, Financial emergency.	9
IV	**LOCAL GOVERNANCE** Panchayati Raj and Municipal Government; Structure, Power & Functions; Significance of 73rd and 74th Amendments; Changes in Rural Power structure and empowerment of the marginalized groups such as SCs/STs and Women	9
V	**CHALLENGES TO INDIAN DEMOCRACY** Caste, class, ethnicity and gender in Indian politics; Criminalization and corruption, politics of regionalism, communalism, backward class and Dalit movements, Tribal people movements, struggle for gender justice	9
	Total Instructional Hours	**45**

Course Outcomes

Upon completion of the course, students can be able to

CO1: Understand the history of Indian Constitution

CO2: Understand fundamental rights and fundamental duties.

CO3: Understand the Parliamentary form of Government and Challenges to Indian Demorcracy

TEXT BOOKS

T1 - Durga Das Basu, "Introduction to the Constitution of India ", Prentice Hall of India, New Delhi, 1997.

T2 - Agarwal R C., "Indian Political System", S.Chand and Company, New Delhi, 1997.

T3 - Johari,J.C. Principles of Modern Political Science. New Delhi: Sterling, 1989.

T4 - Sharma K L., "Social Stratification in India: Issues and Themes", Jawaharlal Nehru University, New Delhi, 1997.

REFERENCES BOOKS:

R1 - Sharma, Brij Kishore, " Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.

R2 - Gahai U R., "Indian Political System ", New Academic Publishing House, Jalaendhar.

R3 - Sharma R N., "Indian Social Problems ", Media Promoters and Publishers Pvt. Ltd.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech.	21LS6405	Yoga for Human Excellence	2	0	2	3

Course Objectives

Understanding of
(1) Structure and functions of Human Body,
(2) Importance of Physical Exercises and various Medical systems
(3) Life force and Philosophy of Kaya Kalpa
(4) Mind and its functions and Meditation Practices.

UNIT	DESCRIPTION	INSTRUCTIONAL HOURS
I	**PHYSICAL STRUCTURE** • Purpose of life - life - yoga - modern life style - importance of physical health • Physical structure - combination of five elements - three forms of body. • Blood circulation system - Respiratory system. • Nervous system - Digesting system.	9
II	**FUNCTIONS OF PHYSICAL BODY** Three circulations - disease, pain and death - causes for disease. •Limit and method in five aspects - food, work, sleep, sensual pleasure and thought. •Importance of physical exercises - Simplified Physical Exercises - Rules and regulations. •Food and Medicine - yogic food habits - natural food - naturopathy - Medical systems: Allopathy, Siddha, Ayurvedha, Unani and Homeopathy.	9
III	**REJUVENATION OF LIFE-FORCE** Philosophy of Kaya kalpa - Physical body - Sexual vital fluid - Life force - Bio-Magnetism - Mind. • Anti-ageing and postponing death - Kayakalpa Practical - benefits. • Sex and spirituality - value of sexual vital fluid - married life - chastity. • Functional Relationships of body, life force and mind.	9
IV	**MIND** Bio-magnetic wave - Mind - imprinting and magnifying - Eight essential factors of living beings. • Mental Frequency - functions of mind - five layers. •Ten stages of mind Benefits of meditation - habitual imprints - understandable imprints. • Importance of meditation - benefits of meditation.	9
V	**MEDITATION** Simplified Kundalini Yoga - greatness of guru - types of meditation • Agna meditation - explanation - benefits. •Santhi meditation - explanation - benefits - clearance of spinal cord - benefits. •Thuriam meditation - explanation - benefits - Thuriyatheetham meditation - explanation - benefits.	9
	Total Instructional Hours	45

TEXT BOOKS

T1 - Yogic Life - VISION, Vethathiri Publications.

REFERENCES BOOKS:

R1 - Vethathiri Maharishi, Yoga for Modern age, 2017, Vethathiri Publications, Erode.
R2. Vethathiri Maharishi, Mind, 2017, Vethathiri Publications, Erode.
R3. Dr.MathuramSekar, Medicine and Health, Narmadha Publications.
R4. Vethathiri Maharishi, Simplified Physical Exercises, 2013, Vethathiri Publications, Erode.
R5. WCSC-VISION for Wisdom, Yogasanas, 2012, Vethathiri Publications, Erode.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI5601	Transducer Engineering	3	0	0	3

Course Objective

1. Educate the fundamentals of Measurement System.
2. Understand the various Resistive transducers and its measurement.
3. Learn the principle and working of Inductive Transducers.
4. Acquire the concepts and working on Capacitive Transducers.
5. Impart knowledge on miscellaneous transducers and Sensors.

Unit	Description	Instructional Hours
I	**BASICS OF MEASUREMENTS AND CHARACTERISTICS OF TRANSDUCERS** Generalized Measurement system - Terminologies of measurements - Errors in measurement - Characteristics of Transducer - Calibration methods - Statistical error analysis. Classification of Transducers - Mathematical Model of Transducer - Zero, First and Second order Transducer - Response to Impulse, Step, Ramp and Sinusoidal inputs.	9
II	**RESISTIVE TRANSDUCERS** Resistance transducer - Principle of operation, construction, characteristics and application of Potentiometer, Strain Gauge, Thermistor, Resistance Temperature Detector, RTD types Thermocouple, Hot Wire Anemometer.	9
III	**INDUCTIVE TRANSDUCERS** Inductance transducer- Principle of operation, construction, characteristics and application of LVDT, RVDT, Synchros, Variable Reluctance Transducer, EI pick up - Eddy Current Transducer.	9
IV	**CAPACITIVE TRANSDUCERS** Capacitance Transducer - Variable Area Type, Variable Air Gap Type - Variable Permittivity Type; Capacitive Microphone - Frequency Response - Applications: Measurement of Pressure, Level, Thickness, Moisture and Density.	9
V	**OTHER TRANSDUCERS AND SMART SENSORS** Hall Effect Transducer - Piezoelectric Transducer - Magnetostrictive Transducer - Digital Transducer-Smart Sensors - Proximity Sensor - SQUID Sensor - Biosensors - IC Sensors - Safety Sensor : fire, smoke and gas leakage detection - Film sensors.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Interpret the basics of measurement systems and the characteristics of different order transducers.
CO2: Explore the knowledge about resistive transducers and its applications.
CO3: Outline an adequate knowledge about various inductive transducers.
CO4: Make use of capacitive transducers on industrial parameters measurement.
CO5: Summarize the role of other transducers and smart sensors.

TEXT BOOKS:

T1 - Sawhney. A.K, "A Course in Electrical and Electronics Measurements and Instrumentation", 19th Edition, Dhanpat Rai & Company Private Limited, 2011.
T2 - Renganathan. S, "Transducer Engineering", Allied Publishers, Chennai, 2003.

REFERENCE BOOKS:

R1 - Ernest O.Doebelin, "Measurement systems", 6thEdition, Tata McGraw Hill, New Delhi, 2011.
R2 - Patranabis. D, "Sensors and Transducers", Prentice Hall of India, 2003.
R3 - Ian Sinclair, "Sensors and Transducers", 3rd Edition, Elsevier, 2012.
R4-Murthy, D.V.S., "Transducers and Instrumentation", 2nd Edition, PHI, New Delhi, 2010.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	2	3	1	1	-	-	-	-	-	2	3	3
CO2	3	3	3	3	1	1	-	-	-	-	-	2	2	3
CO3	3	3	3	2	1	1	-	-	-	-	-	2	2	2
CO4	3	3	3	3	1	1	-	-	-	-	-	2	3	2
CO5	3	2	2	2	1	1	-	-	-	-	-	2	3	3
Avg	2.8	2.6	2.6	2.6	1	1	-	-	-	-	-	2	2.6	2.6

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21EI7601	Industrial Data Communication	3	0	0	3

Course Objective	1. Understand the fundamentals of data networks. 2. Gain knowledge on various internetworking standards. 3. Analyze the modes of data transfer. 4. Impart knowledge about the importance of MODBUS, PROFIBUS and other communication protocol in networking. 5. Observe the use of industrial ethernet in various applications.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO NETWORK FUNDAMENTALS** Networks hierarchy and switching - Open System Interconnection model - Data link control protocol - Media access protocol - Command / response - Token passing - CSMA/CD, TCP/IP	9
II	**DATA COMMUNICATION NETWORKS** Bridges - Routers - Gateways - Standard ETHERNET and ARCNET configuration special requirement for networks used for control - RS 232, RS 485 configuration Actuator Sensor (AS) – interface, Devicenet.	9
III	**HART AND FIELDBUS** Introduction - Evolution of signal standard - HART communication protocol - HART networks - HART commands - HART applications - Fieldbus - Introduction - General Fieldbus architecture - Basic requirements of Fieldbus standard - Fieldbus topology - Interoperability - Interchangeability - Introduction to OLE for process control (OPC).	9
IV	**MODBUS AND PROFIBUS PA/DP/FMS AND FF** MODBUS protocol structure - function codes – troubleshooting Profibus, Introduction, Profibus protocol stack, Profibus communication model - communication objects - system operation - troubleshooting - review of foundation fieldbus - Data Highway	9
V	**INDUSTRIAL ETHERNET AND WIRELESS COMMUNICATION** Industrial Ethernet, 10 Mbps Ethernet, 100 Mbps Ethernet - Radio and wireless communication, components of radio link - radio spectrum and frequency allocation - radio MODEMs-Introduction to wireless HART and ISA100	9
	Total Instructional Hours	**45**

Course Outcome	CO1 : Outline the basics of Industrial data networks. CO2 : Associate appropriate internetworking standards for data transfer. CO3 : Understand the importance of HART and field bus in networking. CO4 : Appraise about MODBUS, PROFIBUS and other communication protocol in networking. CO5 : Outline various standards and applications of wireless communication

TEXT BOOKS:

T1 - Steve Mackay, Edwin Wrijut, Deon Reynders, John Park, "Practical Industrial Data Networks Design, Installation and Troubleshooting", Newnes Publication, Elsevier First Edition, 2004

T2 - William Buchanan, "Computer Buses", CRC Press, 2000.

REFERENCE BOOKS:

R1 - Andrew S. Tanenbaum, David J. Wetherall, "Computer Networks", Prentice Hall of India Pvt. Ltd., 5th Edition. 2011.

R2 - Theodore S Rappaport, "Wireless Communication: Principles and Practice", Prentice Hall of India,dition, 2001.

R3 - William Stallings, "Wireless Communication & Networks", Prentice Hall of India, 2nd Edition, 2005.

WEB REFERENCES:

1.https://youtu.be/8x0y3QU7hTA?si=CouR_9YCKZWIivKQ

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	3	1	-	-	-	-	-	-	2	2	2
CO2	3	3	3	3	1	-	-	-	-	-	-	2	2	3
CO3	3	3	3	2	1	-	-	-	-	-	-	2	3	2
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Avg	2.8	2.8	2.6	2.6	1	-	-	-	-	-	-	2	2.2	2.4

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21EI7602	Power Plant Instrumentation	3	0	0	3

Course Objective	1. Identify the sources of thermal energy generation. 2. Understand the process involved in steam power generation and it's impact on environment. 3. Outline the operation of various equipments involved in the generation of steam. 4. Design various control loops in boiler. 5. Analyze the operation and plot the performance characteristics of turbines.

Unit	Description	Instructional Hours
I	**FUELS AND COMBUSTION** Sources of Chemical Energy - Availability of Fuels-Characteristics of Coal - Other Solid Fuels-Petroleum and Natural Gas - Principles of Combustion - Combustion Calculations - Design Aspect of Burner - Flame Stability - Design Aspects of Furnace.	9
II	**STEAM POWER PLANT CYCLES AND ITS IMPACT ON ENVIRONMENT** Laws of Thermodynamics-Carnot Cycle - Stirling Cycle-Ericsson Cycle - Rankine Cycle - Kalina Cycle-Binary Vapor Cycle - Impact of Performance Parameter on Economics of Generation-Impact of Performance Parameter on the Environment	9
III	**STEAM GENERATORS AND BOILERS** Boiling and Circulation- Design-Classification and Utilization- Boiler Mounting and Accessories - Superheaters and Reheaters - Economizers - Air Heaters - Insulation - Supercritical Boilers - Pulverized Coal-Fired Boilers - Fluidized - Bed Combustion Boilers	9
IV	**CONTROL LOOPS IN BOILER** Combustion Control-air/fuel ratio control - furnace draft control - main steam and reheat steam temperature control - super heater control - attemperator - deaerator control - distributed control system in power plants - interlocks in boiler operation - Trimming of combustion air - Soot blowing - Combustion control for liquid and solid fuel fired boiler.	9
V	**TURBINE MONITORING AND CONTROL** Types of steam turbines - impulse and reaction turbines - compounding - Turbine governing system - Speed and Load control - Transient speed rise - Free governor mode operation - Automatic Load-Frequency Control - Turbine oil system - Oil pressure drop relay - Oil cooling system - Turbine run up system.	9
	Total Instructional Hours	**45**

Course Outcome	CO1: Apply the knowledge acquired to design the equipments involved in thermal power generation. CO2: Summarize the process involved in steam power generation and it's impact on environment. CO3: Outline the operation of equipments involved in the generation of steam. CO4: Assess the performance of various control loops in boiler. CO5: Appraise the operation of turbines.

TEXT BOOKS:

T1 - Dipak Sarkar, "Thermal Power Plant", Elsevier, 2015
T2 - Sam Dukelow. G "The Control of Boilers", Instrument Society of America, Second Edition 1991.

REFERENCE BOOKS:

R1 - Mukopadhyaya, "Operation and Maintenance of Thermal Power Plants", Springer, 2016.
R2 - Elonka. S.M, and Kohan. A.L, "Standard Boilers Operations", McGraw Hill, New Delhi, 1994.
R3 - Krishnaswamy.K and Ponnibala.M.,"Power Plant Instrumentation", PHI Learning Pvt. Ltd., 2013.
R4 - P.K.Nag, "Power Plant Engineering", Tata Mc Graw-Hill Education, 4th edition, 2014.

Web Reference:

1. https://nptel.ac.in/courses/112/107/112107291/

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
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CO4	3	3	2	3	-	1	1	-	-	-	-	2	3	3
CO5	3	3	3	3	-	1	1	-	-	-	-	2	3	3
Avg	3	2.8	1.8	2.2	-	1.2	0.4	-	-	-	-	2	2.6	3

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI5203	Introduction to Internet of Things	3	0	0	3

Course Objective

1. To understand the basic concepts and various building blocks of Internet of Things
2. To learn the various IoT Protocols.
3. To understand core IoT network architecture.
4. To build simple IoT Systems using Raspberry Pi
5. To develop IoT infrastructure for any application.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO INTERNET OF THINGS** Definition & Characteristics of IoT, Physical Design of IoT, LogicalDesign of IoT, IoT Functional Blocks, IoT Communication APIs, IoTEnabling Technologies, IoT Levels and Deployment Templates	9
II	**PROTOCOLS & THINGS in Internet of Things** Smart Objects: The Things in IoT – Sensors, Actuators, Smart objects, Sensor Network Protocols:M2M and WSN Protocols – SCADA and RFID Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus – KNX – Zigbee– MQTT.	9
III	**IOT NETWORK ARCHITECTURE AND DESIGN** Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack, The "Things"in IoT	9
IV	**DEVELOPING INTERNET OF THINGS** IoT Design Methodology, IoT Physical Devices and Endpoints: Basic building blocks of an IoT Device,Exemplary Device: Raspberry Pi, About the Board, Linux on Raspberry Pi, Raspberry Pi interfaces,Programming Raspberry Pi with Python, Other IoT devices.	9
V	**CASE STUDIES** Smart and Connected Cities: Smart City IoT Architecture, Street Lighting Architecture, Smart ParkingArchitecture and Smart Traffic Control Transportation: An IoT Architecture for Transportation, Connected Roadways Network Architecture, Connected Fleet Architecture, Weather monitoring system, Air Pollution Monitoring.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Explain the concept of IoT and various building blocks
CO2: Understand various protocols and its of state-of-the-art IoT systems
CO3: Apply and evaluate data management and analytics related to IoT.
CO4: Design IoT system using Rasperry Pi.
CO5: Analyze applications of IoT in real time scenario.

TEXT BOOKS:

T1 - ArshdeepBahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press,2015
T2 - David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, "IoTFundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things", CiscoPress, 2017

REFERENCE BOOKS:

R1 - Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things – Key applications and Protocols", Wiley, 2012.
R2 - Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Aves and, Stamatis Karnouskos, David Boyle, "From Machine -to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
R3 - Getting Started with the Internet of Things: Connecting Sensors and Microcontrollers to the Cloud (Make: Projects) [Kindle Edition] by CunoPfister, 2011

VIDEO LINK:

1. http:// http://nptel/courses/video/106105166/L02.html

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	3	1	-	-	-	-	-	-	2	2	2
CO2	3	3	3	3	1	-	-	-	-	-	-	2	2	3
CO3	3	3	3	2	1	-	-	-	-	-	-	2	3	2
CO4	3	3	3	3	1	-	-	-	-	-	-	2	2	2
CO5	2	2	2	2	1	-	-	-	-	-	-	2	2	3
Avg	2.8	2.8	2.6	2.6	1	-	-	-	-	-	-	2	2.2	2.4

1-Low, 2-Medium, 3-High, "-" No correlation

Chairman - BoS
EIE - HiCET

ACADEMIC COUNCIL
Chairman

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HiCET

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI5204	Instrumentation Practices in Industries	3	0	0	3

Course Objective

6. Learn the basics of Industry standards.
7. Observe the working of powerplant and types of boilers.
8. Understand the measurements involved in papermaking.
9. Discuss the various products available from petroleum industry
10. Outline the various safety measures and standards.

Unit	Description	Instructional Hours
I	**INDUSTRY STANDARDS AND CALIBRATION** Introduction to standards and calibration, calibration of temperature, pressure and flow measuring devices. Introduction to ISO, IEC , ISA and API standards pertaining to temperature, pressure and flow instrumentation.EMI and EMC standards.	9
II	**INSTRUMENTATATION IN POWERPLANTS** Types of powerplants - Boilers: Boiling and Circulation - Boiler Mounting and Accessories- boiler types- Combustion Control-air/fuel ratio control - furnace draft control - super heater control - Soot blowing . Turbines: Types of steam turbines - Turbine governing system - Speed and Load control - Automatic Load-Frequency Control - Turbine cooling system.	9
III	**INSTRUMENTATATION IN PAPER INDUSTRIES** Measurements of various parameters involved in paper making process - Physical, electrical, optical and chemical properties of paper - compressive test method-quality measurement method - optical testing-ultrasonic measurement -consistency, moisture and basic weight control - dryer control - computer based control systems.	9
IV	**INSTRUMENTATATION IN PETROCHEMICAL INDUSTRIES** Petroleum refining process - unit operations in refinery - thermal cracking - catalytic cracking - catalytic hydrocracking - catalytic reforming - polymerization - isomerization - chemicals from petroleum - Control of binary and fractional distillation columns - Control of catalytic and thermal crackers - control of catalytic reformer - VCM.	9
V	**INDUSTRIAL SAFETY** Introduction, electrical hazards, hazardous areas and classification, non-hazardous areas, enclosures-NEMA types, fuses and circuit breakers. Protection methods: Purging, explosion proofing and intrinsic safety - OSHA standards and types.	9
	Total Instructional Hours	**45**

Course Outcome

CO6: Classify the various standards used in process industries.
CO7: Apply the knowledge acquired to design the equipments involved in thermal power generation.
CO8: Make use of various instruments and its measurements in paper industries.
CO9: Explore the various measurement and control involved in petroleum refineries.
CO10: Interpret the industrial safety standards and classify the hazards.

TEXT BOOKS:

T1 - Liptak B.G, "Process Measurement and Analysis", Chilton Book Company, 4th Edition, 2003.
T2 - Sam Dukelow. G "The Control of Boilers", Instrument Society of America, Second Edition 1991.

REFERENCE BOOKS:

R1 - P.E.Sankaranarayanan, "Pulp and Paper Industries- Technology and Instrumentation", Kotharis, series, 1995.
R2 - A.L.Waddams, "Chemicals from Petroleum", Butter and Janner Ltd., 2000.
R3- R.K.Jain, Sunil S. Rao, "Industrial Safety ,Health and Environment Management system", Khanna Publishers, First Edition,2006

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	3	1	-	-	-	-	-	-	2	3	3
CO2	3	3	3	3	1	-	-	-	-	-	-	2	3	3
CO3	3	3	3	2	1	-	-	-	-	-	-	2	3	2
CO4	3	3	3	3	1	-	-	-	-	-	-	2	3	3
CO5	2	2	2	2	1	-	-	-	-	-	-	2	3	3
Avg	2.8	2.8	2.6	2.6	1	-	-	-	-	-	-	2	3	2.8

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22E15205	**Drives and Control system for Automation**	3	0	0	3

Course Objective	1. Impart the knowledge on Power semiconductor devices and their characteristics. 2. Introduce on Electric drives. 3. Understand about Servomotors and Electromechanical components. 4. Discuss the various types of actuators and its components. 5. Illustrate the function of control valves.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO POWER SEMICONDUCTOR DEVICES** Classification of power semiconductors – Control characteristics of power devices – Types of power electronic circuits - Thyristors : SCR, JFET, MOSFET & IGBT - Operating principle and characteristics -Gate triggering -Commutation methods.	9
II	**ELECTRIC DRIVES** Basic characteristics of DC motors – Operating modes – Single phase semi converter and dual converter drives – Control modes - Power control, Regenerative brake control, Rheostatic brake control, Combined regenerative and rheostatic brake control. **Introduction to AC drives:** Introduction to Variable Frequency Drives (VFD)	9
III	**SERVOMOTORS AND ELECTROMECHANICAL COMPONENTS** Theory of operation and transfer function of DC servomotors and AC servomotors. Stepper motor: Types – Construction and working – Driver circuits – Applications. **Tachogenerators:** Characteristic requirements, AC induction tachogenerators-Working - Applications Synchros: Construction and operation – Characteristics – Application - Synchro pair as error detector. Relays: Classification -Relay circuits	9
IV	**ACTUATORS AND CONTROL COMPONENTS** Actuators: Types - Hydraulic, Pneumatic and Electric Actuators , Electropneumatic actuators - comparison of actuators: Cylinders – Types and construction, Hydraulic cushioning – Rotary Actuators-Hydraulic motors - Control Components: Direction Control, Flow control and pressure control valves – Pneumatic actuators: classification- single cylinder and multi cylinder circuits-Solenoids - Applications.	9
V	**CONTROL VALVES** Control valves: I/P and P/I converters - Classification of Pneumatic control valves - Types of valves and its applications - Commercial valve bodies - Control valve as control elements - Hydraulic valves: Spool type- Nozzle valve- Flapper valve- Pulsed operation of control valves - Directional control valves - Selection of control valves.	9
	Total Instructional Hours	**45**

Course Outcome	CO1: Describe the various power electronic devices and its control methods. CO2: Interpret the fundamentals of Electric drives. CO3: Demonstrate the applications of servos and electromechanical components. CO4: Realize the working and applications of pneumatic and hydraulic components. CO5: Explain various types of control valves and its applications.

TEXT BOOKS:

T1 - Rashid, M.H., "Power Electronics – Circuits, Devices and Applications", 4th Edition, Pearson Education, New Delhi, 2014
T2 - VedamSubrahmanyam,"Electric Drives-Concepts and Applications", 2nd Edition, McGraw Hill Education (India) PrivateLimited, New Delhi, 2017

REFERENCE BOOKS:

R1 - Shanmugasundaram.K., "Hydraulic and Pneumatic Controls". Chand & Co, 2006.
R2 - Desai M.D," Control System components", PHI Learning, Newdelhi, 2008
R3 - Liptak B.G, "Instrument Engineers Handbook" 4th edition, CRC press, 2011.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
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CO2	3	3	3	3	1	-	-	-	-	-	-	2	3	3
CO3	3	3	3	2	1	-	-	-	-	-	-	2	3	2
CO4	3	3	3	3	1	-	-	-	-	-	-	2	3	3
CO5	3	2	2	2	1	-	-	-	-	-	-	2	3	3
Avg	3	2.8	2.6	2.6	1	-	-	-	-	-	-	2	3	2.8

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21EI7203	IoT for Industry Automation	3	0	0	3

Course Objective	1. Outline the basics of Errors and Transducers 2. Build Signal Conditioning Circuits for various measurements 3. Explain the role of Internet of Things in Automotive Industries 4. Interpret the use of Internet of Things in Health Care Industry 5. Utilize the concepts of internet of things for the design of unmanned aerial vehicles

Unit	Description	Instructional Hours
I	**SENSORS & TRANSDUCERS** Introduction to IoT Sensors- Temperature sensors, Proximity sensor, Pressure sensor, Water quality sensor, Chemical sensor, Gas sensor. Smoke sensor. IR sensors, Level sensors, Image sensors, motion sensor, Humidity sensor, Ultrasonic Sensor, MQ2 Sensor, Digital switch, Electro Mechanical switches.	9
II	**SIGNAL CONDITION CIRCUITS** Design of Signal conditioning circuit – Wheatstone Bridge, Deferential and Instrumentation amplifiers, Capacitive Sensors, Inductive Sensors, Electromagnetic Sensors, Thermocouples, Piezoelectric Sensors, Photovoltaic Sensors, Thermistor, RTD, Load cell, Torque, Strain gauge, Force Sensor, Accelerometer, Digital and Intelligent Sensors	9
III	**INTERNET OF THINGS IN AUTOMOTIVE INDUSTRIES** Role of IoT automotive industries, interfacing of digital and analog sensors in automotive industries, Biometric car door opening, accident monitoring, Engine management system, driver management system, real time vehicle tracking system, 5G advanced driver assistance systems (ADAS), Augmented road sign information, In-vehicle Infotainment and Telematics, Automotive Maintenance System, Truck's performance statistics like fuel and mileage, Tracking traffic conditions on the road.	9
IV	**INTERNET OF THINGS FOR THE HEALTHCARE INDUSTRY** Emerging Technologies in Smart Healthcare, Fog Computing in Healthcare, Technologies Used in Software Defined Networking (SDN) and HealthCare, WSN and IoT Based Smart Surveillance Systems for Patients, Security and Privacy Issues in Smart Healthcare System, IoMT- Based Smart Remote Monitoring System.	9
V	**IOT FOR UNMANNED AERIAL VEHICLES** Introduction, Battery and Energy Management, Energy Efficient Communication Methods, Unmanned Aerial Vehicle (UAV) for Security Intelligence. Role of AI and Big Data Analytics in UAV, Blockchain-Based Solutions for Various Security Issues.	9
	Total Instructional Hours	**45**

Course Outcome	CO1: Categorize sensors and transducers used in industry CO2: Explain about signal conditioning circuits CO3: Apply IoT design concept on automotive industry CO4: Analyse the use of IoT technology in health care industry. CO5: Design unmanned aerial vehicles.

TEXT BOOKS:

T1 - A.K. Sawhney, "A Course in Electrical and Electronic Measurements and Instrumentation ", Dhanpat Rai & Co. (P) Limited, 2015.

T2 - Ramon pallas-areny, John G. Webster, sensors and signal Conditioning, A WileyInterscience Publication, 2001

REFERENCE BOOKS:

R1 - Jerry Luecke, Analog and Digital Circuits for Electronic Control System Applications, Elsevier Inc., 2005

R2 - Chimata, Raghuveer, Singh, Rajesh, Singh, Bhupendra, Internet of Things in Automotive Industries and Road Safety, River Publishers, 2018.

R3 - Shalli Rani, Maheswar Rajagopal, Neeraj Kumar, Syed Hassan Ahmed Shah, IoT Enabled Smart Healthcare Systems, Services

and Applications, Wiley, 2022.
R4 - IoT-Enabled Smart Healthcare Systems, Services and Applications by Shalli Rani, Maheswar Rajagopal, Neeraj Kumar, Syed Hassan Ahmed Shah. John.Wiley & Sons,Inc. 2022.

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2. https://www.coursera.org/lecture/internet-of-things-history/iot-automotive-0vJj5

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	3	1	-	-	-	-	-	-	2	3	3
CO2	3	3	3	3	1	-	-	-	-	-	-	2	3	3
CO3	3	3	3	3	1	-	-	-	-	-	-	2	3	3
CO4	3	3	3	3	1	-	-	-	-	-	-	2	3	3
CO5	2	3	3	2	1	-	-	-	-	-	-	2	3	3
Avg	2.8	3	3	2.8	1	-	-	-	-	-	-	2	3	3

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21EI7204	Optical Sensors and Photonics	3	0	0	3

Course Objective	1. Discuss the concepts of various amplifiers in optical field. 2. Analyzing the parameter for fabrication of optical wave guides 3. Interpret the various integrated circuits and applications 4. Discuss the operation of fabrication in photonic material 5. Outline the operation of various photonic devices

Unit	Description	Instructional Hours
I	**OPTICAL AMPLIFIERS** Concepts – principles of optical amplification – optical amplifiers: general considerations – semiconductor optical amplifier – applications – advantages and drawbacks – EDFAs – optical fiber amplifiers – coherent sources for IO – MQW – photonic switching principles.	9
II	**OPTICAL WAVEGUIDES AND INTEGRATED CIRCUITS** Applications of coupled mode theory – theory of gratings in waveguide structures – guided wave control – electro-optic, acousto-optic, magneto-optic, thermo-optic and nonlinear optical effects – fabrication of optical waveguides in glass, Lithium Niobate substrates. waveguide devices – functional optical waveguide devices.	9
III	**ACTIVE OPTICAL INTEGRATED CIRCUITS AND APPLICATIONS** Integrated semiconductor sources, detectors and active switches on substrates – optoelectronic integrated circuits – recent trends in optical integrated circuits. Optical switches – A/D converters – RF spectrum analyzers – convolvers – correlators – modulators – integrated optic sensors.	9
IV	**PHOTONIC MATERIAL GROWTH AND FABRICATION** Types of photonic materials – growth methods – nucleation – homogeneous – heterogeneous – LEC technique – epitaxy - growth of photonic materials by LPE, VPE, MBE, photochemical deposition. Interfaces and junctions - interface quality, inter diffusion and doping. Quantum wells and band gap engineering (examples of structures).	9
V	**PHOTONIC DEVICES** Photodiodes: current-voltage equation – operation-spectral response – quantum efficiency – response time – diffusion time – drift – capacitance of diodes, measurement – photoconductivity – LEDs: electroluminescent process – choice of LED materials – device configuration and efficiency–structures – device performance – manufacturing process – defects and reliability	9
	Total Instructional Hours	**45**

Course Outcome	CO1: Outline the concepts of amplifiers in optical applications CO2: Correlate the important measurements of various parameter for optical wave guide CO3: Identify the appropriate integrated circuits CO4: Analyze the operation of photonic fabrication CO5: Outline the structure of photonic devices

TEXT BOOKS:

T1 - H. Nishihara, M. Haruna and T. Suhara. Optical integrated circuits. McGraw Hill Book Co.,Tokyo (1989).
T2 - Robert G. Hunsperger. Integrated optics: Theory and technology. Springer (2010).
T3- Theodor Tamir (Ed.). Guided-wave optoelectronics. Springer-Verlag (2012).
T4 - G. Keiser. Optical fiber communications. McGraw Hill. New Delhi. (1983).

REFERENCE BOOKS:

R1 - P.Bhattacharya. Semiconductor optoelectronic devices. Prentice-Hall India., NewDelhi, (1998).
R2 - A.Ghatak and K.Thyagarajan. Optical electronics. Cambridge Univ. Press, New Delhi, (2002).
R3 - B.E.A. Saleh and M.C. Teich. Fundamentals of photonics. John Wiley., New York (1991).
R4 - Larry A. Coldren, Scott W. Corzine and Milan L. Mashanovitch, Diode laser and photonicintegrated circuits", Wiley (2012)

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1. https://onlinecourses.nptel.ac.in/noc22_ph01/preview

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	1	-	-	1	-	-	-	-	-	2	3	3
CO2	3	3	2	-	-	2	-	-	-	-	-	2	3	3
CO3	3	3	1	-	-	-	-	-	-	-	-	2	3	3
CO4	3	3	2	3	-	1	1	-	-	-	-	2	3	3
CO5	3	3	3	3	-	1	1	-	-	-	-	2	3	3
Avg	3	2.8	1.8	1.2	-	1	0.4	-	-	-	-	2	2.6	3

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21EI7205	Unit Operation and Control	3	0	0	3

Course Objective	1. Learn the unit operations involved for transportation, mixing and separation of solids 2. Understand the unit operations involved for transportation, mixing and separation of Liquids 3. Familiarize the basic operations involved with heat exchangers and Distillation. 4. Gain knowledge about the operations of evaporators and crystallizers, drying and cooling towers 5. Outline the control aspects in various process industries.

Unit	Description	Instructional Hours
I	**OPERATION OF SOLIDS** General Characteristics of solids; Storage and conveying of solids:bunkers, silos, bins and hoppers, transport of solids in bulk, conveyor selection, different types of conveyors; Estimation of particle size;Screening methods and equipment: Adjusting particle size:methods of size reduction, classification of equipment, crushers - Mixing: mixing of powders; Separation: Electrostatic and magnetic separators, applications.	9
II	**OPERATION OF FLUIDS** Fluid classification - Transport of fluids; Mixing and agitation: Mixing of liquids, selection of suitable mixers; Separation: Gravity settling, sedimentation, thickening, double cone classifier, centrifugal separation; Cyclones - Operation, equipment, contról and applications.	9
III	**HEAT TRANSFER- I** Heat exchangers: Single pass and multi pass heat exchangers, condensers, reboilers Combustion process in thermal power plant; Distillation: Binary distillation, Batch distillation, controls and operations, Chemical reactors.	9
IV	**HEAT TRANSFER- II** Theory of evaporation; single effect and multiple effect evaporators; Crystallization; nucleation and growth, classification of crystallizers; Drying: classification of Dryers, batch and continuous dryers, dryers for solids and slurries and cooling Towers, Refrigeration.	9
V	**CASE STUDIES** Unit Operations and Control schemes applied to Thermal Power plant, Steel Industry, Paper and Pulp Industry, Pharmaceutical industry and Leather Industry.	9
	Total Instructional Hours	**45**

Course Outcome	CO1: Apply the knowledge on solids & fluids to handle the raw materials CO2: Select and apply relevant handling techniques to convert the solids and fluids for a Specific applications. CO3 : Come out with solutions for simple/complex problems in heat transfer and design the Heat exchange equipment for different applications CO4 : Carry out multidisciplinary projects using heat transfer, mass transfer concepts CO5 : Categorize the various control techniques involved in process industries.

TEXT BOOKS:

T1 - B.G Liptak, "Instrumentation in Process Industries", Chilton Book Company, 2003

T2 - P.E.Sankaranarayanan, "Pulp and Paper Industries- Technology and Instrumentation", Kotharis Desk book series, 1995.

REFERENCE BOOKS:

R1 - Britt K.W, "Handbook of Pulp and Paper Technology", Reinbold Company Second Edition, 2004.

R2 - James P.Casey , "Pulp and Paper Chemistry and Chemical Technology", John Wiley and sons, 1981.

R3 - Randolph Norris Shreve and George, "Shreve's Chemical Process Industries", McGraw Hill International Student Edition, Singapore,1985.

R4 - Robert H. Perry, Green D.W. and Maloney J.O., Perry's Chemical Engineers, Handbook, McGraw HillInc, New York, 7th ed, 1998

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
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CO3	2	3	3	2	1	-	-	-	-	-	-	2	3	3
CO4	3	3	3	3	1	-	-	-	-	-	-	2	3	3
CO5	3	3	2	2	1	-	-	-	-	-	-	2	3	3
Avg	2.8	2.8	2.6	2.6	1	-	-	-	-	-	-	2	2.8	3

1-Low, 2-Medium, 3-High, "-" No correlation

Chairman - BoS
EIE - HiCET

ACADEMIC COUNCIL
Chairman

Dean (Academics)
HiCET

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21EI7206	Advanced Instrumentation Systems	3	0	0	3

Course Objective	1. Understand about process parameter measurements. 2. Familiarize with Instrumentation Standards. 3. Explore the various electronic components in automobiles.. 4. Educate on different instrumentation systems involved in agriculture. 5. Impart the knowledge on industry 4.0

Unit	Description	Instructional Hours
I	**MEASUREMENT OF PROCESS PARAMETERS** Review the various Measurement techniques of temperature, pressure, flow and level – application - selection of sensors– calibration methods - Smart/Intelligent transducer- Comparison with conventional transducers- Self diagnosis and remote calibration features- Smart transmitter with industrial communication protocols - Measurement of temperature, pressure and flow in process industries.	9
II	**INSTRUMENTATION STANDARDS** Instrumentation Standards - significance of codes and standards – Standards: Introduction, International and National Standards organization, IEC, ISO, NIST, IEEE, ISA, API, BIS, DIN, JISC and ANSI – API: Process Measurement and Instrumentation (APIRP551) – ISA Standards for Control valave and actuator – ISA Standards for Nuclear power plant.	9
III	**AUTOMOTIVE INSTRUMENTATION** Evolution of electronics in automobiles, emission laws, introduction to Euro standards, equivalent Bharat standards - Working principle and characteristics of airflow rate, engine crank shaft angular position, throttle angle, temperature, oxygen sensors - CAN network, the glass cockpit and information system. Onboard and off board diagnostics – Electronic Control Unit (ECU).	9
IV	**INSTRUMENTATION TECHNIQUES IN AGRICULTURE** Necessity of instrumentation & control for agriculture and food processing requirement – **Agri Sensors:** Soil Temperature, humidity and moisture sensors, pH sensors, Silicon pressure transducer. **Agri Automation:** Microprocessor based Grain moisture measurement - soil nutrient estimation, sensing mechanism - I/O requirement Analysis. SCADA Based system for Agriculture process monitoring – Role of IoT in Agriculture.	9
V	**INDUSTRY 4.0** Evolution: Industry 2.0,3.0 and 4.0 – Internet of Things (IoT) in process industries - IIoT key technologies, IoT and IIoT similarities and differences – Innovations and the IIoT – Intelligent devices – Key opportunities and benefits- Industry 4.0: Characteristics and design principles - Cloud and Fog - Big Data and Analytics in IIoT – AR and VR applications in process industries.	9
	Total Instructional Hours	**45**

Course Outcome	CO1: Acquire the knowledge on measuring the various process parameters. CO2: Interpret various national and international standards for an industry. CO3: Perceive the instrumentation controls involved in automotive systems CO4: Choose and apply appropriate sensors for agriculture measurements. CO5: Develop an IoT in real time industrial environment.

TEXT BOOKS:

T1 - B.G.Liptak, "Instrumentation Engineers Handbook (Process Measurement & Analysis)", Fourth Edition, Chilton Book Co, CRC Press, 2005.

T2 - Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat , Industrial Internet of Things: Cyber manufacturing Systems, Springer, 2017

REFERENCE BOOKS:

R1 - Krishna Kant , "Microprocessor Based Agri Instrumentation", 1st Edition, PHI Private Limited, New Delhi, 2010.

R2- Sidney Walter Reginald Cox, Filby D E , "Instrumentation in Agriculture", Lockwood Publishers, UK, 2011.

R3 - Robert Bosch "Automotive Electrics and Automotive Electronics" Springer, Fifth Edition, 2014.

R4 - Alp Ustundag and EmreCevikcan, "Industry 4.0: Managing the Digital Transformation". Springer series in Advanced Manufacturing, Switzerland, 2018

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2. https://www.coursera.org/learn/industrial-internet-of-things

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
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CO2	3	3	3	3	1	-	-	-	-	-	-	3	3	3
CO3	3	3	3	2	1	-	-	-	-	-	-	3	3	2
CO4	3	3	3	3	1	-	-	-	-	-	-	3	2	3
CO5	3	3	2	2	1	-	-	-	-	-	-	3	3	3
Avg	3	3	2.6	2.6	1	-	-	-	-	-	-	3	2.8	2.8

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21EI7207	Machine Vision system	3	0	0	3

Course Objective	1. Educate the basics on Vision system. 2. Interpret data structures related to vision algorithms 3. Learn about object recognition 4. Know the basics of robot vision 5. Outline the various applications of machine vision system

Unit	Description	Instructional Hours
I	**VISION SYSTEM** Basic Components – Elements of visual perception, Lenses: Pinhole cameras, Gaussian Optics- cameras-computer interfaces.	9
II	**VISION ALGORITHMS** Fundamental Data Structures: Images, Regions, Sub-pixel Precise Contours – Image Enhancement : Gray value transformations, image smoothing, Fourier Transform – Geometric Transformation - Image segmentation – Segmentation of contours, lines, circles and ellipses – Camera calibration – Stereo Reconstruction	9
III	**OBJECT RECOGNITION** Object recognition, Approaches to Object Recognition, Recognition by combination of views – objects with sharp edges, using two views only, using a single view, use of dept values	9
IV	**ROBOT VISION** Basic introduction to Robotic operating System (ROS) – Real and Simulated Robots - Introduction to OpenCV, Open NI and PCL, installing and testing ROS camera Drivers, ROS to OpenCV - The cv_bridge Package	9
V	**APPLICATIONS** Transforming sensor reading, Mapping Sonar Data, Aligning laser scan measurements - Vision and Tracking: Following the road, Iconic image processing, Multiscale image processing, Video Tracking - Learning landmarks: Landmark spatiograms, K-means Clustering, EM Clustering.	9
	Total Instructional Hours	**45**

Course Outcome	CO1: Classify gadgets of vision systems CO2: Illustrate the image capturing and processing techniques CO3: Interpret the concepts of Object recognition CO4: Apply the vision system in other machines CO5: Summarize application of vision and image processing in robot operations

TEXT BOOKS:

T1- Rafael C. Gonzalez and Richard E.woods, "Digital Image Processing", Addition – WesleyPublishing Company, New Delhi, 2007

T2 - Shimon Ullman, "High-Level Vision: Object recognition and Visual Cognition", A Bradford Book,USA, 2000.

REFERENCE BOOKS:

R1- R.Patrick Goebel, " ROS by Example: A Do-It-Yourself Guide to Robot Operating System – Volume I", A Pi Robot Production, 2012.

R2- Carsten Steger, Markus Ulrich, Christian Wiedemann, "Machine Vision Algorithms and applications", WILEY-VCH, Weinheim,2008.

R3-Damian m Lyons,"Cluster Computing for Robotics and Computer Vision", World Scientific, Singapore, 2011.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	2	3	1	1	-	-	-	-	-	2	3	3
CO2	3	3	3	3	1	1	-	-	-	-	-	2	3	3
CO3	3	3	3	2	1	1	-	-	-	-	-	2	3	3
CO4	3	3	3	3	1	1	-	-	-	-	-	3	3	3
CO5	3	2	2	2	1	1	-	-	-	-	-	3	3	3
Avg	2.8	2.6	2.6	2.6	1	1	-	-	-	-	-	2.6	3	3

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21EI7208	SCADA Systems and its Applications	3	0	0	3

Course Objective	1. Learn the fundamentals of SCADA 2. Study the components of SCADA. 3. Know the various configurations of SCADA. 4. Understand about SCADA communications protocols. 5. Interpret the real time industrial applications.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO SCADA** Introduction to SCADA -Data acquisition systems -Evolution of SCADA - Communication technologies monitoring and supervisory functions - SCADA applications in Utility Automation -Industries SCADA	9
II	**SCADA SYSTEM COMPONENTS** Industries SCADA System Components -Schemes- Remote Terminal Unit (RTU) - Intelligent Electronic Devices (IED) - Programmable Logic Controller (PLC) - Communication Network, SCADA Server, SCADA/HMI Systems.	9
III	**SCADA CONFIGURATION** SCADA Architecture -Various SCADA architectures, advantages and disadvantages of each System-single unified standard architecture -IEC 61850.	9
IV	**COMMUNICATION IN SCADA** SCADA Communication -various industrial communication technologies -wired and wireless methods and fiber optics -Open standard communication protocols.	9
V	**APPLICATIONS OF SCADA** SCADA Applications: Utility applications -Transmission and Distribution sector operations, monitoring, analysis and improvement- Industries - oil, gas and water.	9
	Total Instructional Hours	**45**

Course Outcome	CO1:	Describe the basic tasks of Supervisory Control Systems (SCADA).
	CO2:	Acquire knowledge about SCADA architecture, various advantages and disadvantages.
	CO3:	Knowledge about single unified standard architecture IEC 61850
	CO4:	To learn about SCADA system components: remote terminal units, PLCs, intelligent electronic devices
	CO5:	Learn and understand about SCADA applications in industries.

TEXT BOOKS:

T1 - Stuart A. Boyer, SCADA-Supervisory Control and Data Acquisition, Instrument Society of America Publications, USA, 2004.
T2 - Gordon Clarke, Deon Reynders, Practical Modern SCADA Protocols: DNP3, 60870.5 and Related Systems, Newnes Publications, Oxford, UK, 2004

REFERENCE BOOKS:

R1- William T. Shaw, Cyber security for SCADA systems, Penn Well Books, 2006 David Bailey, Edwin Wright, Practical SCADA for industry, Newnes, 2003
R2 - Gordan Clark, Deem Reynders, "Practical Modern SCADA Protocols", ELSEVIER 2010.
R3 - S. K. Singh, "Computer Aided Process Control", PHI 2012.

WEB REFERENCE:

https://nptel.ac.in/courses/107101086/

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	3	1	1	-	-	-	-	-	2	3	3
CO2	3	3	3	3	1	1	-	-	-	-	-	2	3	3
CO3	3	3	3	2	1	1	-	-	-	-	-	2	3	3
CO4	3	3	3	3	1	1	-	-	-	-	-	3	3	3
CO5	3	2	2	2	1	1	-	-	-	-	-	3	2	2
Avg	3	2.6	2.6	2.6	1	1	-	-	-	-	-	2.6	2.8	2.8

1-Low, 2-Medium, 3-High, "-" No correlation

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VALUE ADDED COURSES

Programme	Course Code	Name of the course
B.E	22EIVAC01	ARDUINO PROGRAMMING

Course Objectives	1. To Learn how to prototype circuits with a breadboard 2. To Learn the Arduino programming language and IDE 3. To Program basic Arduino examples 4. To design Prototype circuits and connect them to the Arduino 5. To Program the Arduino microcontroller to make the circuits work

Unit	Description	Instructional Hours
I	Introduction to Arduino, Pin configuration and architecture, Device and platform features, Concept of digital and analog ports, Familiarizing with Arduino Interfacing Board, Introduction to Embedded C and Arduino platform	8
II	Arduino data types, Variables and constants, Operators , Control Statements, Arrays , Functions. Arduino i/o Functions Pins Configured as INPUT, Pull-up Resistors, Pins Configured as OUTPUT, pin Mode() Function, digital Write() Function, analog Read() function, Arduino Interrupts	8
III	Incorporating Arduino time, delay() function, delay Microseconds() function, millis() function, micros() function . Working with Serial Monitor, Line graph via serial monitor, Interfacing a 8 bit LCD to Arduino, Fixed one line static message display, Running message display, Using the LCD Library of Arduino.	8
IV	Types of Relay, Controlling Electrical appliances with electromagnetic relays, Working of a matrix keypad, Using the keypad library to interface with Arduino, Interfacing Servo motors to Arduino, Interfacing a RF Module	8
V	Parallel Communication, Serial Communication Modules, Types of Serial Communications, Arduino UART, GSM/GPRS Arduino Interfacing	8
	Total Instructional Hours	**40**

Course outcome	1. Learn how to prototype circuits with a breadboard 2. Learn the Arduino programming language and IDE 3. Program basic Arduino examples 4. Prototype circuits and connect them to the Arduino 5. Program the Arduino microcontroller to make the circuits work

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Programme	Course Code	Name of the course
B.E	22EIVAC02	VIRTUAL INSTRUMENTATION AND HUMAN MACHINE INTERFACE

Course Objectives	1. To understand the basic components of virtual instrumentation system 2. To develop a VI program using various techniques 3. To identify elements of data acquisition for software and hardware installation 4. To gain the knowledge about different types of common instrument interfaces 5. To learn to develop applications based on virtual instrumentation system

Unit	Description	Instructional Hours
I	Historical Perspective - Conventional and Distributional Virtual Instrumentation(VI) -VI Vs Traditional Instruments - Advantages - Block Diagram and Architecture of a Virtual Instrument – Data Flow Techniques - Graphical Programming in Data Flow -Development of Virtual Instrument using LabVIEW - HMI / SCADA Software.	8
II	Controlling Programs through Structures - Case and Sequence Structures - Formula Nodes - Arrays - Clusters - Error Handling - Waveform Charts and Waveform Graphs -XY Graphs – Strings - File I/O.	8
III	Concepts of Data Acquisition - Data Acquisition in LabVIEW - Hardware Installation and Configuration - Components of DAQ - DAQ Signal Accessory - DAQ Assistant - DAQ Hardware - DAQ Software.	8
IV	Common Instrument Interfaces:RS 232 / RS 485 – GPIB – VISA standard - Bus Interfaces: USB - PCI - PCI - X - PXI - PCMCIA - SCXI - VXI – LXI.	8
V	Application of Virtual Instrumentation: Digital Stop Watch using Lab VIEW - BCD to Seven Segment Decoder - Cruise Control - PID Controller – Client Server Application in LABVIEW – Notifiers, Simple Read Only Server, Two Way Communication, Read Write Server.	8
	Total Instructional Hours	**40**

Course outcome	1: Demonstrate the basic concepts about virtual instrumentation 2: Develop programming through LabVIEW graphical programming environment 3: Experiment with data acquisition hardware and LabVIEW software 4: Apply the knowledge of common instrument interfaces and bus interfaces 5: Design and develop the industrial applications using LabVIEW

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Programme	Course Code	Name of the course
B.E	21EIVAC03	PCB DESIGN USING ORCAD

Course Objectives	1. To study the PCB terminology 2. To study about a circuit and create a schematic capture 3. To create new footprint lib5raries 4. To study schematic and PCB layout. 5. To design and implement with hardware componen

Unit	Description	Instructional Hours
I	**Introduction** Capture window editor explanation, Tool bar details explanation, Menu editor explanation, File handling, Components part library, Components search. Placing of components	8
II	**File Handling** Creating own components library, Generating the cross reference file, Generating the components list file, Generating the multi net list file. Converting schematic to layout file	8
III	**Layout** Different social media channels, Social media for various businesses: B2C&B2B, Measuring social media ROI, Content marketing: Story telling in social media	8
IV	**Footprint Libraries** Layout tool bar details explanation, Menu editor explanation, File handling, Preparing Capture design for Layout& Creating board file.	8
V	**Designing** Component placing, Auto routing, Manual routing, Post Processing (Data Spreadsheets) & Designing circuit Diagram	8
	Total Instructional Hours	**40**

Course outcome	1. Recall the PCB terminology 2. Design a circuit and create a schematic capture 3. Create new footprint libraries 4. Draw schematic and PCB layout. 5. Design and implement with hardware component

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HINDUSTHAN

COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

Coimbatore – 641032

DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

Curriculum and EVEN Semester Syllabus for the Batch

2024 – 2028 (R2022)

2023 – 2027 (R2022)

2022 – 2026 (R2022)

2021 – 2025 (R2019 with Amendments)

(Board of Studies held on 14.12.2024)

(Academic Council Meeting held on 19.12.2024)

VISION AND MISSION OF THE DEPARTMENT

VISION

To impart quality technical education in the field of Electronics and Instrumentation Engineering and strive to serve the society.

MISSION

M1. To enrich technical knowledge through effective teaching-learning process.

M2. To inculcate leadership and managerial skills.

M3. To create passion for serving the society with innovation and ethical responsible.

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

PO1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. **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.

PO3. **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.

PO4. **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.

PO5. **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.

PO6. **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.

PO7. **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.

PO8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. **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.

PO11. **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.

PO12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1. Ability to apply concepts of measurement and sensor to design, calibrate and control various process instruments using industrial automation.

PSO2. Ability to analyze advanced electronics and instrumentation concepts required for industrial and research pursuits.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1. Graduates would have strong foundation in basic science and mathematics to formulate, analyze and solve electronics and instrumentation problems.

PEO2. Graduates shall have good knowledge of instrumentation systems and their applications to design control and safety systems for industrial process.

PEO3. Graduates exhibit professionalism with ethics, communication and team work to satisfy the needs of the society.

DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.E ELECTRONICS AND INSTRUMENTATION ENGINEERING (UG)

REGULATION-2022

(For the students admitted during the academic year 2024-2025 and onwards)

SEMESTER I

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
		THEORY									
1.	22MA1101	Matrices and Calculus (common to all branches)	BSC	3	1	0	4	4	40	60	100
		THEORY WITH LAB COMPONENT									
2.	22HE1151	English for Engineers (Common to all branches)	HSC	2	0	2	3	4	50	50	100
3.	22CY1153	Chemistry For Electrical Sciences	BSC	2	0	2	3	4	50	50	100
4.	22CS1151	Problem Solving using C Programming	ESC	2	0	2	3	4	50	50	100
5.	22EI1251	Basic Electrical and Electronics Engineering	PCC	2	0	2	3	4	50	50	100
		EEC COURSES (SE/AE)									
6.	22HE1072	Entrepreneurship & Innovation (Common to all)	AEC	1	0	0	1	1	100	0	100
7.	22HE1073	Introduction to Soft Skills	SEC	2	0	0	0	1	100	0	100
		MANDATORY COURSE									
8.	22MC1093/ 22MC1094	தமிழர்மரபு / Heritage of Tamil	MC	2	0	0	1	2	100	0	100
9.	22MC1095	Universal Human Values (Common to All Branches)	MC	2	0	0	0	2	40	60	100
			TOTAL	**18**	**1**	**6**	**18**	**26**	**570**	**330**	**900**

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SEMESTER II

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22MA2102	Differential Equations and Laplace Transform	BSC	3	1	0	4	4	40	60	100
2.	22CY2101	Environmental Studies	ESC	2	0	0	2	3	40	60	100
3.	22EI2201	Basics of Instrumentation Engineering	BSC	2	0	0	2	3	40	60	100
THEORY WITH LAB COMPONENT											
4.	22HE2151	Effective Technical Communication (Common to all)	HSC	2	0	2	3	4	50	50	100
5.	22PH2154	Physics For Electrical and Electronics Science	BSC	2	0	2	3	4	50	50	100
6.	22EI2251	Electronic Devices and Circuits	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	22ME2001	Engineering Practices (Common to all)	ESC	0	0	4	2	2	60	40	100
EEC COURSES (SE/AE)											
8.	22HE2071	Design Thinking(Common to all)	AEC	2	0	0	2	2	100	0	100
9.	22HE2072	Soft Skills and Aptitude (Common to all)	SEC	1	0	0	1	1	100	0	100
MANDATORY COURSE											
10.	22MC2094/ 22MC2095	தமிழரும்தொழில்நுட்பமும் / Tamils and Technology	MC	2	0	0	1	2	100	0	100
11.	22MC2093	NCC */NSS / YRC / Sports / Clubs / Society Service - Enrollment (Common)	MC	All students shall enroll, on admission, in anyone of the personality and character development programmes and undergo training for about 80 hours							
			TOTAL	**19**	**1**	**8**	**23**	**26**	**520**	**380**	**900**

SEMESTER III

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22MA3102	Complex Analysis and Transforms	BSC	3	1	0	4	4	40	60	100
2.	22EI3201	Electronic Instrumentation	ESC	3	0	0	3	3	40	60	100
3.	22EE3202	Electric Circuit Analysis	PCC	3	1	0	4	4	40	60	100
4.	22EI3203	Sensors and Transducers	PCC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
5.	22EI3251	Digital Electronics	PCC	2	1	2	4	4	50	50	100

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PRACTICAL											
6.	22EE3001	Electric Circuits Laboratory	ESC	0	0	4	2	4	60	40	100
7.	22EI3002	Sensors and Transducers Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
8.	22HE3071	Soft Skills -II (Common to all)	SEC	1	0	0	1	1	100	0	100
9.	22HE3072	Fundamentals of JAVA Programming	AEC	2	0	0	2	2	100	0	100
MANDATORY COURSE											
10.	22MC3191	Essence of Indian Traditional Knowledge	MC	2	0	0	0	2	100	0	100
			TOTAL	**19**	**3**	**10**	**25**	**31**	**630**	**370**	**1000**

SEMESTER IV

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22HE4101	IPR and Start-ups	HSC	2	0	0	2	2	40	60	100
2.	22EI4201	Electrical Machines	PCC	3	0	0	3	3	40	60	100
3.	22EE4202	Integrated Circuits and Its Applications	PCC	3	1	0	4	4	40	60	100
4.	22EI4203	Industrial Instrumentation - I	PCC	3	0	0	3	3	40	60	100
5.	22EI4204	Analytical Instrumentation	PCC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
6.	22EI4251	Electrical and Electronic Measurements	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	22EI4001	Electrical Machines Laboratory	PCC	0	0	3	2	4	60	40	100
8.	22EE4002	Integrated Circuits Laboratory	PCC	0	0	3	2	4	60	40	100
EEC COURSES (SE/AE)											
9.	22HE4071	Soft Skills and Aptitude -III	SEC	1	0	0	1	1	100	0	100
MANDATORY COURSE											
10.	22MC4191	Indian Constitution	MC	2	0	0	0	2	100	0	100
			TOTAL	**20**	**2**	**6**	**23**	**30**	**570**	**440**	**1000**

* Two weeks internship carries 1 credit and it will be done during Semester III summer vacation and same willbe evaluated in Semester IV.
If students unable to undergo in semester III, then the Internship I offered in the semester IV can be clubbed with Internship II (Total: 4 weeks-2 credits)

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SEMESTER V

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22EI5201	Industrial Instrumentation -II	PCC	3	0	0	3	3	40	60	100
2.	22EE5202	Microprocessors and Microcontrollers	PCC	3	0	0	3	3	40	60	100
3.	22EI53XX	Professional Elective-1	PEC	3	0	0	3	3	40	60	100
4.	22EI53XX	Professional Elective-2	PEC	3	0	0	3	3	40	60	100
5.	22EI53XX	Professional Elective-3	PEC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
6.	22EI5251	Control Systems	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	22EI5001	Industrial Instrumentation Laboratory	PCC	0	0	3	1.5	3	60	40	100
8.	22EE5002	Microprocessors and Microcontrollers Laboratory	PCC	0	0	3	1.5	3	60	40	100
EEC COURSES (SE/AE)											
9.	22HE5071	Soft Skills -IV/Foreign languages	SEC	1	0	0	1	1	100	0	100
			TOTAL	**18**	**0**	**8**	**22**	**25**	**410**	**390**	**800**

SEMESTER VI

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22EI6201	Process Control	PCC	3	0	0	3	3	40	60	100
2.	22EI6202	Digital Signal Processing	PCC	3	0	0	3	3	40	60	100
3.	22HE6101	Professional Ethics	HSC	3	0	0	3	3	40	60	100
4.	22EI63XX	Professional Elective-4	PEC	3	0	0	3	3	40	60	100
5.	22EI63XX	Professional Elective-5	PEC	3	0	0	3	3	40	60	100
6.	22XX64XX	Open Elective – 1	OEC	3	0	0	3	3	40	60	100
PRACTICAL											
7.	22EI6001	Process Control Laboratory	PCC	0	0	3	2	4	60	40	100
8.	22EI6002	Virtual Instrumentation and Data Acquisition Laboratory	PCC	0	0	3	2	4	60	40	100
EEC COURSES (SE/AE)											
9.	22HE6071	Soft Skills – V	SEC	2	0	0	2	2	100	0	100
			TOTAL	**20**	**0**	**6**	**24**	**28**	**460**	**440**	**900**

SEMESTER VII

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22EI7201	Programmable Logic Controller and Its Applications	PCC	3	0	0	3	3	40	60	100
2.	22EI7202	Bio-Medical Instrumentation	PCC	3	0	0	3	3	40	60	100
3.	22EI73XX	Professional Elective-6	PEC	3	0	0	3	3	40	60	100
4.	22LS74XX	Open Elective – 2	OEC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
5.	22EI7251	VLSI Design	PCC	2	0	2	3	4	40	60	100
PRACTICAL											
6.	22EI7001	Industrial Automation Laboratory	PCC	0	0	4	1.5	3	60	40	100
7.	22EI7001	Instrumentation System Design Laboratory	PCC	0	0	4	1.5	3	60	40	100
EEC COURSES (SE/AE)											
8.	22EI7701	Internship Training	SEC	-	-	-	2	1	100	0	100
			TOTAL	**15**	**1**	**4**	**20**	**21**	**360**	**340**	**700**
* - Four weeks internship carries 2 credit and it will be done in before Semester VI summer vacation/placement training and same will be evaluated in Semester VII.											

SEMESTER VIII

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
EEC COURSES (SE/AE)											
1.	22EI8901	Project Work/Granted Patent	SEC	0	0	20	10	20	100	100	200
			TOTAL	**0**	**0**	**20**	**10**	**20**	**100**	**100**	**200**

Note:

* 1. As per the AICTE guideline, in Semester I, II, III & IV NCC one credit subject is added as Value Added Course with Extra Credit. Further, the students' who enrolled his/her name in HICET NCC and Air Wing are eligible to undergo this subject. The earned extra credits printed in the Consolidated Mark sheet as per the regulation.

2. NCC course level 1 & Level 2 will be added in the list of open elective subjects in the appropriate semester. Further, the students' who have opted NCC subjects in Semester I, II, III & IV are eligible to undergo NCC Open Elective Subjects.

3. The above-mentioned NCC Courses will be offered to the Students who are going to be admitted in the Academic Year 2021 – 22.

PROFESSIONAL ELECTIVE COURSES:VERTICALS

Vertical I Applied Instrumentation	Vertical II Health care Instrumentation	Vertical III Advanced Measurements and Control	Vertical IV Electronics & Communication systems	Vertical V Control and Automation	Vertical VI Process Instrumentation
22EI5301 Power plant Instrumentation	22EI5304 Telemetry and Telecontrol	22EI5307 Micro Electro Mechanical Systems	22EI5310 Embedded Systems	22EI5313 Plant Automation and IIOT	22EI5316 Instrumentation and Control in paper Industries
22EI5302 Industrial Pollution Control	22EI5305 Digital Image Processing	22EI5308 Wireless Instrumentation	22EI5311 Communication Engineering	22EI5314 PC based Instrumentation	22EI5317 System Identification
22EI5303 Safety Instrumented Systems	22EI5306 Medical Robotics	22EI5309 Wearable Technology	22EI5312 Fundamentals of Nanotechnology and Nanoelectronics	22EI5315 Introduction to Soft Computing	22EI5318 Industrial data Communication
22EI6301 Optical Instrumentation	22EI6303 Brain Computer Interface and Applications	22EI6305 Virtual Instrumentation	22EI6307 Semiconductor Manufacturing	22EI6309 Advanced Control Theory	22EI6311 Piping and Instrumentation Diagrams
22EI6302 Project Engineering and Management	22EI6304 Diagnosis and Therapeutic Equipment	22EI6306 Machine Monitoring and Control	22EI6308 Industrial Electronics	22EI6310 Robotics and Automation	22EI6312 Instrumentation and Control in Petrochemical Industries
22EI7301 Computer Control of Process	22EI7302 Biophotonics	22EI7303 Computer Vision and Image Processing	22EI7304 Microcontroller Based System Design	22EI7305 Introduction to DCS	22EI7306 Instrumentation System design

Note:
Students are permitted to choose all professional electives from any of the verticals.

OPEN ELECTIVEI

(VI SEMESTER– COMMON LIST FOR ALL THE PROGRAMS)

(EMERGING TECHNOLOGIES)

Students must choose an open elective course from the given list. The content of the course should not be related to their current program of study.

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TCP	CREDIT	Strength
				L	T	P			
1	22AI6401	Artificial Intelligence and Machine Learning Fundamentals	OEC	3	0	0	3	3	65
2	22CS6401	Block chain Technology Fundamentals	OEC	3	0	0	3	3	130
3	22EC6402	IoT Concepts and Applications	OEC	3	0	0	3	3	130
4	22IT6401	Data Science and Analytics Fundamentals	OEC	3	0	0	3	3	130
5	22BM6401	3D printing	OEC	3	0	0	3	3	65
6	22AE6401	Space Science	OEC	3	0	0	3	3	65
7 8	22MT6401	Introduction to Industrial Engineering	OEC	3	0	0	3	3	65
9	22MT6402	Industrial Safety and Environment	OEC	3	0	0	3	3	65
10	22CE6401	Climate Change and its Impact	OEC	3	0	0	3	3	65
11	22CE6402	Environment and Social Impact Assessment	OEC	3	0	0	3	3	65
12	22ME6401	Renewable Energy System	OEC	3	0	0	3	3	65
13	22ME6402	Additive Manufacturing systems	OEC	3	0	0	3	3	65
14	22EI6401	Introduction to Industrial Instrumentation and Control	OEC	3	0	0	3	3	65
15	22AU6401	Basics of Automobile Engineering	OEC	3	0	0	3	3	65
16	22EE6401	Fundamentals of Electric vehicles	OEC	3	0	0	3	3	65
17	22FT6401	Traditional Foods	OEC	3	0	0	3	3	65
18	22AG6401	Urban Agriculture and Organic Farming	OEC	3	0	0	3	3	65
19	22CH6401	Waste to Energy conversion	OEC	3	0	0	3	3	65
20		NCC Level - I	OEC	3	0	0	3	3	65

OPEN ELECTIVE II

(VII SEMESTER - COMMON LIST FOR ALL THE PROGRAMS)

LIFE SKILL COURSES

Students shall choose any one of the Life Skill courses from the open elective courses listed below.

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TCP	CREDIT	Strength
				L	T	P			
1	22LS7401	General studies for competitive examinations	OEC	3	0	0	3	3	130
2	22LS7402	Human Rights, Women Rights and Gender equity	OEC	3	0	0	3	3	130
3	22LS7403	Indian ethos and Human values	OEC	3	0	0	3	3	130
4	22LS7404	Financial independence and management	OEC	3	0	0	3	3	130
5	22LS7405	Yoga for Human Excellence	OEC	3	0	0	3	3	130
6	22LS7406	Democracy and Good Governance	OEC	3	0	0	3	3	130
7	22LS7407	NCC Level - II	OEC	3	0	0	3	3	130
8	22LS7408	Cybercrime and Awareness	OEC	3	0	0	3	3	130
9	22LS7409	First Aid and Emergency care	OEC	3	0	0	3	3	130
10	22LS7410	Business Communication	OEC	3	0	0	3	3	130

DETAILS OF VERTICAL I: Applied Instrumentation

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22EI5301	Power plant Instrumentation	PEC	3	0	0	3	3
2.	22EI5302	Industrial Pollution Control	PEC	3	0	0	3	3
3.	22EI5303	Safety Instrumented Systems	PEC	3	0	0	3	3
4.	22EI6301	Optical Instrumentation	PEC	3	0	0	3	3
5.	22EI6302	Project Engineering and Management	PEC	3	0	0	3	3
6.	22EI7301	Computer Control of Process	PEC	3	0	0	3	3

DETAILS OF VERTICAL II: Health care Instrumentation

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22EI5304	Bio-Medical Instrumentation	PEC	3	0	0	3	3
2.	22EI5305	Telemetry and Telecontrol	PEC	3	0	0	3	3
3.	22EI5306	Digital Image Processing	PEC	3	0	0	3	3
4.	22EI6303	Medical Robotics	PEC	3	0	0	3	3
5.	22EI6304	Diagnosis and Therapeutic Equipment	PEC	3	0	0	3	3
6.	22EI7302	Occupational Health and Safety Management	PEC	3	0	0	3	3

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DETAILS OF VERTICAL III: Advanced Measurements and Control

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22EI5307	Micro Electro Mechanical Systems	PEC	3	0	0	3	3
2.	22EI5308	Wireless Instrumentation	PEC	3	0	0	3	3
3.	22EI5309	Wearable Technology	PEC	3	0	0	3	3
4.	22EI6305	Virtual Instrumentation	PEC	3	0	0	3	3
5.	22EI6306	Machine Monitoring and Control	PEC	3	0	0	3	3
6.	22EI7303	Computer Vision and Image Processing	PEC	3	0	0	3	3

DETAILS OF VERTICAL IV: Electronics & Communication systems

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22EI5310	Embedded Systems	PEC	3	0	0	3	3
2.	22EI5311	Communication Engineering	PEC	3	0	0	3	3
3.	22EI5312	Fundamentals of Nanotechnology and Nanoelectronics	PEC	3	0	0	3	3
4.	22EI6307	Semiconductor Manufacturing	PEC	3	0	0	3	3
5.	22EI6308	Industrial Electronics	PEC	3	0	0	3	3
6.	22EI7304	Microcontroller Based System Design	PEC	3	0	0	3	3

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DETAILS OF VERTICAL V: Control and Automation

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK L	T	P	TOTAL CONTACT PERIODS	CREDITS
1.	22EI5313	Plant Automation and IIOT	PEC	3	0	0	3	3
2.	22EI5314	PC based Instrumentation	PEC	3	0	0	3	3
3.	22EI5315	Introduction to Soft Computing	PEC	3	0	0	3	3
4.	22EI6309	Advanced Control Theory	PEC	3	0	0	3	3
5.	22EI6310	Robotics and Automation	PEC	3	0	0	3	3
6.	22EI7305	Introduction to DCS	PEC	3	0	0	3	3

DETAILS OF VERTICAL VI: Process Instrumentation

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK L	T	P	TOTAL CONTACT PERIODS	CREDITS
1.	22EI5316	Instrumentation and Control in paper Industries	PEC	3	0	0	3	3
2.	22EI5317	System Identification	PEC	3	0	0	3	3
3.	22EI5318	Industrial Data Communication	PEC	3	0	0	3	3
4.	22EI6311	Piping and Instrumentation Diagrams	PEC	3	0	0	3	3
5.	22EI6312	Instrumentation and Control in Petrochemical Industries	PEC	3	0	0	3	3
6.	22EI7306	Instrumentation System design	PEC	3	0	0	3	3

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Enrolment for B.E. / B. TECH. (HONOURS) / Minor Degree (optional)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only. For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes.

Clause 4.10 of Regulation 2022 is applicable for the Enrolment of B.E. / B. TECH. (HONOURS) / Minor Degree(Optional).

VERTICALS FOR MINOR DEGREE

- Heads are requested to provide one vertical from their program to offer for other program students to register for additional courses (18 Credits) to become eligible for the B.E./B.Tech. Minor Degree.

Note: Each programme should provide verticals for minor degree –

ELECTRONICS AND INSTRUMENTATION ENGINEERING OFFERING MINOR DEGREE

S. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22EI5471	Sem 5: Transducer Engineering	MDC	3	0	0	3	3
2.	22EI6471	Sem 6: Measurements and Measuring Instruments	MDC	3	0	0	3	3
3.	22EI6472	Sem 6: Industrial Instrumentation	MDC	3	0	0	3	3
4.	22EI7471	Sem 7: Industrial data Communication	MDC	3	0	0	3	3
5.	22EI7472	Sem 7: Powerplant Instrumentation	MDC	3	0	0	3	3
6.	22EI8471	Sem 8: Industrial Automation	MDC	3	0	0	3	3

*MDC – Minor Degree Course

In addition to the above the following additional courses for Minor Degree can also be given to the student's common to all the branches.

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Vertical I
Fintech and Block Chain

S. No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	22CS5471	Financial Management	MDC	3	0	0	3	3
2	22CS6471	Fundamentals of Investment	MDC	3	0	0	3	3
3	22CS6472	Banking, Financial Services and Insurance	MDC	3	0	0	3	3
4	22CS7471	Introduction to Blockchain and its Applications	MDC	3	0	0	3	3
5	22CS7472	Fintech Personal Finance and Payments	MDC	3	0	0	3	3
6	22CS8471	Introduction to Fintech	MDC	3	0	0	3	3

Vertical II
Entrepreneurship

S. No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	22BA5471	Foundations of Entrepreneurship	MDC	3	0	0	3	3
2	22BA6471	Introduction to Business Venture	MDC	3	0	0	3	3
3	22 BA6472	Team Building & Leadership Management for Business	MDC	3	0	0	3	3
4	22 BA7471	Creativity & Innovation in Entrepreneurship	MDC	3	0	0	3	3
5	22 BA7472	Principles of Marketing Management For Business	MDC	3	0	0	3	3
6	22 BA8471	Human Resource Management for Entrepreneurs	MDC	3	0	0	3	3
7	22BA8472	Financing New Business Ventures	MDC	3	0	0	3	3

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Vertical III
Environment and Sustainability

S. No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	22CE5471	Sustainable infrastructure Development	MDC	3	0	0	3	3
2	22CE6471	Sustainable Agriculture and Environmental Management	MDC	3	0	0	3	3
3	22CE6472	Sustainable Bio Materials	MDC	3	0	0	3	3
4	22CE7471	Materials for Energy Sustainability	MDC	3	0	0	3	3
5	22CE7472	Green Technology	MDC	3	0	0	3	3
6	22CE8471	Environmental Quality Monitoring and Analysis	MDC	3	0	0	3	3

B.E (Hons) ELECTRONICS AND INSTRUMENTATION ENGINEERING

Vertical I IoT and Smart Sensors	Vertical II Process Control	Vertical III Industrial Automation
Sem 5: 22EI5371 Introduction to Internet of Things	**Sem 5:** 22EI5372 Instrumentation Practices in Industries	**Sem 5:** 22EI5373 Drives and control system for Automation
Sem 6: 22EI6371 Principle of Sensors and Signal Conditioning	**Sem 6:** 22EI6373 Adaptive control	**Sem 6:** 22EI6375 Applied Industrial Instrumentation
Sem 6: 22EI6372 Embedded systems for IoT	**Sem 6:** 22EI6374 Advanced Process Control	**Sem 6:** 22EI6376 Instrumentation in Building Automation
Sem 7: 22EI7371 IoT for Industry Automation	**Sem 7:** 22EI7373 Unit operation and control	**Sem 7:** 22EI7375 Machine vision system
Sem 7: 22EI7372 Optical sensors and photonics	**Sem 7:** 22EI7374 Advanced Instrumentation Systems	**Sem 7:** 22EI7376 SCADA systems and its applications
Sem 8: 22EI8371 Smart Instrumentation	**Sem 8:** 22EI8372 Industrial safety and Hazard Management	**Sem 8:** 22EI8373 Technological Trends in Automation

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Vertical I
B.E (Hons)_Electronics and Instrumentation Engineering with Specialization in IoT and Smart Sensors

S. No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	22EI5371	Introduction to Internet of Things	PC	3	0	0	3	3
2	22EI6371	Principles of Sensors and Signal Conditioning	PC	3	0	0	3	3
3	22EI6372	Embedded systems for IoT	PC	3	0	0	3	3
4	22EI7371	IoT for Industry Automation	PC	3	0	0	3	3
5	22EI7372	Optical sensors and photonics	PC	3	0	0	3	3
6	22EI8371	Smart Instrumentation	PC	3	0	0	3	3

Vertical II
B.E (Hons)_Electronics and Instrumentation Engineering with Specialization in Process Control

S. No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	22EI5372	Instrumentation Practices in Industries	PC	3	0	0	3	3
2	22EI6373	Adaptive control	PC	3	0	0	3	3
3	22EI6374	Advanced Process Control	PC	3	0	0	3	3
4	22EI7373	Unit operation and control	PC	3	0	0	3	3
5	22EI7374	Advanced Instrumentation Systems	PC	3	0	0	3	3
6	22EI8372	Industrial safety and Hazard Management	PC	3	0	0	3	3

Vertical III
B.E (Hons)_Electronics and Instrumentation Engineering with Specialization in Industrial Automation

S No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	22EI5373	Drives and control system for Automation	PC	3	0	0	3	3
2	22EI6375	Applied Industrial Instrumentation	PC	3	0	0	3	3
3	22EI6376	Instrumentation in Building Automation	PC	3	0	0	3	3
4	22EI7375	Machine vision system	PC	3	0	0	3	3
5	22EI7376	SCADA systems and its applications	PC	3	0	0	3	3
6	22EI8373	Technological Trends in Automation	PC	3	0	0	3	3

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SEMESTER-WISE CREDIT DISTRIBUTION

B.E. / B.TECH.PROGRAMMES										
S.No.	Course Area	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HSC	3	3	-	2	-	3	-	-	**11**
2	BSC	7	9	4	-	-	-	-	-	**20**
3	ESC	6	4	5	-	-	-	-	-	**15**
4	PCC	-	3	13	20	12	10	9	-	**67**
5	PEC	-	-	-	-	9	6	3	-	**18**
6	OEC	-	-	-	-	-	3	6	-	**9**
7	EEC	2	4	3	1	1	2	2	10	**25**
8	MC	√	√							
	Total	**18**	**23**	**25**	**23**	**22**	**24**	**20**	**10**	**165**

Credit Distribution R2022

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	18	23	25	23	22	24	20	10	165

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SEMESTER – II

Programme/Sem	Course Code	Name of the Course	L	T	P	C
B.E./II	22MA2102	DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORM (ECE, EEE &EIE)	3	1	0	4

Course Objective

The learner should be able to

1. Describe some methods to solve different types of first order differential equations.
2. Understand the various approach to find general solution of the ordinary differential equations
3. Evaluate the various types of Partial differential equations and methods to find solution.
4. Analyze the techniques of Laplace transform.
5. Analyze the techniques of Inverse Laplace transform.

Unit	Description	Instructional Hours
I	**ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER** Basic concepts, separable differential equations, exact differential equations, integrating factors, linear differential equations, Bernoulli equation.	12
II	**LINEAR DIFFERENTIAL EQUATIONS OF SECOND ORDER** Second order linear differential equations with constant with RHS of the form e^{ax},x^n , sinax, cosax-e^{ax},f(x)– Cauchy's linear equations– Method of variation of parameters.	12
III	**PARTIAL DIFFERENTIAL EQUATIONS** Formation of partial differential equations by eliminating arbitrary constants and functions – Solution of first order partial differential equations of the form f(p,q)=0, Clairaut's equation – Lagrange's equation.	12
IV	**LAPLACE TRANSFORM** Laplace transform–Basic properties –Transforms of derivatives and integrals of functions-Periodicfunctions –Initial and Final value problems- Unit step function - Dirac delta function.	12
V	**INVERSE LAPLACE TRANSFORM** Inverse Laplace transform-Convolution theorem Basic problems only)Solution of linear ODE of second order with constant coefficients using Laplacetransforms..	12
	Total Instructional Hours	**60**

Course Outcome

At the end of the course, the learner will be able to

CO1: Apply few methods to solve different types of first order differential equations.
CO2: Evaluate the solutions of higher order ordinary differential equations and its properties.
CO3: Compute the solution of first order partial differential equations.
CO4: Apply Laplace transform and its properties to solve periodic functions.
CO5: Solve certain linear differential equations using inverse Laplace Transform.

TEXT BOOKS:

T1 - Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley India Private Ltd., New Delhi, 2018
T2 - Bali. N.P and Manish Goyal& Watkins, "Advanced Engineering Mathematics", 7th Edition, Laxmi Publications Pvt Ltd, 2007

REFERENCE BOOKS :

R1- Thomas & Finney " Calculus and Analytic Geometry" , Sixth Edition,,Narosa Publishing House, New Delhi.
R2 - Weir,M.D and Joel Hass, ' Thomas Calculus" 12thEdition,Pearson India 2016.
R3 - Grewal B.S, "Higher Engineering Mathematics", 42nd Edition, Khanna Publications, Delhi, 2012.

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO2	3	3	3	2	3	-	-	-	-	-	-	2	2	2
CO3	3	3	3	3	3	-	-	-	-	-	-	2	2	3
CO4	3	3	3	3	3	-	-	-	-	-	-	2	1	2
CO5	3	3	3	3	3	-	-	-	-	-	-	2	2	1
Avg	3	3	3	2.6	2.8	-	-	-	-	-	-	2	1.8	2

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Programme/ Sem	Course Code	Name of the Course	L	T	P	C
B.E/ II	22CY2101	**ENVIRONMENTAL STUDIES (Common to all branches except CSE,IT & AIML)**	2	0	0	2

Course Objective	**The learner should be able to** 1. Grasp the importance and issues related to ecosystem and biodiversity and their protection. 2. Acquire knowledge about environmental pollution – sources, effects and control measures of environmental pollution. 3. Identify the various natural resources, exploitation and its conservation 4. Gain knowledge on the scientific, technological, economic and political solutions to environmental problems. 5. Become aware on the national and international concern for environment and its protection

Unit	Description	Instructional Hours
I	**ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY** Main objectives and scope of environmental studies-Importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – food chain, food web and ecological pyramids - energy flow in the ecosystem – ecological succession processes - Introduction, types, characteristic features, structure and function of the forest and ponds ecosystem – Introduction to biodiversity definition: types and value of biodiversity – hot-spots of biodiversity – threats to biodiversity– endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.	9
II	**NATURAL RESOURCES** Renewable and Non renewable resources - Forest resources: Use and over-exploitation, deforestation, timber extraction, mining, dams and their effects on forests and tribal people - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture – Energy resources: Renewable and non renewable energy sources – Solar energy and wind energy - role of an individual in conservation of natural resources.	9
III	**ENVIRONMENTAL POLLUTION** Definition – causes, effects and control measures of: Air pollution- Water pollution – Water quality parameters- Soil pollution - Noise pollution- Nuclear hazards – role of an individual in prevention of pollution.	9
IV	**SOCIAL ISSUES AND THE ENVIRONMENT** From unsustainable to sustainable development – urban problems related to energy-environmental ethics: Issues and possible solutions – 12 Principles of green chemistry-Municipal solid waste management. Global issues – Climatic change, acid rain, greenhouse effect and ozone layer depletion – Disaster Management – Tsunami and cyclones.	9
V	**HUMAN POPULATION AND THE ENVIRONMENT** Population growth, variation among nations – population explosion – family welfare programme – environment and human health – effect of heavy metals – human rights – value education – HIV / AIDS – women and child welfare –Environmental impact analysis (EIA)- GIS-remote sensing-role of information technology in environment and human health.	9
	Total Instructional Hours	45

Course Outcome	**At the end of the course, the learner will be able to** CO1: Discuss the importance of ecosystem and biodiversity for maintaining ecological balance. CO2: Identify the causes of environmental pollution and hazards due to manmade activities. CO3: Develop an understanding of different natural resources including renewable resources. CO4: Demonstrate an appreciation for need for sustainable development and understand the various social issues and solutions to solve the issues. CO5: Describe about the importance of women and child education, existing technology to protect environment.

TEXT BOOKS:

T1 – S.Annadurai and P.N. Magudeswaran, "Environmental studies", Cengage Learning India Pvt.Ltd,, 2020
T2 - Anubha Kaushik and C. P. Kaushik, "Perspectives in Environmental studies", Sixth edition, New Age International Publishers,2019.

REFERENCE BOOKS:

R1 - ErachBharucha, "Textbook of environmental studies" University Press (I) Pvt.ltd, Hyderabad, 2015

R2 - G.Tyler Miller, Jr and Scott E. Spoolman"Environmental Science" Thirteenth Edition, Cengage Learning, 2010.

R3 – Gilbert M. Masters and Wendell P. Ela "Introduction to Environmental Engineering and Science", 3rd edition, Pearson Education, 2013.

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E	22EI2201	BASICS OF INSTRUMENTATION ENGINEERING	2	0	0	2

Course Objective	1. Introduce the concepts related to measurement system 2. Classify different types transducers and sensors 3. Learn about Industrial Parameter measurement. 4. Impart the measurement and Control tools in Process Instrumentation 5. Explore about Graphical System Design

Unit	Description	Instructional Hours
I	**PRINCIPLES OF INSTRUMENTATION** Basic concepts of Instrumentation – Classification of Instruments – Elements of generalized measurement systems – Terminology of measurement system - Errors in measurement- Types of errors - Concept of calibration -Review of order of an instrument, first and second order systems.	6
II	**ELEMENTS OF MEASUREMENT SYSTEM** Classification of transducers – Characteristics and choice of Transducers – Transducers vs sensors - Sensing elements: Resistive, capacitive and Inductive - Signal conditioning elements: amplifiers, bridge detectors - Signal processing elements: computer and microcontroller systems - Introduction to Data Presentation Elements (DPE).	6
III	**INTRODUCTION TO INDUSTRIAL PARAMETERS MEASUREMENT** Introduction to Process control - Need for process control – Basic Block diagram of open loop and closed loop system – Control valve – Characteristics, types – Process Parameter measurement (Temperature, Pressure, Flow and Level): Thermocouple, Manometers, Orifice and Venturi tube, Air Purge/ Bubbler system.	6
IV	**PROCESS INSTRUMENTATION** Basics of Programmable Logic Controller (PLC)– Architecture – Principle of operation – Hardware components of PLC – Relays and switches - Data Acquisition Systems (DAQ) – Direct Digital Control - Supervisory Control and Data Acquisition (SCADA) , Distributed Control System (DCS) (Qualitative approach only).	6
V	**VIRTUAL INSTRUMENTATION** Graphical System Design (GSD) Model – Design flow with GSD - Virtual Instrumentation, Advantages, Architecture, Virtual Instruments and Traditional Instruments, Hardware and Software - Virtual Instrumentation in the engineering process – Graphical Programming and Textual Programming	6
	Total Instructional Hours	**30**

Course Outcome	CO1: Explain about the principles of Instrumentation CO2: Interpret different types transducers and sensors CO3: Outline the concepts related to Industrial Parameter measurement CO4: Illustrate the measurement and Control tools in Process Instrumentation CO5: Infer about Graphical System Design model

TEXT BOOKS:

T1 - Sawhney. A.K, "A Course in Electrical and Electronics – Measurement and Instrumentation", 19th Edition, Dhanpat Rai & Sons, 2014.

T2 - Krishnaswamy.K, Vijayachitra S "Industrial Instrumentation", New Age International Publishers, 2014.

T3 - Frank D. Petruzella, "Programmable Logic Controllers", McGraw-Hill Companies, 3rd Edition, 2013.

T4 - Jerome, Jovitha, "Virtual Instrumentation and LABVIEW", PHI Learning, New Delhi, 1st Edition, 2010.

REFERENCE BOOKS:

R1 - Kalsi.H.S, "Electronic Instrumentation", Tata McGraw Hill, 2010.

R2 - Stephanopoulos. G, "Chemical Process Control - An Introduction to Theory and Practice", Prentice Hall of India, 2008.

R3 - David Bailey, Edwin Wright, "Practical SCADA for Industry", Elsevier, 2003.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	2	2	1	-	-	-	-	-	-	2	2	3
CO2	2	2	3	2	2	-	-	-	-	-	-	2	2	2
CO3	2	3	3	2	2	-	-	-	-	-	-	2	2	2
CO4	2	2	2	2	2	-	-	-	-	-	-	2	2	2
CO5	2	2	3	2	2	-	-	-	-	-	-	2	2	3
Avg	2	2.2	2.6	2	1.8	-	-	-	-	-	-	2	2.2	2.4

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E	22HE2151	**EFFECTIVE TECHNICAL COMMUNICATION (Common to all Branches)**	2	0	2	3

Course Objective

The learner should be able

1. To improve essential business communication skills.
2. To enrich employability knowledge.
3. To acquire the crucial organizing ability in official forum.
4. To impart important business writings.
5. To make effective presentation with essential etiquette.

Unit	Description	Instructional Hours
I	Language Proficiency: Types of sentences in English according to structure Writing: writing definitions, Describing product, work place and service (purpose, appearance, function) Vocabulary – words on nature **Practical Component: Listening- Watching and interpreting advertisements/short films Speaking- Extempore speech**	9
II	Language Proficiency: Direct and Indirect speech. Writing: Formal memos, Job application and resume preparation Vocabulary - words on offense and ethics**Practical Component: Listening- Comprehensions based on telephonic conversation Speaking- Vote of thanks& welcome address**	9
III	Language Proficiency: Homophones and Homonyms, Writing: Preparing a detail plan for an official visit, schedule and Itinerary, reading comprehension, Vocabulary– words on society **Practical Component: Listening- Listening- paraphrasing the listened content Speaking- Group Discussion with preparation**	9
IV	Language Proficiency: Idioms Writing: Report writing (marketing, investigating) Vocabulary-words involved in business **Practical Component: Listening- Watching technical discussions and preparing MoM Speaking- On the spot Group Discussion**	9
V	Language Proficiency: spotting errors Writing: making /interpreting chart, sequencing of sentences Vocabulary- words involved in finance **Practical Component: Listening- Comprehensions based on announcements Speaking- Presentation on a technical topic with ppt.**	9
	Total Instructional Hours	45

Course Outcome

At the end of the course, learners will be able

CO1: To the business procedure and promotion skills.
CO2: To make oral and written presentation in corporate forum.
CO3: To schedule official events and participate in official discussions without reluctance.
CO4: To take an effective role and manage in an organizational sector.
CO5:To prepare and demonstrate a professional presentation

TEXT BOOKS:

T1 - NormanWhitby, "Business Benchmark-Pre-intermediate to Intermediate",Cambridge University Press, 2016.
T2- Ian Wood and Anne Willams. "Pass Cambridge BEC Preliminary", Cengage Learning press 2015.

REFERENCE BOOKS :

R1 -Michael Mc Carthy, "Grammar for Business", Cambridge University Press, 2009.
R2- Bill Mascull, "Business Vocabulary in use: Advanced 2nd Edition", Cambridge University Press, 2009.
R3-Frederick T. Wood, "Remedial English Grammar For Foreign Students", Macmillan publishers, 2001.

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	2	-	-	1	-	1	3	-	1	2	1	-
CO2	2	1	-	-	-	2	2	2	3	-	2	1	1	-
CO3	2	-	1	-	-	2	-	1	3	-	2	1	1	-
CO4	1	2	-	-	-	1	-	1	3	-	1	1	1	-
CO5	1	-	-	2	-	1	-	1	3	-	2	1	1	-
Avg.	1.4	1.5	1.5	2	-	1.4	2	1.2	3	-	1.6	1.2	1	-

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Programme / Sem	Course Code	Name of the Course	L	T	P	C
BE/II	22PH2154	PHYSICS FOR ELECTRICAL AND ELECTRONICS SCIENCE (For B.E. ECE, EEE & EIE)	2	0	2	3

Course Objective	**The learner should be able to :** 1. Extend the knowledge about fiber optics in engineering field. 2. Acquire knowledge on basics of electrical properties of solid materials. 3. Gain knowledge about mechanical properties of materials. 4. Enhance the basics of wave properties of light. 5. Acquire fundamental and application of superconducting materials.	
Unit	**Description**	**Instructional Theory Hours**
I	**BASICS OF FIBRE OPTICS** Principle and propagation of light through optical fibers – Derivation of numerical aperture and acceptance angle – Classification of optical fibers (based on refractive index, modes and materials) -- Fiber optical communication link – Fiber optic sensors – Temperature and displacement sensors. **Determination of acceptance angle and numerical aperture in an optical fiber.** **Visit to IDEA lab.**	9
II	**ELECTRICAL PROPERTIES OF MATERIALS** Classical free electron theory - Expression for electrical conductivity – Thermal conductivity, expression – Widemann - Franz law – Success and failures – Quantum theory – Postulates - Fermi – Dirac statistics – Effect of temperature on fermi function – Density of energy states – concentration of electrons.	6
III	**MECHANICS OF MATERIALS** Elasticity – Hooke's law –stress-strain diagram – bending moment – depression of a cantilever – derivation of young's modulus of the material of the beam by uniform bending - theory and experiment.Twisting couple - Torsion pendulum: theory and experiment. **Determination of Young's modulus by uniform bending method** **Determination of Rigidity modulus – Torsion pendulum**	6
IV	**PHOTONICS** Spontaneous emission and stimulated emission – Population inversion – Pumping methods – Type of lasers – Nd:YAG laser and CO 2 laser. Laser Applications - Industrial applications of laser. Interference -Conditions for sustained Interference – air wedge and it's applications. **Determination of Wavelength and particle size using Laser** **Determination of thickness of a thin wire – Air wedge method** **V-Lab- https://vlab.amrita.edu/?sub=1&brch=189&sim=342&cnt=1**	12
V	**MAGNETIC AND SUPERCONDUCTING MATERIALS** Origin of magnetic moment – Bohr magnetron – comparison of Dia, Para and Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials. Superconductivity: properties (Messiner effect, effect of magnetic field, effect of current and isotope effects) – Type I and Type II superconductors –Applications of superconductors – SQUID, Cryotron and magnetic levitation.	6
	Total Instructional Hours	45
Course Outcome	**At the end of the course, the learner will be able to** CO1: Relate the basics of fiber optics and its applications CO2 Familiarize knowledge on basics of electrical properties of solid materials. CO3: Relate mechanical properties of materials and applications CO4: Recall the basics of wave properties of light. CO5: Relate the Superconducting material and their applications.	

TEXT BOOKS:

T1 - Rajendran V, Applied Physics, Tata McGraw Hill Publishing Company Limited, New Delhi, 2017.
T2- Gaur R.K. and Gupta S.L., Engineering Physics, 8th edition, Dhanpat Rai Publications (P) Ltd., New Delhi, 2015.

REFERENCE BOOKS:

R1 - M.N Avadhanulu and PG Kshirsagar"A Text Book of Engineering physics"S.Chand and Company ltd., NewDelhi 2016
R2 -Halliday, D., Resnick, R. and Walker, J. "Principles of Physics". Wiley, 2020.

WEB REFERENCES:

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2.https://nptel.ac.in/courses/112106227/
3. https://en.wikipedia.org/wiki/Aerospace_materials/
4.https://nptel.ac.in/courses/105105177/
5. https://nptel.ac.in/courses/104104085/

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	1	2	1	1	-	1	-	2	2	1	2
CO2	3	3	3	2	2	-	3	-	-	-	-	3	1	2
CO3	2	3	2	1	2	1	1	-	2	-	2	3	1	2
CO4	2	3	3	2	2	1	1	-	1	-	2	2	1	2
CO5	3	3	3	2	2	-	3	-	-	-	-	3	1	2
Avg	**2.6**	**2.8**	**2.8**	**1.6**	**2.0**	**1.0**	**1.8**	**-**	**1.3**	**-**	**2.0**	**2.6**	**1**	**2**

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI2251	ELECTRONIC DEVICES AND CIRCUITS	2	0	2	3

Course Objective

1. Recall the basics of semiconductor devices.
2. Interpret the structure, operation and characteristics of FET.
3. Analyze various structures of power devices.
4. Infer the basic concepts of large signal amplifiers.
5. Interpret the operations of feedback amplifiers and oscillators.

Unit	Description	Instructional Hours
I	**SEMICONDUCTOR DEVICES** PN Junction Diode - Structure, Operation and V-I Characteristics, Application of Diode –Rectifiers – Principle of operation – Characteristics -Display devices: Principal of operation and Characteristics of LED, Laser diodes -**Characteristics of PN diode and LED.**	9
II	**FIELD EFFECT TRANSISTOR** Introduction to power semiconductor devices: JFET,Construction and Operation -Drain and Transfer Characteristics MOSFET- structure, operation, Depletion Type MOSFET, Enhancement Type MOSFET –**Characteristics of JFET.**	9
III	**POWER DEVICES** Silicon control rectifier: Construction – Operation – Characteristics – Applications – Insulated Gate Bipolar Transistor: Structure – Principal of working – Characteristics – Applications – DIAC – construction – working – TRIAC – working and characteristics. **Characteristics of SCR**	9
IV	**LARGE SIGNAL AMPLIFIERS** Classification of Power Amplifiers, Efficiency of Class A Amplifier, Class B Complementary – Symmetry and Class C - operation, Push - Pull Power Amplifiers- Crossover Distortion. **Construct and Analyze the current series Feedback Amplifier.**	9
V	**FEEDBACK AMPLIFIERS AND OSCILLATORS** Advantages of Negative Feedback - Voltage / Current, Series, Shunt Feedback - Positive Feedback - Condition for Oscillations, RC Phase Shift - Hartley, Colpitts and Crystal Oscillators. **Develop and testing of a RC phase shift Oscillator.**	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Explain the structure and operation of semiconductor devices.
CO2: Summarize the concepts of field effect transistors.
CO3: Transform the acquired skill in power devices.
CO4: Illustrate the nature of large signal amplifiers.
CO5: Outline the concepts of feedback amplifiers, conditions for oscillation and types of oscillators

TEXT BOOKS:

T1 - David A. Bell, "Electronic Devices and Circuits", 5th Edition, Prentice Hall Publications, 2008.
T2-S.Salivahanan, "Electronic Devices and Circuits", 3rd Edition, Tata McGraw-Hill Education, 2012.

REFERENCE BOOKS:

R1-Rashid, "Microelectronic Circuits: Analysis & Design" 2ndEdition , CL Engineering publishers, 2010.
R2-A P Godse, U A Bakshi, "Electronic Devices and Circuits", Technical Publications,2017.
R3-Donald A Neamen, "Electronic Circuit Analysis and Design" Tata McGraw Hill, 3rd Edition, 2006.
R4-Laboratory manual prepared by the Department of Electronics and Instrumentation Engineering, 2016.

Web Reference:

https://onlinecourses.nptel.ac.in/noc21_ee80/preview

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	3	1	-	-	-	-	-	-	2	2	2
CO2	3	3	3	3	1	-	-	-	-	-	-	3	2	3
CO3	3	3	3	2	1	-	-	-	-	-	-	3	2	3
CO4	3	3	3	3	1	-	-	-	-	-	-	3	2	2
CO5	3	3	2	2	1	-	-	-	-	-	-	3	2	3
Avg	3	2.8	2.6	2.6	1	-	-	-	-	-	-	2.8	2	2.6

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E	22ME2001	**ENGINEERING PRACTICES** **(Common to all branches)**	0	0	4	2

Course Objective	To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical and Electrical Engineering.

Unit	Description of the Experiments
	GROUP A (CIVIL AND MECHANICAL)
1	Preparation of Single pipe line and Double pipe line connection by using valves, taps, couplings, unions, reducers and elbows.
2	Arrangement of bricks using English Bond for one brick thick wall for right angle corner junction and T-junction
3	Arrangement of bricks using English Bond for one and a half brick thick wall for right angle corner and T-junction
4	Preparation of arc welding of Butt joints, Lap joints and Tee joints.
5	Practice on sheet metal Models– Trays and funnels
6	Hands-on-exercise in wood work, joints by sawing, planning and cutting.
7	Practice on simple step turning, taper turning and drilling.
8	Demonstration on Smithy operation.
9	Demonstration on Foundry operation.
10	Demonstration on Power tools.
	GROUP B (ELECTRICAL ENGINEERING)
1	Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2	Fluorescent lamp wiring.
3	Stair case wiring.
4	Measurement of Electrical quantities – voltage, current, power & power factor in single phase circuits.
5	Measurement of energy using single phase energy meter.
6	Soldering practice using general purpose PCB.
7	Measurement of Time, Frequency and Peak Value of an Alternating Quantity using CRO and Function Generator.
8	Study of Energy Efficient Equipment's and Measuring Instruments.
	Total Instructional Hours 45

Course Outcome

- Fabricate wooden components and pipe connections including plumbing works.
- Fabricate simple weld joints.
- Fabricate different electrical wiring circuits and understand the AC Circuits.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22HE2071	DESIGN THINKING	2	0	0	2

Course Objective	**The student should be able to** 1. To expose students to the design process 2. To develop and test innovative ideas through a rapid iteration cycle. 3. To provide an authentic opportunity for students to develop teamwork and leadership skills

Unit	Description	Instructional Hours
I	**DESIGN ABILITY** Asking Designers about what they Do – Deconstructing what Designers Do – Watching what Designers Do – Thinking about what Designers Do – The Natural Intelligence of Design Sources	6
II	**DESIGNING TO WIN** Formula One Designing – Radical Innovations – City Car Design – Learning From Failures – Design Process and Working Methods	5
III	**DESIGN TO PLEASE AND DESIGNING TOGETHER** Background – Product Innovations – Teamwork versus Individual work – Roles and Responsibilities – Avoiding and Resolving Conflicts.	6
IV	**DESIGN EXPERTISE** Design Process – Creative Design - Design Intelligence – Development of Expertise – Novice to Expert. Critical Thinking – Case studies: Brief history of Albert Einstein, Isaac Newton and Nikola Tesla	6
V	**DESIGN THINKING TOOLS AND METHODS** Purposeful Use of Tools and Alignment with Process - Journey Mapping - Value Chain Analysis - Mind Mapping – Brainstorming - Design Thinking Application: Design Thinking Applied to Product Development	7
	Total Instructional Hours	30

Course Outcome	**After completion of the course the learner will be able to** CO1: Develop a strong understanding of the Design Process CO2: Learn to develop and test innovative ideas through a rapid iteration cycle. CO3: Develop teamwork and leadership skills

TEXT BOOKS:

T1 - Nigel Cross, "Design Thinking", Kindle Edition.

REFERENCE BOOKS:

R1 - Tom Kelley, "Creative Confidence", 2013.
R2 - Tim Brown, "Change by Design", 2009.

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திட்டம்/செம்	பாடநெறி குறியீடு	பாடத்தின் பெயர்	L	T	P	C
பி.இ/ க	22MC2094	தமிழரும் தொழில் நுட்பமும் (முதலாம் ஆண்டு பி.இ பொதுபாடப்பிரிவு)	2	0	0	1

பாடத்தின் நோக்கம்

கற்றவர் இயல வேண்டும்

1. சங்ககாலத்தில் தொழில்துறை பற்றிய அறிவைப்பெறுதல்.
2. சங்ககாலத்தில் வீட்டின் பொருள், சிற்பங்கள் மற்றும் கோவில்கள் வடிவமைப்பு பற்றி கூட்டு கற்றல்
3. வரலாறு மற்றும் தொல்லியல் சான்றுகளின் ஆதாரமாக உலோகவியல் ஆய்வுகளில் அறிவை வளர்த்துக் கொள்ளுங்கள்.
4. வேளாண்மை மற்றும் வேளாண் செயலாக்கத்தில் பயன்படுத்தப்படும் பண்டைய நுட்பங்களைப்பற்றிய அறிவைப்பெறுதல்.
5. தமிழ் மொழியின் மென்பொருள் பற்றி அறிதல்

அலகு	விளக்கம்	பயிற்சி நேரம்
I	**நெசவு மற்றும் பானைத் தொழில்நுட்பம்** சங்ககாலத்தில் நெசவுத்தொழில் – பானைத்தொழில்நுட்பம் – கருப்பு சிவப்பு பாண்டங்கள்-பாண்டங்களில் கீறல் குறியீடுகள்.	3
II	**வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்** சங்க இலக்கியத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் மற்றும் சங்ககாலத்தில் வீட்டுப்பொருட்களில் வடிவமைப்பு – சங்ககாலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்புபற்றிய விவரங்கள்- மாமல்லபுரச்சிற்பங்களும், கோவில்களும்- சோழர்காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிப்பாடுத்தளங்கள் – நாயக்கர் காலக்கோயில்கள் – மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரைமீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர்மஹால்- செட்டிநாட்டு வீடுகள்- பிரிட்டிஷ்காலத்தில் சென்னையில் இந்தோ – சாரோச்செனிக் கட்டிடக்கலை.	3
III	**உற்பத்தி தொழில்நுட்பம்** கப்பல்கட்டும்கலை- உலோகவியல்- இரும்புத்தொழிற்சாலை- இரும்பைஉருகுதல்எஃகு - வரலாற்றுசாலைசான்றுகளாகசெம்புமற்றும்தங்கநாணயங்கள்- நாணயங்கள்அச்சடித்தல்- மணிஉருவாக்கும்தொழிற்சாலைகள்- கல்மணிகள், கண்ணாடிமணிகள்- சுடுமண்மணிகள்- சங்குமணிகள்- எலும்புத்துண்டுகள்- தொல்லியல்சான்றுகள்- சிலப்பதிகாரத்தில்மணிகளின்வகைகள்.	3
IV	**வேளாண்மை மற்றும் நீர்பாசனத் தொழில்நுட்பம்** அணை, ஏரி, குளங்கள், மதகு- சோழர்காலக்குமுழித்தூம்பின்முக்கியத்துவம்- கால்நடைபராமரிப்பு- கால்நடைகளுக்காகவடிவமைக்கபட்டகிணறுகள்- வேளாண்மைமற்றும்வேளாண்மைசார்ந்தசெயல்பாடுகள்- கடல்சார்அறிவு- மீன்வளம்- முத்துமற்றும்முத்துக்குளித்தல்- பெருங்கடல்குறித்தபண்டையஅறிவு- அறிவுசார்சமூகம்.	3
V	**அறிவியல் தமிழ் மற்றும் கணித்தமிழ்** அறிவியல்தமிழின்வளர்ச்சி- கணித்தமிழ்வளர்ச்சி- தமிழ்நூல்களைமின்பதிப்புசெய்தல்- தமிழ்மென்பொருட்கள்உருவாக்கம்- தமிழ்இணையகல்விக்கழகம்- தமிழ்மின்நூலகம்- இணையத்தில்தமிழ்அகராதிகள்- சொற்குவைத்திட்டம்.	3
	மொத்த பயிற்றுவிக்கும் நேரம்	**15**

பாடத்தின்முடிவு

பாடநெறியின் முடிவில் கற்றவர் கற்றபின்

பாமு1: பண்டையதொழில்நுப்பதைஅடையாளம்கொள்ளதெரியும்

பாமு2: சங்ககாலகட்டுமானப்பொருட்கள்- சிற்பவகைகளைவேறுபடுத்தமுடியும்

பாமு3:வரலாறுமற்றும்தொல்லியல்சான்றுகளின்ஆதாரமாகஉலோகவியல்ஆய்வுகளில்பட்டியலிட்டுஅடையாளம் காணமுடியும்

பாமு4:விவசாயம்மற்றும்வேளாண்செயலாக்கத்தில்பயன்படுத்தப்படும்பழங்காலநுட்பங்களைப்பற்றி விளக்கத்துடன்நிரூபிக்கமுடியும்

பாமு5: தமிழ்மொழியின்புதியமென்பொருள்பற்றிஉருவாக்கக்கூடியதிறன்மேம்படுத்துதல்.

உரைபுத்தகங்கள்

உ1- தமிழகவரலாறு- மக்களும்பண்பாடும்- கே.கேபிள்ளை(வெளியீடுதமிழ்நாடுபாடநூல்மற்றும்கல்வியியல்பணிகள்கழகம்)

உ2- எஸ்.கே. சிங், இடைக்காலஇந்தியாவின்வரலாறு. புதுதில்லி: ஆக்சிஸ்புக்ஸ்பிரைவேட் லிமிடெட், 2013.

குறிப்புகள்

கு1- கணிதத்தமிழ்-முனைவர்இல. சுந்தரம்.(விகடன்பிரசுரம்)

கு2- கீழடி.வைகைநதிக்கரையில்சங்ககாலநகரநாகரிகம்(தொல்லியல்துறைவெளியீடு.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22MC2095	TAMILS AND TECHNOLOGY	2	0	0	1

Course Objectives:

The student should be able to

1. Acquiring knowledge of industry during the Sangam Period.
2. Collaborate learning about house design, sculpture and temples during Sangam Period
3. Develop Knowledge in metallurgical studies as a source of historical and archaeological evidence.
4. Acquiring knowledge about ancient techniques used in agriculture and agro processing
5. Knowledge of Tamil language literature.

UNIT I WEAVING AND CERAMIC TECHNOLOGY

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY

Designing and Structural construction House & Designs in household materials during Sangam Age – Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram – Sculptures and Temples of Mamallapuram – Great Temples of Cholas and other worship places – Temples of Nayaka Period – Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal – Chetti Nadu Houses, Indo – Saracenic architecture at Madras during British Period.

UNIT III MANUFACTURING TECHNOLOGY

Art of Ship Building – Metallurgical studies – Iron industry – Iron smelting, steel -Copper and goldCoins as source of history – Minting of Coins – Beads making-industries Stone beads -Glass beads – Terracotta beads -Shell beads/ bone beats – Archeological evidences – Gem stone types described in Silappathikaram.

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry – Wells designed for cattle use – Agriculture and Agro Processing – Knowledge of Sea – Fisheries – Pearl – Conche diving – Ancient Knowledge of Ocean – Knowledge Specific Society.

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING

Development of Scientific Tamil – Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

Course Outcome:

After completion of the course the learner will be able to

CO1:Recognize ancient business
CO2: Distinguish Sangam period building material and types of sculpture.
CO3: Identify the source of historical and archaeological
CO4: Demonstrate the techniques used in agriculture and agro processing.
CO5:Understand the new software of Tamil language.

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Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	22MC2093	SOCIAL SERVICES AND COMMUNITY DEVELOPMENT	1	0	0	1

Course Objectives:

The student should be able to

1. Acquire the knowledge and active participate in social service and community development activities.
2. Understand the concept of disaster management and role of NCC cadets in disaster management..
3. Understand the concept thinking and reasoning process..
4. Understand about maps and use of bearing and service protector
5. Know about the principles of flight and Aero foil structure and ATC procedures.

Unit	Description	Instructional Hours
I	**SOCIAL SERVICES AND COMMUNITY DEVELOPMENT** Basics of social services and its need - Rural development programs - Contribution of youth towards social welfare - NGOs in social services SwachbharathAbhiyan - Social evils - Mission Indradanush - BetibachoBetipado - Digital awareness - Constitution day.	3
II	**DISASTER MANAGEMENT** Organization of Disaster management -Types of emergencies - Natural and manmade disasters - fire service and fire fighting - prevention of fire.	3
III	**PERSONALITY DEVELOPMENT** Introduction to personality development - public speaking Intra and Inter personal skills -self awareness - critical thinking - Decision making and problem solving.	3
IV	**MAP READING** Types of maps - conventional signs - scales and Grid system - relief and contour gradient - cardinal points - Types of North - types of bearing and use of service protector - Prismatic compass and its uses - setting of map - finding North and own position.	3
V	**PRINCIPLES OF FLIGHT AND AIRMANSHIP** Introduction to principle of flight - Forces acting on the aircraft - Angle of attack - Angle of incidence - Newton's - law of motion - Bernauli's theorem and Venturi effect - Aerofoil - Airfield layout - ATC (Air Traffic Control) - circuit procedures - Aviation medicine.	3
	Total Instructional Hours	15

Course Outcome:

After completion of the course the learner will be able to

CO1:Perform the social services on various occasions for better community and social life

CO2:Appreciate the need and requirement for disaster management and NCC role in disaster management activities.

CO3: Define thinking, reasoning, critical thinking and creative thinking

CO4:Use of bearing and service protector and locate the places and objects on the ground.

CO5:Understand the principles of flight and Aerofoil structure

Reference:

1. UGC and AICTE circulated syllabus.

Text Books :

1. NCC cadet Guide (SD/SW) Army
2. NCC cadet Guide (SD/SW) Airforce.
3. ANOs Guide (SD/SW) by DG NCC, Ministry of Defence, New Delhi
4. Digital Forum App 1.0 & 2.0, by DG NCC DG NCC, Ministry of Defence, New Delhi

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22HE2072	SOFT SKILLS AND APTITUDE	1	0	0	1

Course Objective	1. To develop and nurture the soft skills of the students through instruction, knowledge acquisition, demonstration and practice. 2. To enhance the students ability to deal with numerical and quantitative skills. 3. To identify the core skills associated with critical thinking. 4. To develop and integrate the use of English language skills

Unit	Description	Instructional Hours
I	**Lessons on excellence** Skill introspection, Skill acquisition, consistent practice	2
II	**Logical Reasoning** Problem Solving - Critical Thinking- Lateral Thinking - Coding and Decoding – Series – Analogy - Odd Man Out - Visual Reasoning - Sudoku puzzles - Attention to detail	11
III	**Quantitative Aptitude** Addition and Subtraction of bigger numbers - Square and square roots - Cubes and cube roots - Vedic maths techniques - Multiplication Shortcuts - Multiplication of 3 and higher digit numbers – Simplifications - Comparing fractions - Shortcuts to find HCF and LCM - Divisibility tests shortcuts - Algebra and functions	11
IV	**Recruitment Essentials** Resume Building - Impression Management	4
V	**Verbal Ability** Nouns and Pronouns – Verbs - Subject-Verb Agreement - Pronoun-Antecedent – Agreement - Punctuations	4
	Total Instructional Hours	**30**

Course Outcome	After completion of the course the learner will be able to CO1: Students will analyze interpersonal communication skills. public speaking skills. CO2: Students will exemplify tautology, contradiction and contingency by logical thinking. CO3: Students will be able to develop an appropriate integral form to solve all sorts of quantitative problems. CO4: Students can produce a resume that describes their education, skills, experiences and measurable achievements with proper grammar, format and brevity CO5: Students will be developed to acquire the ability to use English language with an error while making optimum use of grammar

REFERENCE BOOKS:

R1 - Quantitative Aptitude – Dr. R S Agarwal
R2 -Speed Mathematics: Secret Skills for Quick Calculation - Bill Handley
R3 -Verbal and Non – Verbal Reasoning – Dr. R S Agarwal
R4- Objective General English – S.P.Bakshi

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(An Autonomous Institution, Affiliated to AnnaUniversity, Chennai
Approved by AICTE,NewDelhi &Accredited by NAAC with'A++'Grade)
Valley Campus, Pollachi Highways, Coimbatore, Tamilnadu.

Department of Electronics and Instrumentation Engineering

SYLLABUS REVISION DETAILS FOR THE REGULATION 2022 – 2024 Batch - SEMESTER II						
S. NO	COURSE CODE/COURSE NAME	SUGGESTION BY EXPERTS	EXISTING CONTENT (IN THE AY2023-24 EVEN)	REVISED CONTENT(FOR AY 2024-25 EVEN)	TYPE OF REVISION DELETION/ INSERTION/ MODIFICATION	PERCENTAGE OF REVISION
NIL						
					Total Percentage Changes	NIL

New Course Introduced (2022 Regulation) – 2024 Batch - II Semester

S.No	Regulation	Course code with Name	Credits
1.	2022	22EI2201 – Basics of Instrumentation Engineering	2

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DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.E ELECTRONICS AND INSTRUMENTATION ENGINEERING (UG)

REGULATION-2022

(For the students admitted during the academic year 2023-2024 and onwards)

SEMESTER I

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
		THEORY									
1.	22MA1101	Matrices and Calculus (common to all branches)	BSC	3	1	0	4	4	40	60	100
2.	22EI1201	Fundamentals of Electrical, Electronics and Instrumentation Engineering	PCC	3	0	0	3	3	40	60	100
		THEORY WITH LAB COMPONENT									
3.	22HE1151	English for Engineers (Common to all branches)	HSC	2	0	2	3	4	50	50	100
4.	22CY1151	Chemistry for Circuit Engineering	BSC	2	0	2	3	4	50	50	100
5.	22CS1151	Problem Solving using C Programming	ESC	2	0	2	3	4	50	50	100
		EEC COURSES (SE/AE)									
6.	22HE1071	Universal Human Values (Common to all branches)	AEC	2	0	0	2	3	40	60	100
7.	22HE1072	Entrepreneurship & Innovation (Common to all)	AEC	1	0	0	1	1	100	0	100
		NON CREDIT - MANDATORY COURSE									
8.	22MC1091/ 22MC1092	தமிழரும்தொழில்நுட்பமும் / Indian Constitution	MC	2	0	0	0	2	100	0	100
			TOTAL	15	5	6	19	27	370	330	700

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SEMESTER II

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22MA2102	Differential Equations and Laplace Transform	BSC	3	1	0	4	4	40	60	100
2.	22CY2101	Environmental Studies	ESC	2	0	0	2	3	40	60	100
3.	22PH2101	Basics of Material Science	BSC	2	0	0	2	3	40	60	100
THEORY WITH LAB COMPONENT											
4.	22HE2151	Effective Technical Communication (Common to all)	HSC	2	0	2	3	4	50	50	100
5.	22PH2151	Physics For Circuit Engineering	BSC	2	0	2	3	4	50	50	100
6.	22EI2251	Electronic Devices and Circuits	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	22ME2001	Engineering Practices (Common to all)	ESC	0	0	4	2	2	60	40	100
EEC COURSES (SE/AE)											
8.	22HE2071	Design Thinking(Common to all)	AEC	2	0	0	2	2	100	0	100
9.	22HE2072	Soft Skills and Aptitude-I(Common to all)	SEC	1	0	0	1	1	100	0	100
NON CREDIT - MANDATORY COURSE											
10.	22MC2091/ 22MC2092	தமிழர்மரபு /Heritage of Tamil	MC	2	0	0	0	2	100	0	100
11.	22MC2093	NCC */NSS / YRC / Sports / Clubs / Society Service - Enrollment (Common)	MC	All students shall enroll, on admission, in anyone of the personality and character development programmes and undergo training for about 80 hours							
			TOTAL	**19**	**1**	**8**	**22**	**27**	**520**	**380**	**900**

SEMESTER III

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22MA3102	Complex Analysis and Transforms	BSC	3	1	0	4	4	40	60	100
2.	22EI3201	Electronic Instrumentation	ESC	3	0	0	3	3	40	60	100
3.	22EE3202	Electric Circuit Analysis	PCC	3	1	0	4	4	40	60	100
4.	22EI3203	Sensors and Transducers	PCC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
5.	22EI3251	Digital Electronics	PCC	2	1	2	4	4	50	50	100

PRACTICAL											
6.	22EE3001	Electric Circuits Laboratory	ESC	0	0	4	2	4	60	40	100
7.	22EI3002	Sensors and Transducers Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
8.	22HE3071	Soft Skills and Aptitude -II (Common to all)	SEC	1	0	0	1	1	100	0	100
9.	22HE3072	Fundamentals of JAVA Programming	AEC	2	0	0	2	2	100	0	100
NON CREDIT - MANDATORY COURSE											
10.	22MC3191	Essence of Indian Traditional Knowledge	MC	2	0	0	0	2	100	0	100
			TOTAL	**19**	**3**	**10**	**25**	**31**	**630**	**370**	**1000**

SEMESTER IV

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22HE4101	IPR and Start-ups	HSC	2	0	0	2	2	40	60	100
2.	22EI4201	Electrical Machines	PCC	3	0	0	3	3	40	60	100
3.	22EE4202	Integrated Circuits and Its Applications	PCC	3	1	0	4	4	40	60	100
4.	22EI4203	Industrial Instrumentation - I	PCC	3	0	0	3	3	40	60	100
5.	22EI4204	Analytical Instrumentation	PCC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
6.	22EI4251	Electrical and Electronic Measurements	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	22EI4001	Electrical Machines Laboratory	PCC	0	0	4	2	4	60	40	100
8.	22EE4002	Integrated Circuits Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
9.	22HE4071	Soft Skills and Aptitude III	SEC	1	0	0	1	1	100	0	100
10.	22MC4191	Indian Constitution	MC	2	0	0	0	2	100	0	100
			TOTAL	**18**	**1**	**10**	**23**	**28**	**470**	**430**	**900**

* Two weeks internship carries 1 credit and it will be done during Semester III summer vacation and same willbe evaluated in Semester IV.
If students unable to undergo in semester III, then the Internship I offered in the semester IV can be clubbed with Internship II (Total: 4 weeks-2 credits)

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SEMESTER V

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22EI5201	Industrial Instrumentation -II	PCC	3	0	0	3	3	40	60	100
2.	22EE5202	Microprocessors and Microcontrollers	PCC	3	0	0	3	3	40	60	100
3.	22EI53XX	Professional Elective-1	PEC	3	0	0	3	3	40	60	100
4.	22EI53XX	Professional Elective-2	PEC	3	0	0	3	3	40	60	100
5.	22EI53XX	Professional Elective-3	PEC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
6.	22EI5251	Control Systems	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	22EI5001	Industrial Instrumentation Laboratory	PCC	0	0	4	1.5	3	60	40	100
8.	22EE5002	Microprocessors and Microcontrollers Laboratory	PCC	0	0	4	1.5	3	60	40	100
EEC COURSES (SE/AE)											
9.	22HE5071	Soft Skills -IV/Foreign languages	SEC	1	0	0	1	1	100	0	100
			TOTAL	**18**	**0**	**6**	**22**	**25**	**410**	**390**	**800**

SEMESTER VI

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22EI6201	Process Control	PCC	3	0	0	3	3	40	60	100
2.	22EI6202	Digital Signal Processing	PCC	3	0	0	3	3	40	60	100
3.	22HE6101	Professional Ethics	HSC	3	0	0	3	3	40	60	100
4.	22EI63XX	Professional Elective-4	PEC	3	0	0	3	3	40	60	100
5.	22EI63XX	Professional Elective-5	PEC	3	0	0	3	3	40	60	100
6.	22XX64XX	Open Elective – 1	OEC	3	0	0	3	3	40	60	100
PRACTICAL											
7.	22EI6001	Process Control Laboratory	PCC	0	0	4	2	4	60	40	100
8.	22EI6002	Virtual Instrumentation and Data Acquisition Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
9.	22HE6071	Soft Skills – V	SEC	2	0	0	2	2	100	0	100
			TOTAL	**20**	**0**	**8**	**24**	**28**	**460**	**440**	**900**

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SEMESTER VII

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22EI7201	Programmable Logic Controller and Its Applications	PCC	3	0	0	3	3	40	60	100
2.	22EI7202	Bio-Medical Instrumentation	PCC	3	0	0	3	3	40	60	100
3.	22EI73XX	Professional Elective-6	PEC	3	0	0	3	3	40	60	100
4.	22LS74XX	Open Elective – 2	OEC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
5.	22EI7251	VLSI Design	PCC	2	0	2	3	4	40	60	100
PRACTICAL											
6.	22EI7001	Industrial Automation Laboratory	PCC	0	0	4	1.5	3	60	40	100
7.	22EI7001	Instrumentation System Design Laboratory	PCC	0	0	4	1.5	3	60	40	100
EEC COURSES (SE/AE)											
8.	22EI7701	Internship Training	SEC	-	-	-	2	1	100	0	100
			TOTAL	**15**	**1**	**4**	**20**	**21**	**360**	**340**	**700**
* - Four weeks internship carries 2 credit and it will be done in before Semester VI summer vacation/placement training and same will be evaluated in Semester VII.											

SEMESTER VIII

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
EEC COURSES (SE/AE)											
1.	22EI8901	Project Work/Granted Patent	SEC	0	0	20	10	20	100	100	200
			TOTAL	**0**	**0**	**20**	**10**	**20**	**100**	**100**	**200**

Note:

* 1. As per the AICTE guideline, in Semester I, II, III & IV NCC one credit subject is added as Value Added Course with Extra Credit. Further, the students' who enrolled his/her name in HICET NCC and Air Wing are eligible to undergo this subject. The earned extra credits printed in the Consolidated Mark sheet as per the regulation.

2. NCC course level 1 & Level 2 will be added in the list of open elective subjects in the appropriate semester. Further, the students' who have opted NCC subjects in Semester I, II, III & IV are eligible to undergo NCC Open Elective Subjects.

3. The above-mentioned NCC Courses will be offered to the Students who are going to be admitted in the Academic Year 2021 – 22.

PROFESSIONAL ELECTIVE COURSES:VERTICALS

Vertical I Applied Instrumentation	Vertical II Health care Instrumentation	Vertical III Advanced Measurements and Control	Vertical IV Electronics & Communication systems	Vertical V Control and Automation	Vertical VI Process Instrumentation
22EI5301 Power plant Instrumentation	22EI5304 Telemetry and Telecontrol	22EI5307 Micro Electro Mechanical Systems	22EI5310 Embedded Systems	22EI5313 Plant Automation and IIOT	22EI5316 Instrumentation and Control in paper Industries
22EI5302 Industrial Pollution Control	22EI5305 Digital Image Processing	22EI5308 Wireless Instrumentation	22EI5311 Communication Engineering	22EI5314 PC based Instrumentation	22EI5317 System Identification
22EI5303 Safety Instrumented Systems	22EI5306 Medical Robotics	22EI5309 Wearable Technology	22EI5312 Fundamentals of Nanotechnology and Nanoelectronics	22EI5315 Introduction to Soft Computing	22EI5318 Industrial data Communication
22EI6301 Optical Instrumentation	22EI6303 Brain Computer Interface and Applications	22EI6305 Virtual Instrumentation	22EI6307 Semiconductor Manufacturing	22EI6309 Advanced Control Theory	22EI6311 Piping and Instrumentation Diagrams
22EI6302 Project Engineering and Management	22EI6304 Diagnosis and Therapeutic Equipment	22EI6306 Machine Monitoring and Control	22EI6308 Industrial Electronics	22EI6310 Robotics and Automation	22EI6312 Instrumentation and Control in Petrochemical Industries
22EI7301 Computer Control of Process	22EI7302 Biophotonics	22EI7303 Computer Vision and Image Processing	22EI7304 Microcontroller Based System Design	22EI7305 Introduction to DCS	22EI7306 Instrumentation System design

Note:

Students are permitted to choose all professional electives from any of the verticals.

OPEN ELECTIVE I

(VI SEMESTER– COMMON LIST FOR ALL THE PROGRAMS)

(EMERGING TECHNOLOGIES)

Students must choose an open elective course from the given list. The content of the course should not be related to their current program of study.

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TCP	CREDIT	Strength
				L	T	P			
1	22AI6401	Artificial Intelligence and Machine Learning Fundamentals	OEC	3	0	0	3	3	65
2	22CS6401	Block chain Technology Fundamentals	OEC	3	0	0	3	3	130
3	22EC6402	IoT Concepts and Applications	OEC	3	0	0	3	3	130
4	22IT6401	Data Science and Analytics Fundamentals	OEC	3	0	0	3	3	130
5	22BM6401	3D printing	OEC	3	0	0	3	3	65
6	22AE6401	Space Science	OEC	3	0	0	3	3	65
7 8	22MT6401	Introduction to Industrial Engineering	OEC	3	0	0	3	3	65
9	22MT6402	Industrial Safety and Environment	OEC	3	0	0	3	3	65
10	22CE6401	Climate Change and its Impact	OEC	3	0	0	3	3	65
11	22CE6402	Environment and Social Impact Assessment	OEC	3	0	0	3	3	65
12	22ME6401	Renewable Energy System	OEC	3	0	0	3	3	65
13	22ME6402	Additive Manufacturing systems	OEC	3	0	0	3	3	65
14	22EI6401	Introduction to Industrial Instrumentation and Control	OEC	3	0	0	3	3	65
15	22AU6401	Basics of Automobile Engineering	OEC	3	0	0	3	3	65
16	22EE6401	Fundamentals of Electric vehicles	OEC	3	0	0	3	3	65
17	22FT6401	Traditional Foods	OEC	3	0	0	3	3	65
18	22AG6401	Urban Agriculture and Organic Farming	OEC	3	0	0	3	3	65
19	22CH6401	Waste to Energy conversion	OEC	3	0	0	3	3	65
20		NCC Level - I	OEC	3	0	0	3	3	65

OPEN ELECTIVE II

(VII SEMESTER - COMMON LIST FOR ALL THE PROGRAMS)

LIFE SKILL COURSES

Students shall choose any one of the Life Skill courses from the open elective courses listed below.

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TCP	CREDIT	Strength
				L	T	P			
1	22LS7401	General studies for competitive examinations	OEC	3	0	0	3	3	130
2	22LS7402	Human Rights, Women Rights and Gender equity	OEC	3	0	0	3	3	130
3	22LS7403	Indian ethos and Human values	OEC	3	0	0	3	3	130
4	22LS7404	Financial independence and management	OEC	3	0	0	3	3	130
5	22LS7405	Yoga for Human Excellence	OEC	3	0	0	3	3	130
6	22LS7406	Democracy and Good Governance	OEC	3	0	0	3	3	130
7	22LS7407	NCC Level - II	OEC	3	0	0	3	3	130
8	22LS7408	Cybercrime and Awareness	OEC	3	0	0	3	3	130
9	22LS7409	First Aid and Emergency care	OEC	3	0	0	3	3	130
10	22LS7410	Business Communication	OEC	3	0	0	3	3	130

5.	22EI6302	Project Engineering and Management	PEC	3	0	0	3	3
6.	22EI7301	Computer Control of Process	PEC	3	0	0	3	3

DETAILS OF VERTICAL II: Health care Instrumentation

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22EI5304	Bio-Medical Instrumentation	PEC	3	0	0	3	3
2.	22EI5305	Telemetry and Telecontrol	PEC	3	0	0	3	3
3.	22EI5306	Digital Image Processing	PEC	3	0	0	3	3
4.	22EI6303	Medical Robotics	PEC	3	0	0	3	3
5.	22EI6304	Diagnosis and Therapeutic Equipment	PEC	3	0	0	3	3
6.	22EI7302	Biophotonics	PEC	3	0	0	3	3

DETAILS OF VERTICAL III: Advanced Measurements and Control

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22EI5307	Micro Electro Mechanical Systems	PEC	3	0	0	3	3
2.	22EI5308	Wireless Instrumentation	PEC	3	0	0	3	3
3.	22EI5309	Wearable Technology	PEC	3	0	0	3	3
4.	22EI6305	Virtual Instrumentation	PEC	3	0	0	3	3
5.	22EI6306	Machine Monitoring and Control	PEC	3	0	0	3	3
6.	22EI7303	Computer Vision and Image Processing	PEC	3	0	0	3	3

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DETAILS OF VERTICAL IV: Electronics & Communication systems

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22EI5310	Embedded Systems	PEC	3	0	0	3	3
2.	22EI5311	Communication Engineering	PEC	3	0	0	3	3
3.	22EI5312	Fundamentals of Nanotechnology and Nanoelectronics	PEC	3	0	0	3	3
4.	22EI6307	Semiconductor Manufacturing	PEC	3	0	0	3	3
5.	22EI6308	Industrial Electronics	PEC	3	0	0	3	3
6.	22EI7304	Microcontroller Based System Design	PEC	3	0	0	3	3

DETAILS OF VERTICAL V: Control and Automation

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22EI5313	Plant Automation and IIOT	PEC	3	0	0	3	3
2.	22EI5314	PC based Instrumentation	PEC	3	0	0	3	3
3.	22EI5315	Introduction to Soft Computing	PEC	3	0	0	3	3
4.	22EI6309	Advanced Control Theory	PEC	3	0	0	3	3
5.	22EI6310	Robotics and Automation	PEC	3	0	0	3	3
6.	22EI7305	Introduction to DCS	PEC	3	0	0	3	3

DETAILS OF VERTICAL VI: Process Instrumentation

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22EI5316	Instrumentation and Control in paper Industries	PEC	3	0	0	3	3
2.	22EI5317	System Identification	PEC	3	0	0	3	3
3.	22EI5318	Industrial Data Communication	PEC	3	0	0	3	3
4.	22EI6311	Piping and Instrumentation Diagrams	PEC	3	0	0	3	3
5.	22EI6312	Instrumentation and Control in Petrochemical Industries	PEC	3	0	0	3	3
6.	22EI7306	Instrumentation System design	PEC	3	0	0	3	3

Enrolment for B.E. / B. TECH. (HONOURS) / Minor Degree (optional)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only. For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes.

Clause 4.10 of Regulation 2022 is applicable for the Enrolment of B.E. / B. TECH. (HONOURS) / Minor Degree(Optional).

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VERTICALS FOR MINOR DEGREE

- Heads are requested to provide one vertical from their program to offer for other program students to register for additional courses (18 Credits) to become eligible for the B.E./B.Tech. Minor Degree.

  Note: Each programme should provide verticals for minor degree –

ELECTRONICS AND INSTRUMENTATION ENGINEERING OFFERING MINOR DEGREE

S NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22EI5471	Sem 5: Transducer Engineering	MDC	3	0	0	3	3
2.	22EI6471	Sem 6: Measurements and Measuring Instruments	MDC	3	0	0	3	3
3.	22EI6472	Sem 6: Industrial Instrumentation	MDC	3	0	0	3	3
4.	22EI7471	Sem 7: Industrial data Communication	MDC	3	0	0	3	3
5.	22EI7472	Sem 7: Powerplant Instrumentation	MDC	3	0	0	3	3
6.	22EI8471	Sem 8: Industrial Automation	MDC	3	0	0	3	3

*MDC – Minor Degree Course

In addition to the above the following additional courses for Minor Degree can also be given to the student's common to all the branches.

Vertical I
Fintech and Block Chain

S. No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	22CS5471	Financial Management	MDC	3	0	0	3	3
2	22CS6471	Fundamentals of Investment	MDC	3	0	0	3	3
3	22CS6472	Banking, Financial Services and Insurance	MDC	3	0	0	3	3
4	22CS7471	Introduction to Blockchain and its Applications	MDC	3	0	0	3	3
5	22CS7472	Fintech Personal Finance and Payments	MDC	3	0	0	3	3
6	22CS8471	Introduction to Fintech	MDC	3	0	0	3	3

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Vertical II
Entrepreneurship

S. No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	22BA5471	Foundations of Entrepreneurship	MDC	3	0	0	3	3
2	22BA6471	Introduction to Business Venture	MDC	3	0	0	3	3
3	22 BA6472	Team Building & Leadership Management for Business	MDC	3	0	0	3	3
4	22 BA7471	Creativity & Innovation in Entrepreneurship	MDC	3	0	0	3	3
5	22 BA7472	Principles of Marketing Management For Business	MDC	3	0	0	3	3
6	22 BA8471	Human Resource Management for Entrepreneurs	MDC	3	0	0	3	3
7	22BA8472	Financing New Business Ventures	MDC	3	0	0	3	3

Vertical III
Environment and Sustainability

S. No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	22CE5472	Sustainable infrastructure Development	MDC	3	0	0	3	3
2	22CE6471	Sustainable Agriculture and Environmental Management	MDC	3	0	0	3	3
3	22CE6472	Sustainable Bio Materials	MDC	3	0	0	3	3
4	22CE7471	Materials for Energy Sustainability	MDC	3	0	0	3	3
5	22CE7472	Green Technology	MDC	3	0	0	3	3
6	22CE8471	Environmental Quality Monitoring and Analysis	MDC	3	0	0	3	3

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B.E (Hons) ELECTRONICS AND INSTRUMENTATION ENGINEERING

Vertical I IoT and Smart Sensors	Vertical II Process Control	Vertical III Industrial Automation
Sem 5: 22EI5371 Introduction to Internet of Things	**Sem 5:** 22EI5372 Instrumentation Practices in Industries	**Sem 5:** 22EI5373 Drives and control system for Automation
Sem 6: 22EI6371 Principle of Sensors and Signal Conditioning	**Sem 6:** 22EI6373 Adaptive control	**Sem 6:** 22EI6375 Applied Industrial Instrumentation
Sem 6: 22EI6372 Embedded systems for IoT	**Sem 6:** 22EI6374 Advanced Process Control	**Sem 6:** 22EI6376 Instrumentation in Building Automation
Sem 7: 22EI7371 IoT for Industry Automation	**Sem 7:** 22EI7373 Unit operation and control	**Sem 7:** 22EI7375 Machine vision system
Sem 7: 22EI7372 Optical sensors and photonics	**Sem 7:** 22EI7374 Advanced Instrumentation Systems	**Sem 7:** 22EI7376 SCADA systems and its applications
Sem 8: 22EI8371 Smart Instrumentation	**Sem 8:** 22EI8372 Industrial safety and Hazard Management	**Sem 8:** 22EI8373 Technological Trends in Automation

Vertical I
B.E (Hons)_Electronics and Instrumentation Engineering
with Specialization in IoT and Smart Sensors

S. No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	22EI5371	Introduction to Internet of Things	PC	3	0	0	3	3
2	22EI6371	Principles of Sensors and Signal Conditioning	PC	3	0	0	3	3
3	22EI6372	Embedded systems for IoT	PC	3	0	0	3	3
4	22EI7371	IoT for Industry Automation	PC	3	0	0	3	3
5	22EI7372	Optical sensors and photonics	PC	3	0	0	3	3
6	22EI8371	Smart Instrumentation	PC	3	0	0	3	3

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Vertical II

B.E (Hons)_Electronics and Instrumentation Engineering with Specialization in Process Control

S. No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	22EI5372	Instrumentation Practices in Industries	PC	3	0	0	3	3
2	22EI6373	Adaptive control	PC	3	0	0	3	3
3	22EI6374	Advanced Process Control	PC	3	0	0	3	3
4	22EI7373	Unit operation and control	PC	3	0	0	3	3
5	22EI7374	Advanced Instrumentation Systems	PC	3	0	0	3	3
6	22EI8372	Industrial safety and Hazard Management	PC	3	0	0	3	3

Vertical III

B.E (Hons)_Electronics and Instrumentation Engineering with Specialization in Industrial Automation

S No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	22EI5373	Drives and control system for Automation	PC	3	0	0	3	3
2	22EI6375	Applied Industrial Instrumentation	PC	3	0	0	3	3
3	22EI6376	Instrumentation in Building Automation	PC	3	0	0	3	3
4	22EI7375	Machine vision system	PC	3	0	0	3	3
5	22EI7376	SCADA systems and its applications	PC	3	0	0	3	3
6	22EI8373	Technological Trends in Automation	PC	3	0	0	3	3

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SEMESTER-WISE CREDIT DISTRIBUTION

B.E. / B.TECH.PROGRAMMES										
S.No.	Course Area	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HSC	3	3	-	2	-	3	-	-	**11**
2	BSC	7	9	4	-	-	-	-	-	**20**
3	ESC	6	4	5	-	-	-	-	-	**15**
4	PCC	-	3	13	20	12	10	9	-	**67**
5	PEC	-	-	-	-	9	6	3	-	**18**
6	OEC	-	-	-	-	-	3	6	-	**9**
7	EEC	2	4	3	1	1	2	2	10	**25**
8	MC	√	√							
	Total	**18**	**23**	**25**	**23**	**22**	**24**	**20**	**10**	**165**

- **Credit Distribution R2022**

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	**18**	**23**	**25**	**23**	**22**	**24**	**20**	**10**	**165**

Chairman BoS

Chairman - BoS

Dean Academics

Dean (Academics)

Principal

PRINCIPAL

Hindusthan College Of Engineering & T...

COIMBATORE

SEMESTER - IV

Programme	Course code	Name of the course	L	T	P	C
B.E.	22HE4101	IPR AND START-UPS	2	0	0	2

The student should be able

Course Objective

1. The main objective of the IPR is to make the students aware of their rights for the protection of their invention done in their project work.
2. To get registration in our country and foreign countries of their invention, designs and thesis or theory written by the students during their project work and for this they must have knowledge of patents, copy right,
3. To learn about the trademarks and geographical indications (GI) in our country and foreign countries of their invention.
4. To gain the knowledge about designsand layout design Act-2000.
5. To learn about the technology transfer to product andStart-up knowledge.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO IPR** Meaning of property, Origin, Nature, Meaning of Intellectual Property RightsIntroduction to Trade-Related of Intellectual Property Rights (TRIPS) and World Trade Organization (WTO). - Kinds of Intellectual property rights—Copy Right, Patent, Trade Mark, Trade Secret and trade dress, Design, Layout Design, Geographical Indication, Plant Varieties and Traditional Knowledge.	6
II	**PATENT RIGHTS AND COPY RIGHTS** Origin, Meaning of Patent, Types, Procedure to follow the methods of IP agents, Inventions, which are not patentable, Registration Procedure, Rights and Duties of Patentee, Assignment and licence, Restoration of lapsed Patents, Surrender and Revocation of Patents, Infringement, Remedies & Penalties, IT Act- introduction. COPY RIGHT- Origin, Definition &Types of Copy Right, Patent Ethics, Registration procedure, Assignment & licence, Terms of Copy Right, Piracy, Infringement, Remedies,	6
III	**TRADE MARKS AND GEOGRAPHICAL INDICATION** Origin, Meaning & Nature of Trade Marks, Types, Registration of Trade Marks, Infringement & Remedies, Offences relating to Trade Marks, Passing off, Penalties. GEOGRAPHICAL INDICATION – International Protection, plant varieties, Infringement of GI, licencing, legal issues.	6
IV	**DESIGN** Meaning, Definition, Object, Registration of Design, Cancellation of Registration, International convention on design, functions of Design. Semiconductor Integrated circuits and layout design Act-2000.	6
V	**START-UPS** Process of Innovation, Monetizing Ideas,Technology transfer to product, Funding Options for Start-up,Start-up Models,Preparation of Project Report, Start up to MNC, Start-up Audit.	6
	Total Instructional Hours	**30**

Course Outcome

Upon completion of the course, the students will be able to:
CO1: Understand IPR and aware the invention rights.
CO2: Get awareness of acquiringthe patent for their project ideas
CO3: Learn obtaining copyright for their innovative works
CO4:Understand the designs and layout design Act-2000.
CO5:Understand the concept of start-ups, identify the required strategic resources.

TEXT BOOK:

T1. Intellectual Property Rights (IPR) by M.K Bhandari 2021
T2. Law relating to Intellectual Property Rights, by V.K Ahuja 2017
T3. Intellectual Property Rights (IPR) for Start-ups by Vinay Vaish 2016
T4. Intellectual Property - Patents, Copyright, Trade Marks and Allied Rights (South Asian Edition) by W Cornish and D Llewelyn and T Pain 8th South Asian Edition, 2016.
T5. Peter Thiel & Blake Masters, Zero to One: Notes on Start Ups, or How to Build the Future, Random House, 2014.

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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
Avg.	3	-	3	-	-	3	-	-	-	-	-	3	2	2

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EIE - RICET

Dean (Academics)
RICET

Programme	Course Code	Name of the Course	L	T	P	C
BE	22EI4201	Electrical Machines	3	0	0	3

Course Objective

1. Understand the principles of operations of DC generator
2. Define the construction details of DC motor and testing of DC machine
3. Understand the construction of transformer
4. Introduce special electrical machines
5. llustrate the principle of synchronous machine

Unit	Description	Instructional Hours
II	**D.C. GENERATORS** Principle of operation and construction details- Armature winding and its types- EMF equation - Characteristics - Armature reaction – Commutation – Methods of improving commutation – Parallel operation of DC generators - Application of DC Generator.	9
III	**D.C. MOTOR** Principle of operation – Construction details - Torque equation - Characteristics - Starting and speed control D.C. Motor- Significance of back EMF – Losses and efficiency in dc machine – Testing of DC machine: Brake test, Swinburne's test – Hopkinson's test – Retardation test – Application of DC Motor.	9
IV	**TRANSFORMERS** Construction and Principle - Theory of ideal transformer - EMF equation – Open circuit and short circuit test- Voltage regulation – Losses and efficiency - Tests on transformers - Equivalent circuit - Phasor diagram – Applications of single phase transformer	9
V	**INDUCTION MACHINES** Single phase induction motor - Three-phase Induction motor - Principle of operation - Torque-slip and Torque-speed characteristics – Starting methods - Speed control of induction motors- Applications	9
	SYNCHRONOUS MACHINES AND SPECIAL ELECTRICAL MACHINES Synchronous Generator - Principle of operation and construction - Types - EMF Equation - Vector diagram- Synchronous motor- Torque equation- Speed control – Hunting- Hysteresis Motor – Stepper motor - Switched reluctance motor	
	Total Instructional Hours	45

Course Outcome

CO1: State the principle of operation and construction of D.C. Generator
CO2: Ability to write the DC motor operation and DC machine testing
CO3: List the operation of transformer
CO4: Illustrate the operation of induction and special electrical machines
CO5: Explain the operation and control of synchronous

TEXT BOOKS:

T1 - Kothari D. P. and Nagrath I. J, "Electric Machines", Fourth Edition, McGraw Hill Education (India) Private Limited, 2015.
T2 - Deshpande M. V., "Electrical Machines", Prentice Hall of India Learning Pvt. Ltd., New Delhi, 2011.
T3- Abhijit Chakrabarti and Sudipta Debnath, "Electrical Machines", McGraw- Hill Education, 2015

REFERENCE BOOKS :

R1 - M.N.Bandyopadhyay, "Electrical Machines Theory and Practice", Prentice Hall of India Learning Pvt. Ltd., New Delhi, 2009.
R2 - B.L.Theraja and A.K.Theraja, "A Text Book of Electrical Technology" Volume II, S.Chand and Company, 2013.
R3 - C.A.Gross, "Electric Machines", CRC Press 2010.
R4-Fitzgerald A.E, Kingsley C., Umans, S. and Umans S.D., "Electric Machinery", McGrawHill, 2002.
R5-B.S.Guru and H.R.Hiziroglu, "Electric Machinery and Transformer', Oxford university Press 2007

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	2	3	1	1	-	-	-	-	-	2	3	3
CO2	3	3	3	3	1	1	-	-	-	-	-	2	3	3
CO3	3	3	3	2	1	1	-	-	-	-	-	2	3	2
CO4	3	3	3	3	1	1	-	-	-	-	-	2	3	2
CO5	3	2	2	2	1	1	-	-	-	-	-	2	3	3
Avg	2.8	2.6	2.6	2.6	1	1	-	-	-	-	-	2	3	2.6

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
BE	22EE4202	**Integrated Circuits and Its Applications** *(Common to EEE and EIE)*	3	1	0	4

Course Objectives	1	Understand the fundamental knowledge of integrated circuit (IC) fabrication procedures.
	2	Compare the characteristics of linear integrated circuits and identify their applications
	3	Apply OP-AMP on various applications like Timers, PLL circuits, ADC's and DAC's.
	4	Explain the basic principles of regulator circuits and illustrate the functioning of special-purpose integrated circuits.
	5	Summarize internal functional blocks of special function IC's.

Unit	Description	Instructional Hours
I	**IC FABRICATION** Introduction - IC classification - chip size and circuit complexity - fundamental of monolithic IC technology - Silicon wafer preparation - Epitaxial growth – Oxidation - Photolithography - diffusion - Ion Implantation-Isolation Techniques-Metallization-Assembly Processing and packaging - Fabrication FET and CMOS	12
II	**CHARACTERISTICS OF OP-AMP** Basic information of OP-AMP – The Ideal OP-AMP characteristics - DC characteristics - AC characteristics -Inverting and Non-inverting Amplifiers -Voltage Follower-Differential amplifier - Basic OP-AMP applications: Summer - Differentiator and Integrator - V/I & I/V converters- S/H circuit..	12
III	**APPLICATIONS OF OP-AMP** Instrumentation amplifier - First order LPF - First order HPF - First order BPF and Band reject filters - Comparators - Multivibrators – Triangular wave generator - Peak detector- - D/A converter : R- 2R ladder and weighted resistor types - A/D converters : Successive Approximations- Dual Slope.	12
IV	**SPECIAL IC's** Functional block- characteristics with IC 555 Timer - Application: Missing pulse detector, PWM, FSK Generator, SCHMITT Trigger - IC566 voltage controlled oscillator - IC565 - Phase Lock Loop IC - PLL application: frequency multiplication/division, AM Detection.	12
V	**APPLICATION IC's** IC voltage regulators – LM78XX - 79XX Fixed voltage regulators - 723 General purpose regulator - switching regulator - Opto Coupler IC's- IC8038 function generator-LM380 Audio Amplifier.	12
	Total Instructional Hours	**60**

Course Outcomes	CO1	Describe the fundamental concepts of IC fabrication procedures.
	CO2	Analyze the characteristics of linear integrated circuits and classify their applications in real-world scenarios
	CO3	Develop solutions using operational amplifiers (OP-AMPs) for various applications, including timers, PLL circuits, ADCs, and DACs.
	CO4	Illustrate the internal architecture and explain the functionality of special-purpose integrated circuits.
	CO5	Summarize the working principles of regulator circuits and operational features of special-purpose integrated circuits.

TEXT BOOKS:

T1 - D. Roy Choudhary , Shail B. Jain, "Linear Integrated Circuits", 5th Edition, New Age Publishers,2018.
T2 -S Salivahanan, V S KanchanaBhaaskaran, "Linear Integrated Circuits", 2nd Edition, TMH,2017.

REFERENCE BOOKS:

R1- RamakantA.Gayakward, "Op-amps and Linear Integrated Circuits", IV edition, Pearson Education, 2015.
R2- Robert F.Coughlin, Fredrick F. Driscoll, "Op-amp and Linear ICs", PHI Learning, 6th Edition, 2000.
R3- Floyd .Buchla,"Fundamentals of Analog Circuits", Pearson, 2013.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	2	1	1	-	-	-	-	-	2	3	2
CO2	3	2	2	2	1	1	-	-	-	-	-	2	3	2
CO3	3	2	2	2	1	1	-	-	-	-	-	2	2	3
CO4	3	3	2	3	1	1	-	-	-	-	-	2	3	3
CO5	3	3	3	3	1	1	-	-	-	-	-	2	3	3
Avg	3	2.4	2.2	2.5	1	1	-	-	-	-	-	2	2.8	2.6

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E	22EI4203	Industrial Instrumentation-I	3	0	0	3

Course Objective	1. Infer the concepts of Speed, Force and Torque measurements in instrumentation. 2. Discuss the methods of Acceleration, Vibration, Density and Viscosity measurements. 3. Illustrate various pressure measurement instruments. 4. Demonstrate various temperature measuring instruments. 5. Outline the methods used for the measurement of temperature.

Unit	Description	Instructional Hours
I	**MEASUREMENT OF SPEED, FORCE AND TORQUE** Speed - Measurement of speed - AC and DC tacho generators, photo electric pickup - stroboscope - Force - Measurement of force - Load cell, pneumatic and hydraulic load cell - Torque - Measurement of torque - Strain gauge, relative regular twist.	9
II	**MEASUREMENT OF ACCELERATION, VIBRATION, DENSITY AND VISCOSITY** Accelerometers - LVDT, piezoelectric, and variable reluctance type accelerometers Mechanical type vibration instruments - Seismic instrument as an accelerometer and vibrometer - Calibration of vibration pick-ups Units of density, specific gravity and viscosity used in industries - Baume scale, API scale - Pressure head type and Float type densitometer - Ultrasonic densitometer - Bridge type gas densitometer - Viscosity terms - Saybolt viscometer -Rotameter type.	9
III	**MEASUREMENT OF PRESSURE** Units of pressure - Manometers - different types - Elastic type pressure gauges - Bourdon tube, bellows, diaphragms - Electrical methods - Measurement of vacuum-McLeod gauge, thermal conductivity gauges, Ionization gauge - flapper-nozzle assembly, Dead weight tester - Calibration and selection of pressure gauges.	9
IV	**MEASUREMENT OF TEMPERATURE** Temperature scales - bimetallic thermometer-Liquid in Glass thermometer - filled-in thermometer - Electrical method of measurement - RTD - 3wire and 4 wire RTD, Thermistor- construction and types, Thermocouples-types of thermocouple, cold junction compensation, high temperature measuring thermocouples - thermal well - Radiation methods of temperature measurement - Calibration and selection of thermal sensing meters.	9
V	**THERMOCOUPLE AND RADIATION PYROMETER** Thermocouples - Laws of thermocouple, Fabrication of industrial thermocouples, Signal conditioning for thermocouple, iso thermal block reference junctions, Commercial circuits for cold junction compensation, Response of thermocouple, Special techniques for measuring high temperature using thermocouple, Radiation fundamentals, Pyrometers: Total radiation & Selective Radiation pyrometers, Optical pyrometers, Two colour radiation pyrometers.	9
	Total Instructional Hours	**45**

Course Outcome	CO1: Interpret the measurement of Speed, Force and Torque in instrumentation CO2: Classify the Instruments used for measurement of Acceleration, Vibration, Density and Viscosity CO3: Choose the instruments used for the measurement of pressure CO4: Design temperature measuring instruments CO5: Identify the methods used for the measurement of temperature

TEXT BOOKS:

T1 - E.O. Doebelin, "Measurement Systems – Application and Design", Tata McGraw Hill Ltd., 2003.
T2 - R.K. Jain, "Mechanical and Industrial Measurements", Khanna Publishers, New Delhi, 1999.
T3 -Eckman D.P., "Industrial Instrumentation", Wiley Eastern Limited,1990.

REFERENCE BOOKS:

R1 - D. Patranabis, "Principles of Industrial Instrumentation", Tata McGraw Hill Ltd.,1996.
R2 - A.K. Sawhney and P. Sawhney, "A Course on Mechanical Measurements, Instrumentation and Control", Dhanpat Rai and Co, 2004.
R3 - S.K. Singh, "Industrial Instrumentation and Control", Tata McGraw Hill, 2003.
R4- Liptak, B.G., "Instrumentation Engineers Handbook (Measurement)", CRC Press,2005.
R5-Jones, B.E., "Instrument Technology", Vol.2, Butterworth-Heinemann, International Edition, 2003

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	2	1	1	1	1	-	-	-	-	2	3	3
CO2	3	2	2	1	1	1	1	-	-	-	-	2	3	3
CO3	3	2	2	1	1	1	1	-	-	-	-	2	3	3
CO4	3	3	2	1	1	1	1	-	-	-	-	2	3	3
CO5	3	3	3	1	1	1	1	-	-	-	-	2	3	3
Avg	3	2	2.2	1	1	1	1	-	-	-	-	2	3	3

1-Low, 2-Medium, 3-High, "-" No correlation

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EIE - HICET

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HICET

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI4204	Analytical Instrumentation	3	0	0	3

Course Objective

1. Understand various methods of analysis in electromagnetic spectrum.
2. Study important methods of analysis of in chromatography.
3. Interpret the fundamentals of Industrial Gas Analyzers.
4. Infer the knowledge about pH meters and dissolved component analyzer.
5. Gain knowledge about Microscopic techniques.

Unit	Description	Instructional Hours
I	**SPECTROPHOTOMETERS** Elements of Analytical Instruments - Beer-Lambert law – Colorimeter – UV and Visible spectrophotometers - Single and Double Beam Instruments - IR spectrophotometers - Flame photometers - Atomic absorption spectrophotometers – FTIR spectrophotometers - Sources – Detectors.	9
II	**CHROMATOGRAPHY** Gas chromatography - Basic parts - Chromatographic column - Sources – Detectors – Liquid Chromatography - Types - Column chromatography- Thin layer Chromatography - Paper partition Chromatography-Applications - High pressure liquid chromatography- Sources – Detectors.	9
III	**INDUSTRIAL GAS ANALYZERS AND POLLUTION MONITORING INSTRUMENTS** Types of gas analyzers – oxygen, NO2, Paramagnetic oxygen analyzer –Infrared gas analyzers – Thermal conductivity analyzers – Analysis based on Ionization of gases – air pollution due to carbon monoxide, nitrogen oxides, sulphur dioxide estimation – dust and smoke measurements.	9
IV	**pH METERS AND DISSOLVED COMPONENT ANALYSERS** Principle of pH measurement - Hydrogen electrode, Glass electrode, Reference electrode - Selective Ion Electrode, Ammonia Electrodes – Biosensors - Sodium analyzer - Silicon Analyzer - dissolved oxygen analyzer.	9
V	**NUCLEAR MAGNETIC RESONANCE AND MICROSCOPIC TECHNIQUES** Principle of NMR - Types - Construction and applications - Scanning Electron Microscope (SEM) - Basic principles, Instrumentation and applications. Transmission Electron Microscope (TEM) - Basic principles, Instrumentation and applications. Mass spectrometers - Types and applications.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Understand the principle of Spectrophotometers
CO2: Identify liquid and gas chromatographic techniques.
CO3: Gain knowledge about industrial gas analyzers and pollution monitoring instruments.
CO4: Analyze pH measurements and Impart awareness on dissolved component analyzer.
CO5: Explain the principle of nuclear magnetic resonance and microscopic techniques.

TEXT BOOKS:

T1 - R.S. Khandpur, "Handbook of Analytical Instruments", McGraw Hill Education (India) Private Limited, Third edition, 2015.

T2 - Willard H.H., Merritt L.L., Dean J.A., and Settle F.A. "Instrumental Methods of Analysis", 7th Edition, CBS Publishing& Distribution, New Delhi, 2012.

T3- Liptak, B.G., "Process Measurement and Analysis", CRC Press, 5th Edition, 2015.

REFERENCE BOOKS:

R1 - G.W. Ewing, "Instrumental Methods of Analysis",6th Edition, Mc Graw Hill, 2007.

R2-Braun, R.D., "Introduction to Instrumental Analysis", Pharma Book Syndicate, Singapore,2006.

R3-Robert E. Sherman., "Analytical Instrumentation", Instruments Society of America, 1996.

R4-Jain, R.K., Mechanical and Industrial Measurements, Khanna Publishers, Delhi, 1999.

R5-, Douglas A. Skoog, "Instrumental Analysis", Cengage learning 2009.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	2	3	1	1	-	-	-	-	3	3	3
CO2	3	3	2	3	3	2	1	-	-	-	-	2	3	3
CO3	3	3	2	3	3	2	1	-	-	-	-	3	2	3
CO4	3	3	2	3	2	1	1	-	-	-	-	3	2	3
CO5	3	3	3	3	3	1	1	-	-	-	-	3	3	3
Avg	3	2.8	2.2	2.8	3	1.4	1	-	-	-	-	2.8	2.8	3

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI4251	**Electrical and Electronic Measurements** ***(Common to EIE and EEE)***	2	0	2	3

Course Objective	1. Understand the Basics of measurement systems. 2. Outline the characteristics of electrical measurements. 3. Examine the Various Bridges used for Measuring Electrical Parameters. 4. Describe the Analog and Digital Electronic Instruments and it's Working 5. Illustrate the function of Oscilloscope, Signal Generators and Analyzers.

Unit	Description	Instructional Hours
I	**BASICS OF MEASUREMENT SYSTEM** Generalized Measurement system, Functional elements of an instrument, Classification of instruments, Error in measurement, Classification of errors– Static and dynamic characteristics– Statistical evaluation of measurement data – Standards and calibration-***Calibration of DC instruments using standard meters.***	6+3
II	**ELECTRICAL MEASUREMENTS** Principle, Construction, Operation of Moving Coil and Moving Iron Instruments - Ammeters and Voltmeters - Single phase Watt meters and Energy Meters - DC potentiometer:– Basic circuit, standardization – Laboratory type (Crompton's) – AC potentiometer:-Drysdale (polar type) type – Gall-Tinsley (coordinate) type – Instrument Transformer CT & PT-***Calibration of watt meter.***	6+3
III	**MEASUREMENT OF R,L,C USING BRIDGES** D.C Bridges: Wheatstone – Kelvin bridge- Kelvin double bridge – A.C Bridges: Anderson Bridge –Maxwell Bridge- Hay's Bridge and Schering bridge - Megger ***Measurement of Unknown Capacitance using Schering Bridge.***	6+3
IV	**ELECTRONIC INSTRUMENTS** D.C Ammeter and Voltmeters – Ohmmeter – Component measuring Instruments - Vector Voltmeter, Digital Tachometer – Digital Multimeter, Digital Frequency Meter, Digital Measurement of Time, Electronic Counter, Digital Phase and Capacitance meter, Microprocessor-based instruments. ***Measurement of various parameters using Digital Multimeter***	6+3
V	**DIGITAL STORAGE OSCILLOSCOPE AND SIGNAL GENERATORS** Digital Storage Oscilloscopes – Signal Generation: Feedback Oscillators, Function Generator - Signal Generating Instruments: Swept frequency Generator, Random noise generator - Wave Analyzer: Heterodyne Wave Analyzer - Spectrum Analyzer-***Measurement of frequency and voltage at different ac inputs using DSO.***	6+3
	Total Instructional Hours	**45**

Course Outcome	CO1:	Interpret the errors, error analysis and characteristics of different measurement systems.
	CO2:	In-depth knowledge about different electrical measurements.
	CO3:	Analyze the operation and characteristics of different bridges.
	CO4:	Ability to interpret the working of both analog and digital instruments.
	CO5:	Illustrate the method of measurement using Oscilloscope, Signal generators and wave analyzers.

TEXT BOOKS:

T1 - Sawhney. A.K, "A Course in Electrical and Electronic Measurement and Instrumentation", 19th Edition, Dhanpat Rai & Sons, 2014.

T2 - Albert D. Helfrick and William D. Cooper, "Modern Electronic Instrumentation and Measurement Techniques", Prentice Hall of India, 2008.

T3- J.J. Carr, "Elements of Electronic Instrumentation and Measurement", Pearson Education India, New Delhi, 2011.

REFERENCE BOOKS:

R1 - J. B. Gupta, "A Course in Electronic and Electrical Measurements", S. K. Kataria & Sons, 2003.

R2 - Kalsi.H.S, "Electronic Instrumentation", Tata McGraw Hill, 2010.

R3 - Doebelin. E, "Measurement Systems: Application and Design", 6th Edition, Tata McGraw Hill Private Limited, 2012.

R4 - David A Bell. "Electronic Instrumentation and Measurements", Oxford Pubilisher, Second Edition, 2010.

R5- M.M.S. Anand, "Electronics Instruments and Instrumentation Technology", Prentice Hall India, NewDelhi, 2009

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	3	1	1	-	-	-	-	-	-	2	2	3
CO2	3	3	2	1	1	-	-	-	-	-	-	2	3	3
CO3	3	2	3	2	2	-	-	-	-	-	-	2	3	3
CO4	2	2	3	2	2	-	-	-	-	-	-	3	2	3
CO5	3	3	2	1	2	-	-	-	-	-	-	2	3	3
Avg	2.8	2.4	2.6	1.4	1.6	-	-	-	-	-	-	2.2	2.6	3

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI4001	Electrical Machines Laboratory	0	0	3	2

Course Objective

1. Apply the knowledge gained to conduct load test on D.C Machines.
2. Exposed to the Load Test on Single and Three Phase Induction Motor.
3. Familiar with the Operation of Starters.

Expt. No.	Description of the Experiments
1.	Open Circuit and Load Characteristics of Separately excited D.C. Shunt Generator.
2.	Load Test on D.C. Shunt Motor.
3.	Load Test on D.C. Series Motor.
4.	Load Test on D.C. Compound Motor.
5.	Swinburne's Test
6.	Speed Control of D.C. Shunt Motor.
7.	Load Test on Single Phase Transformer
8.	Open circuit and Short Circuit test on Single Phase Transformer.
9.	Load Test on Single Phase Induction Motor.
10.	Load Test on Three phase Induction Motor.
11.	Study of Starters

Total Practical Hours 45

Course Outcome

CO1: Demonstrate the principle of DC generators, DC motors.
CO2: Explain the principle and to conduct test on transformers.
CO3: Validate suitable test to compute the characteristics of motors.
CO4: Establish suitable experiments on generators.
CO5: Demonstrate about starting methods of motors.

REFERENCES:

R1-Gupta B R, and Vandana Singhal, "Fundamentals of Electrical Machine", New Age International Publishers, Third Edition, 2010.
R2- Laboratory manual prepared by the Department of Electronics and Instrumentation Engineering, 2016.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1	1	1	-	-	-	3	3	-	2	2	2
CO2	3	2	1	1	1	-	-	-	3	2	-	2	2	2
CO3	3	2	1	1	1	-	-	-	3	3	-	3	2	2
CO4	3	2	1	1	1	-	-	-	3	2	-	3	2	2
CO5	3	3	2	2	1	-	-	-	3	2	-	2	2	2
Avg	3	2.2	1.2	1.2	1	-	-	-	3	2.4	-	2.4	2	2

1-Low, 2-Medium, 3-High, "-" No correlation

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Dean (Academics)
HICET

Programme	Course Code	Name of the Course	L	T	P	C
B.E	22EE4002	**Integrated Circuits Laboratory** *(Common To EEE and EIE)*	0	0	3	2

Course Objectives

1. Recognize the performance characteristics of operational amplifier (Op-Amp) ICs and their configurations such as inverting and non-inverting amplifiers.
2. Design and test analog circuits such as adders, subtractors, integrators, and differentiators using operational amplifiers.
3. Analyze the frequency response characteristics of first-order low-pass filters and evaluate their performance.
4. Implement and test various circuits, including A/D and D/A converters, multivibrators, and regulated DC power supplies using standard ICs such as IC 555 and IC 723.
5. Simulate and evaluate advanced Op-Amp-based circuits like Schmitt triggers and differential amplifiers to understand their functionality and applications.

S.No	Description of the Experiments
1.	Analyze the performance characteristics of operational amplifier (Op-Amp) ICs through experimental observation.
2.	Design and implement inverting and non-inverting amplifier configurations using Op-Amps.
3.	Construct and validate the functionality of adder and subtractor circuits using operational amplifiers.
4.	Develop and test integrator and differentiator circuits using operational amplifiers.
5.	Measure and evaluate the frequency response characteristics of first-order low-pass filters.
6.	Construct and test digital-to-analog (D/A) and analog-to-digital (A/D) converters using standard ICs.
7.	Build and test astable and monostable multivibrator circuits using the IC 555 timer.
8.	Assemble and validate the performance of a regulated DC power supply using IC 723.
9.	Simulate and analyze the working of a Schmitt Trigger circuit in a simulation environment.
10	Simulate and evaluate the performance of a differential amplifier using appropriate software tools.

Total Practical Hours 45

Course Outcomes

CO1: Clarify the performance characteristics of operational amplifier (Op-Amp) ICs anddemonstrate their use in inverting and non-inverting amplifier configurations.
CO2: Construct and evaluate analog circuits such as Adders, Subtractor, Integrators and Differentiators using operational amplifiers.
CO3: Analyze the frequency response of first-order low-pass filters and verify their operational characteristics through practical testing.
CO4: Implement and test electronic circuits, including A/D and D/A converters, multivibratorsand regulated power supplies using ICs like IC 555 and IC 723.
CO5: Simulate and analyze advanced Op-Amp-based circuits such as Schmitt triggers and differential amplifiers to validate their theoretical concepts and practical applications.

REFERENCES:

R1- Ramakant A. Gayakwad, "Lab manual for Op-amps and Linear Integrated Circuits", Prentice Hall, 2010.
R2- Laboratory manual prepared by the Department of Electronics and Instrumentation Engineering, 2016.

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
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CO3	3	2	1	1	1	-	-	-	3	3	-	2	2	3
CO4	3	2	1	1	1	-	-	-	3	2	-	2	2	2
CO5	3	3	2	2	1	-	-	-	3	2	-	2	2	2
Avg	3	2.2	1.2	1.2	1	-	-	-	3	2.2	-	2	2	2.2

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Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	22HE4071	Soft Skills and Aptitude -III	1	0	0	1

Course Objectives:

1. Solve Logical Reasoning questions of easy to intermediate level
2. Solve Quantitative Aptitude questions of easy to intermediate level
3. Solve Verbal Ability questions of easy to intermediate level
4. Display good writing skills while dealing with essays

Unit	Description	Instructional Hours
I	**Logical Reasoning** Clocks - Calendars - Direction Sense - Cubes - Data Interpretation: Tables, Pie Chart, Bar Graph - Data Sufficiency - Syllogism	10
II	**Quantitative Aptitude** Time and work: Work with different efficiencies, Pipes and cisterns, Work equivalence, Division of wages - Time, Speed and Distance: Basics of time, speed and distance, Relative speed, Problems based on trains, Problems based on boats and streams, Problems based on races - Profit and loss, Partnerships and averages: Basic terminologies in profit and loss - Partnership - Averages - Weighted average Permutation, Combination: Fundamental Counting Principle, Permutation and Combination, Computation of Permutation, Circular Permutations, Computation of Combination - Probability	12
III	**Verbal Ability** Sentence Correction: Subject-Verb Agreement, Modifiers, Parallelism, Pronoun-Antecedent Agreement, Verb Time Sequences, Comparisons, - Sentence Completion and Para-jumbles- Critical Reasoning: Argument – Identifying the Different Parts (Premise, assumption, conclusion), Strengthening statement, Weakening statement, Mimic the pattern	6
IV	**Recruitment Essentials** Cracking interviews - demonstration through a few mocks - Sample mock interviews to demonstrate how to crack the: HR interview, MR interview, Technical interview - Cracking other kinds of interviews: Skype/ Telephonic interviews, Panel interviews, Stress interviews - Resume building -- workshop: A workshop to make students write an accurate resume- Essay Writing	2
	Total Instructional Hours	30

Course Outcome:

- CO1: Students will avoid the various fallacies that can arise through the misuse of logic.
- CO2: Students would opt for alternate methods to solve the problems rather than conventional methods.
- CO3: Students will heighten their awareness of correct usage of English grammar in writing and speaking
- CO4: Students will be concise and clear, using professional language for placements.

REFERENCE BOOKS:

R1: A New Approach To Reasoning Verbal & Non-Verbal By B.S. Sijwali
R2: How to prepare for data interpretation for CAT by Arun Sharma.
R3: How to Crack TEST OF REASONING in all competitive examinations by Jaikishan and Premkishan.
R4: Quantitative Aptitude for Competitive Examinations - Dr. R.S. Aggarwal, S. Chand
R5: Word Power Made Easy by Norman Lewis
R:6 Six weeks to words of power by Wilfred Funk

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EIE - HICET

Chairman

Dean (Academics)
HICET

Programme/ Sem	CourseCode	Name of the Course	L	T	P	C
B.E./B.Tech/ IV	22MC4191	INDIAN CONSTITUTION (Common for all Branches)	2	0	0	0

Course Objectives

The student should be made to
1. Sensitization towards self, family (relationship),society and nature
2. Understanding (or developing clarity) of nature, society and larger systems, on the basis of human relationships and resolved individuals
3. Strengthening of self-reflection
4. Development of commitment and courage to act

Unit	Description	Instructional Hours
I	**BASIC FEATURES AND FUNDAMENTAL PRINCIPLES** Meaning of the constitution law and constitutionalism–Historical perspective of the constitution of India– salient features and characteristic of the constitution of India.	6
II	**FUNDAMENTAL RIGHTS** Scheme of the fundamental rights–fundamental duties and its legislative status–The directive principles of state policy–its importance and implementation-Federal structure and distribution Of legislative and financial powers between the union and states.	6
III	**PARLIAMENTARY FORM OF GOVERNMENT** The constitution powers and the status of the president in India.–Amendment of the constitutional Powers and procedures–The historical perspective of the constitutional amendment of India–Emergency provisions: National emergency, President rule, Financial emergency.	6
IV	**LOCALGOVERNANCE** Local self-government-Rural Local Government-Panchayath Raj, Elections of Panchayat-State Election Commission- Urban Local Government-Amendment Act, Urban Local Government Structures in India -	6
V	**INDIANSOCIETY** ConstitutionalRemediesforcitizens–PoliticalPartiesandPressureGroups;Right of Women,Childrenand Scheduled Castes and Scheduled Tribes and other Weaker Sections.	6
	Total Instructional Hours	**30**

Course Outcome

At the end of the course, the learner will be able to
CO1:Understand the functions of the Indian government.
CO2:Understand and abide the rules of the Indian Constitution

TEXT BOOKS:

T1: Durga Das Basu,"Introduction to the Constitution of India",Prentice Hall of India,New Delhi,1997.
T2: Agarwal R C.,"Indian Political System", S.Chand and Company, NewDelhi,1997.
T3: Maciverand Page,"Society:AnIntroduction Analysis",Mac Mil.in India Ltd.,New Delhi.
T4: Sharma K L., "Social Stratification in India: Issues and Themes ",Jawaharlal Nehru University,New Delhi,1997.

REFERENCE BOOKS:

R1-Sharma,Brij Kishore,"Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.
R2-GahaiUR.,"IndianPoliticalSystem",NewAcademicPublishingHouse, Jalaendhar.
R3-Sharma R N., "Indian Social Problems",Media Promoters and Publishers Pvt. Ltd.

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HiCET

Hindusthan College of Engineering and Technology

(An Autonomous Institution, Affiliated to AnnaUniversity, Chennai
Approved by AICTE,NewDelhi &Accredited by NAAC with'A++'Grade)
Valley Campus, Pollachi Highways, Coimbatore, Tamilnadu.

HICET

Department of Electronics and Instrumentation Engineering

SYLLABUS REVISION DETAILS FOR THE REGULATION 2022 – 2023 BATCH - IV SEMESTER						
S. NO	COURSE CODE/COURSE NAME	SUGGESTION BY EXPERTS	EXISTING CONTENT (IN THE AY2023-24 EVEN)	REVISED CONTENT(FOR AY 2024-25 EVEN)	TYPE OF REVISION DELETION/ INSERTION/ MODIFICATION	PERCENTAGE OF REVISION
NIL						
					Total Percentage Changes	NIL

New Course Introduced (2022 Regulation) – 2023 Batch - IV Semester

S.No	Regulation	Course code with Name	Credits
NIL			

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Chairman - BoS
EIE

Dean-Academics

Dean (Academics)
HICET

DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.E ELECTRONICS AND INSTRUMENTATION ENGINEERING (UG)

REGULATION-2022

(For the students admitted during the academic year 2022-2023 and onwards)

SEMESTER I

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22MA1101	Matrices and Calculus (common to all branches)	BSC	3	1	0	4	4	40	60	100
2.	22EI1201	Fundamentals of Electrical, Electronics and Instrumentation Engineering	PCC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
3.	22HE1151	English for Engineers (Common to all branches)	HSC	2	0	2	3	4	50	50	100
4.	22CY1151	Chemistry for Circuit Engineering	BSC	2	0	2	3	4	50	50	100
5.	22CS1151	Problem Solving using C Programming	ESC	2	0	2	3	4	50	50	100
EEC COURSES (SE/AE)											
6.	22HE1071	Universal Human Values (Common to all branches)	AEC	2	0	0	2	3	40	60	100
7.	22HE1072	Entrepreneurship & Innovation (Common to all)	AEC	1	0	0	1	1	100	0	100
NON CREDIT - MANDATORY COURSE											
8.	22MC1091/ 22MC1092	தமிழரும்தொழில்நுட்பமும் / Indian Constitution	MC	2	0	0	0	2	100	0	100
			TOTAL	**15**	**5**	**6**	**19**	**27**	**370**	**330**	**700**

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SEMESTER II

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22MA2102	Differential Equations and Laplace Transform	BSC	3	1	0	4	4	40	60	100
2.	22CY2101	Environmental Studies	ESC	2	0	0	2	3	40	60	100
3.	22PH2101	Basics of Material Science	BSC	2	0	0	2	3	40	60	100
THEORY WITH LAB COMPONENT											
4.	22HE2151	Effective Technical Communication (Common to all)	HSC	2	0	2	3	4	50	50	100
5.	22PH2151	Physics For Circuit Engineering	BSC	2	0	2	3	4	50	50	100
6.	22EI2251	Electronic Devices and Circuits	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	22ME2001	Engineering Practices (Common to all)	ESC	0	0	4	2	2	60	40	100
EEC COURSES (SE/AE)											
8.	22HE2071	Design Thinking(Common to all)	AEC	2	0	0	2	2	100	0	100
9.	22HE2072	Soft Skills and Aptitude-I(Common to all)	SEC	1	0	0	1	1	100	0	100
NON CREDIT - MANDATORY COURSE											
10.	22MC2091/ 22MC2092	தமிழர்மரபு /Heritage of Tamil	MC	2	0	0	0	2	100	0	100
11.	22MC2093	NCC */NSS / YRC / Sports / Clubs / Society Service - Enrollment (Common)	MC	All students shall enroll, on admission, in anyone of the personality and character development programmes and undergo training for about 80 hours							
			TOTAL	**19**	**1**	**8**	**22**	**27**	**520**	**380**	**900**

SEMESTER III

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22MA3102	Complex Analysis and Transforms	BSC	3	1	0	4	4	40	60	100
2.	22EI3201	Electronic Instrumentation	ESC	3	0	0	3	3	40	60	100
3.	22EE3202	Electric Circuit Analysis	PCC	3	1	0	4	4	40	60	100
4.	22EI3203	Sensors and Transducers	PCC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
5.	22EI3251	Digital Electronics	PCC	2	1	2	4	4	50	50	100
PRACTICAL											
6.	22EE3001	Electric Circuits Laboratory	ESC	0	0	4	2	4	60	40	100

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7.	22EI3002	Sensors and Transducers Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
8.	22HE3071	Soft Skills and Aptitude -II (Common to all)	SEC	1	0	0	1	1	100	0	100
9.	22HE3072	Fundamentals of JAVA Programming	AEC	2	0	0	2	2	100	0	100
NON CREDIT - MANDATORY COURSE											
10.	22MC3191	Essence of Indian Traditional Knowledge	MC	2	0	0	0	2	100	0	100
			TOTAL	**19**	**3**	**10**	**25**	**31**	**630**	**370**	**1000**

SEMESTER IV

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22HE4101	IPR and Start-ups	HSC	2	0	0	2	2	40	60	100
2.	22EI4201	Electrical Machines	PCC	3	0	0	3	3	40	60	100
3.	22EE4202	Integrated Circuits and Its Applications	PCC	3	1	0	4	4	40	60	100
4.	22EI4203	Industrial Instrumentation - I	PCC	3	0	0	3	3	40	60	100
5.	22EI4204	Analytical Instrumentation	PCC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
6.	22EI4251	Electrical and Electronic Measurements	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	22EI4001	Electrical Machines Laboratory	PCC	0	0	4	2	4	60	40	100
8.	22EE4002	Integrated Circuits Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
9.	22HE4071	Soft Skills and Aptitude III	SEC	1	0	0	1	1	100	0	100
10.	22MC4191	Indian Constitution	MC	2	0	0	0	2	100	0	100
			TOTAL	**18**	**1**	**10**	**23**	**28**	**470**	**430**	**900**

* Two weeks internship carries 1 credit and it will be done during Semester III summer vacation and same willbe evaluated in Semester IV.
If students unable to undergo in semester III, then the Internship I offered in the semester IV can be clubbed with Internship II (Total: 4 weeks-2 credits)

SEMESTER V

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22EI5201	Industrial Instrumentation -II	PCC	3	0	0	3	3	40	60	100
2.	22EE5202	Microprocessors and Microcontrollers	PCC	3	0	0	3	3	40	60	100
3.	22EI53XX	Professional Elective-1	PEC	3	0	0	3	3	40	60	100

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4.	22EI53XX	Professional Elective-2	PEC	3	0	0	3	3	40	60	100
5.	22EI53XX	Professional Elective-3	PEC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
6.	22EI5251	Control Systems	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	22EI5001	Industrial Instrumentation Laboratory	PCC	0	0	4	1.5	3	60	40	100
8.	22EE5002	Microprocessors and Microcontrollers Laboratory	PCC	0	0	4	1.5	3	60	40	100
EEC COURSES (SE/AE)											
9.	22HE5071	Soft Skills -IV/Foreign languages	SEC	1	0	0	1	1	100	0	100
			TOTAL	**18**	**0**	**6**	**22**	**25**	**410**	**390**	**800**

SEMESTER VI

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22EI6201	Process Control	PCC	3	0	0	3	3	40	60	100
2.	22EI6202	Digital Signal Processing	PCC	3	0	0	3	3	40	60	100
3.	22HE6101	Professional Ethics	HSC	3	0	0	3	3	40	60	100
4.	22EI63XX	Professional Elective-4	PEC	3	0	0	3	3	40	60	100
5.	22EI63XX	Professional Elective-5	PEC	3	0	0	3	3	40	60	100
6.	22XX64XX	Open Elective – 1	OEC	3	0	0	3	3	40	60	100
PRACTICAL											
7.	22EI6001	Process Control Laboratory	PCC	0	0	3	2	4	60	40	100
8.	22EI6002	Virtual Instrumentation and Data Acquisition Laboratory	PCC	0	0	3	2	4	60	40	100
EEC COURSES (SE/AE)											
9.	22HE6071	Soft Skills – V	SEC	2	0	0	2	2	100	0	100
			TOTAL	**20**	**0**	**6**	**24**	**28**	**460**	**440**	**900**

SEMESTER VII

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22EI7201	Programmable Logic Controller and Its Applications	PCC	3	0	0	3	3	40	60	100
2.	22EI73XX	Professional Elective-6	PEC	3	0	0	3	3	40	60	100
3.	22XX7401	Open Elective – 2	OEC	3	0	0	3	3	40	60	100
4.	22LS74XX	Open Elective – 3	OEC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											

SEMESTER VII

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22EI7201	Programmable Logic Controller and Its Applications	PCC	3	0	0	3	3	40	60	100
2.	22EI7202	Bio-Medical Instrumentation	PCC	3	0	0	3	3	40	60	100
3.	22EI73XX	Professional Elective-6	PEC	3	0	0	3	3	40	60	100
4.	22LS74XX	Open Elective – 2	OEC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
5.	22EI7251	VLSI Design	PCC	2	0	2	3	4	40	60	100
PRACTICAL											
6.	22EI7001	Industrial Automation Laboratory	PCC	0	0	4	1.5	3	60	40	100
7.	22EI7001	Instrumentation System Design Laboratory	PCC	0	0	4	1.5	3	60	40	100
EEC COURSES (SE/AE)											
8.	22EI7701	Internship Training	SEC	-	-	-	2	1	100	0	100
			TOTAL	**15**	**1**	**4**	**20**	**21**	**360**	**340**	**700**
* - Four weeks internship carries 2 credit and it will be done in before Semester VI summer vacation/placement training and same will be evaluated in Semester VII.											

SEMESTER VIII

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
EEC COURSES (SE/AE)											
1.	22EI8901	Project Work/Granted Patent	SEC	0	0	20	10	20	100	100	200
			TOTAL	**0**	**0**	**20**	**10**	**20**	**100**	**100**	**200**

Note:

* 1. As per the AICTE guideline, in Semester I, II, III & IV NCC one credit subject is added as Value Added Course with Extra Credit. Further, the students' who enrolled his/her name in HICET NCC and Air Wing are eligible to undergo this subject. The earned extra credits printed in the Consolidated Mark sheet as per the regulation.

2. NCC course level 1 & Level 2 will be added in the list of open elective subjects in the appropriate semester. Further, the students' who have opted NCC subjects in Semester I, II, III & IV are eligible to undergo NCC Open Elective Subjects.

3. The above-mentioned NCC Courses will be offered to the Students who are going to be admitted in the Academic Year 2021 – 22.

PROFESSIONAL ELECTIVE COURSES:VERTICALS

Vertical I Applied Instrumentation	Vertical II Health care Instrumentation	Vertical III Advanced Measurements and Control	Vertical IV Electronics & Communication systems	Vertical V Control and Automation	Vertical VI Process Instrumentation
22EI5301 Power plant Instrumentation	22EI5304 Telemetry and Telecontrol	22EI5307 Micro Electro Mechanical Systems	22EI5310 Embedded Systems	22EI5313 Plant Automation and IIOT	22EI5316 Instrumentation and Control in paper Industries
22EI5302 Industrial Pollution Control	22EI5305 Digital Image Processing	22EI5308 Wireless Instrumentation	22EI5311 Communication Engineering	22EI5314 PC based Instrumentation	22EI5317 System Identification
22EI5303 Safety Instrumented Systems	22EI5306 Medical Robotics	22EI5309 Wearable Technology	22EI5312 Fundamentals of Nanotechnology and Nanoelectronics	22EI5315 Introduction to Soft Computing	22EI5318 Industrial data Communication
22EI6301 Optical Instrumentation	22EI6303 Brain Computer Interface and Applications	22EI6305 Virtual Instrumentation	22EI6307 Semiconductor Manufacturing	22EI6309 Advanced Control Theory	22EI6311 Piping and Instrumentation Diagrams
22EI6302 Project Engineering and Management	22EI6304 Diagnosis and Therapeutic Equipment	22EI6306 Machine Monitoring and Control	22EI6308 Industrial Electronics	22EI6310 Robotics and Automation	22EI6312 Instrumentation and Control in Petrochemical Industries
22EI7301 Computer Control of Process	22EI7302 Biophotonics	22EI7303 Computer Vision and Image Processing	22EI7304 Microcontroller Based System Design	22EI7305 Introduction to DCS	22EI7306 Instrumentation System design

Note:

Students are permitted to choose all professional electives from any of the verticals.

OPEN ELECTIVE I

(VI SEMESTER– COMMON LIST FOR ALL THE PROGRAMS)

(EMERGING TECHNOLOGIES)

Students must choose an open elective course from the given list. The content of the course should not be related to their current program of study.

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TCP	CREDIT	Strength
				L	T	P			
1	22AI6401	Artificial Intelligence and Machine Learning Fundamentals	OEC	3	0	0	3	3	65
2	22CS6401	Block chain Technology Fundamentals	OEC	3	0	0	3	3	130
3	22EC6402	IoT Concepts and Applications	OEC	3	0	0	3	3	130
4	22IT6401	Data Science and Analytics Fundamentals	OEC	3	0	0	3	3	130
5	22BM6401	3D printing	OEC	3	0	0	3	3	65
6	22AE6401	Space Science	OEC	3	0	0	3	3	65
7 8	22MT6401	Introduction to Industrial Engineering	OEC	3	0	0	3	3	65
9	22MT6402	Industrial Safety and Environment	OEC	3	0	0	3	3	65
10	22CE6401	Climate Change and its Impact	OEC	3	0	0	3	3	65
11	22CE6402	Environment and Social Impact Assessment	OEC	3	0	0	3	3	65
12	22ME6401	Renewable Energy System	OEC	3	0	0	3	3	65
13	22ME6402	Additive Manufacturing systems	OEC	3	0	0	3	3	65
14	22EI6401	Introduction to Industrial Instrumentation and Control	OEC	3	0	0	3	3	65
15	22AU6401	Basics of Automobile Engineering	OEC	3	0	0	3	3	65
16	22EE6401	Fundamentals of Electric vehicles	OEC	3	0	0	3	3	65
17	22FT6401	Traditional Foods	OEC	3	0	0	3	3	65
18	22AG6401	Urban Agriculture and Organic Farming	OEC	3	0	0	3	3	65
19	22CH6401	Waste to Energy conversion	OEC	3	0	0	3	3	65
20		NCC Level - I	OEC	3	0	0	3	3	65

OPEN ELECTIVE II

(VII SEMESTER - COMMON LIST FOR ALL THE PROGRAMS)

LIFE SKILL COURSES

Students shall choose any one of the Life Skill courses from the open elective courses listed below.

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TCP	CREDIT	Strength
				L	T	P			
1	22LS7401	General studies for competitive examinations	OEC	3	0	0	3	3	130
2	22LS7402	Human Rights, Women Rights and Gender equity	OEC	3	0	0	3	3	130
3	22LS7403	Indian ethos and Human values	OEC	3	0	0	3	3	130
4	22LS7404	Financial independence and management	OEC	3	0	0	3	3	130
5	22LS7405	Yoga for Human Excellence	OEC	3	0	0	3	3	130
6	22LS7406	Democracy and Good Governance	OEC	3	0	0	3	3	130
7	22LS7407	NCC Level - II	OEC	3	0	0	3	3	130
8	22LS7408	Cybercrime and Awareness	OEC	3	0	0	3	3	130
9	22LS7409	First Aid and Emergency care	OEC	3	0	0	3	3	130
10	22LS7410	Business Communication	OEC	3	0	0	3	3	130

DETAILS OF VERTICAL III: Advanced Measurements and Control

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22EI5307	Micro Electro Mechanical Systems	PEC	3	0	0	3	3
2.	22EI5308	Wireless Instrumentation	PEC	3	0	0	3	3
3.	22EI5309	Wearable Technology	PEC	3	0	0	3	3
4.	22EI6305	Virtual Instrumentation	PEC	3	0	0	3	3
5.	22EI6306	Machine Monitoring and Control	PEC	3	0	0	3	3
6.	22EI7303	Computer Vision and Image Processing	PEC	3	0	0	3	3

DETAILS OF VERTICAL IV: Electronics & Communication systems

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22EI5310	Embedded Systems	PEC	3	0	0	3	3
2.	22EI5311	Communication Engineering	PEC	3	0	0	3	3
3.	22EI5312	Fundamentals of Nanotechnology and Nanoelectronics	PEC	3	0	0	3	3
4.	22EI6307	Semiconductor Manufacturing	PEC	3	0	0	3	3
5.	22EI6308	Industrial Electronics	PEC	3	0	0	3	3
6.	22EI7304	Microcontroller Based System Design	PEC	3	0	0	3	3

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DETAILS OF VERTICAL V: Control and Automation

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22EI5313	Plant Automation and IIOT	PEC	3	0	0	3	3
2.	22EI5314	PC based Instrumentation	PEC	3	0	0	3	3
3.	22EI5315	Introduction to Soft Computing	PEC	3	0	0	3	3
4.	22EI6309	Advanced Control Theory	PEC	3	0	0	3	3
5.	22EI6310	Robotics and Automation	PEC	3	0	0	3	3
6.	22EI7305	Introduction to DCS	PEC	3	0	0	3	3

DETAILS OF VERTICAL VI: Process Instrumentation

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22EI5316	Instrumentation and Control in paper Industries	PEC	3	0	0	3	3
2.	22EI5317	System Identification	PEC	3	0	0	3	3
3.	22EI5318	Industrial Data Communication	PEC	3	0	0	3	3
4.	22EI6311	Piping and Instrumentation Diagrams	PEC	3	0	0	3	3
5.	22EI6312	Instrumentation and Control in Petrochemical Industries	PEC	3	0	0	3	3
6.	22EI7306	Instrumentation System design	PEC	3	0	0	3	3

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HINDUSTHAN COLLEGE OF ENG. ACADEMIC

Enrolment for B.E. / B. TECH. (HONOURS) / Minor Degree (optional)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only. For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes.

Clause 4.10 of Regulation 2022 is applicable for the Enrolment of B.E. / B. TECH. (HONOURS) / Minor Degree(Optional).

VERTICALS FOR MINOR DEGREE

- Heads are requested to provide one vertical from their program to offer for other program students to register for additional courses (18 Credits) to become eligible for the B.E./B.Tech. Minor Degree.

  Note: Each programme should provide verticals for minor degree –

ELECTRONICS AND INSTRUMENTATION ENGINEERING OFFERING MINOR DEGREE

S NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	22EI5471	Sem 5: Transducer Engineering	MDC	3	0	0	3	3
2.	22EI6471	Sem 6: Measurements and Measuring Instruments	MDC	3	0	0	3	3
3.	22EI6472	Sem 6: Industrial Instrumentation	MDC	3	0	0	3	3
4.	22EI7471	Sem 7: Industrial data Communication	MDC	3	0	0	3	3
5.	22EI7472	Sem 7: Powerplant Instrumentation	MDC	3	0	0	3	3
6.	22EI8471	Sem 8: Industrial Automation	MDC	3	0	0	3	3

*MDC – Minor Degree Course

In addition to the above the following additional courses for Minor Degree can also be given to the student's common to all the branches.

ACADEMIC COUNCIL HINDUSTHAN COLLEGE OF ENGG & TECH Chairman

Vertical I
Fintech and Block Chain

S. No	Course Code	Course Title	Category	Periods Per week L	T	P	Total Contact Periods	Credits
1	22CS5471	Financial Management	MDC	3	0	0	3	3
2	22CS6471	Fundamentals of Investment	MDC	3	0	0	3	3
3	22CS6472	Banking, Financial Services and Insurance	MDC	3	0	0	3	3
4	22CS7471	Introduction to Blockchain and its Applications	MDC	3	0	0	3	3
5	22CS7472	Fintech Personal Finance and Payments	MDC	3	0	0	3	3
6	22CS8471	Introduction to Fintech	MDC	3	0	0	3	3

Vertical II
Entrepreneurship

S. No	Course Code	Course Title	Category	Periods Per week L	T	P	Total Contact Periods	Credits
1	22BA5471	Foundations of Entrepreneurship	MDC	3	0	0	3	3
2	22BA6471	Introduction to Business Venture	MDC	3	0	0	3	3
3	22 BA6472	Team Building & Leadership Management for Business	MDC	3	0	0	3	3
4	22 BA7471	Creativity & Innovation in Entrepreneurship	MDC	3	0	0	3	3
5	22 BA7472	Principles of Marketing Management For Business	MDC	3	0	0	3	3
6	22 BA8471	Human Resource Management for Entrepreneurs	MDC	3	0	0	3	3
7	22BA8472	Financing New Business Ventures	MDC	3	0	0	3	3

Vertical III
Environment and Sustainability

S. No	Course Code	Course Title	Category	Periods Per week L	T	P	Total Contact Periods	Credits
1	22CE5472	Sustainable infrastructure Development	MDC	3	0	0	3	3
2	22CE6471	Sustainable Agriculture and Environmental Management	MDC	3	0	0	3	3
3	22CE6472	Sustainable Bio Materials	MDC	3	0	0	3	3
4	22CE7471	Materials for Energy Sustainability	MDC	3	0	0	3	3
5	22CE7472	Green Technology	MDC	3	0	0	3	3
6	22CE8471	Environmental Quality Monitoring and Analysis	MDC	3	0	0	3	3

B.E (Hons) ELECTRONICS AND INSTRUMENTATION ENGINEERING

Vertical I IoT and Smart Sensors	Vertical II Process Control	Vertical III Industrial Automation
Sem 5: 22EI5371 Introduction to Internet of Things	**Sem 5:** 22EI5372 Instrumentation Practices in Industries	**Sem 5:** 22EI5373 Drives and control system for Automation
Sem 6: 22EI6371 Principle of Sensors and Signal Conditioning	**Sem 6:** 22EI6373 Adaptive control	**Sem 6:** 22EI6375 Applied Industrial Instrumentation
Sem 6: 22EI6372 Embedded systems for IoT	**Sem 6:** 22EI6374 Advanced Process Control	**Sem 6:** 22EI6376 Instrumentation in Building Automation
Sem 7: 22EI7371 IoT for Industry Automation	**Sem 7:** 22EI7373 Unit operation and control	**Sem 7:** 22EI7375 Machine vision system
Sem 7: 22EI7372 Optical sensors and photonics	**Sem 7:** 22EI7374 Advanced Instrumentation Systems	**Sem 7:** 22EI7376 SCADA systems and its applications
Sem 8: 22EI8371 Smart Instrumentation	**Sem 8:** 22EI8372 Industrial safety and Hazard Management	**Sem 8:** 22EI8373 Technological Trends in Automation

Chairman

Vertical I
B.E (Hons)_Electronics and Instrumentation Engineering with Specialization in IoT and Smart Sensors

S. No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	22EI5371	Introduction to Internet of Things	PC	3	0	0	3	3
2	22EI6371	Principles of Sensors and Signal Conditioning	PC	3	0	0	3	3
3	22EI6372	Embedded systems for IoT	PC	3	0	0	3	3
4	22EI7371	IoT for Industry Automation	PC	3	0	0	3	3
5	22EI7372	Optical sensors and photonics	PC	3	0	0	3	3
6	22EI8371	Smart Instrumentation	PC	3	0	0	3	3

Vertical II
B.E (Hons)_Electronics and Instrumentation Engineering with Specialization in Process Control

S. No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	22EI5372	Instrumentation Practices in Industries	PC	3	0	0	3	3
2	22EI6373	Adaptive control	PC	3	0	0	3	3
3	22EI6374	Advanced Process Control	PC	3	0	0	3	3
4	22EI7373	Unit operation and control	PC	3	0	0	3	3
5	22EI7374	Advanced Instrumentation Systems	PC	3	0	0	3	3
6	22EI8372	Industrial safety and Hazard Management	PC	3	0	0	3	3

Vertical III
B.E (Hons)_Electronics and Instrumentation Engineering with Specialization in Industrial Automation

S No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	22EI5373	Drives and control system for Automation	PC	3	0	0	3	3
2	22EI6375	Applied Industrial Instrumentation	PC	3	0	0	3	3
3	22EI6376	Instrumentation in Building Automation	PC	3	0	0	3	3
4	22EI7375	Machine vision system	PC	3	0	0	3	3
5	22EI7376	SCADA systems and its applications	PC	3	0	0	3	3
6	22EI8373	Technological Trends in Automation	PC	3	0	0	3	3

ACADEMIC COUNCIL
Chairman

SEMESTER-WISE CREDIT DISTRIBUTION

B.E. / B.TECH.PROGRAMMES										
S.No.	Course Area	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HSC	3	3	-	2	-	3	-	-	**11**
2	BSC	7	9	4	-	-	-	-	-	**20**
3	ESC	6	4	5	-	-	-	-	-	**15**
4	PCC	-	3	13	20	12	10	9	-	**67**
5	PEC	-	-	-	-	9	6	3	-	**18**
6	OEC	-	-	-	-	-	3	6	-	**9**
7	EEC	2	4	3	1	1	2	2	10	**25**
8	MC	√	√							
	Total	**18**	**23**	**25**	**23**	**22**	**24**	**20**	**10**	**165**

Credit Distribution R2022

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	**18**	**23**	**25**	**23**	**22**	**24**	**20**	**10**	**165**

Chairman BoS | **Dean Academics** | **Principal**

Chairman - BoS
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HICET

PRINCIPAL
Hindusthan College Of Engineering & Technology
COIMBATORE - 641 032.

SEMESTER – VI

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI6201	Process Control	3	0	0	3

Course Objective	1. Learn the basics of process control systems and its dynamics. 2. Impart the knowledge on control actions and controller modes. 3. Understand the various controller tuning procedures. 4. Familiarize the characteristics and types of control valves. 5. Outline about advanced multiloop control schemes.

Unit	Description	Instructional Hours
I	**PROCESS DYNAMICS** Process control terminologies - Objectives and need of Process control - Principle of empirical modeling – systems with dead time- Modeling of First order Level, Pressure and Thermal processes - Interacting and Non-interacting systems – systems with inverse response-Continuous and batch processes - Self regulation - Servo and regulatory operations.	9
II	**CONTROLLER ACTION AND CHARACTERISTICS** Control actions – Characteristics of Two-Position control, Floating, Proportional, Integral and Derivative control modes – Composite Control: P+I,P+D and P+I+D control modes – OP amp based Electronic PID controller, PID Bumpless Auto/manual transfer–Reset Wind-up - PID enhancements: practical forms – PID implementation issues.	9
III	**CONTROLLER TUNING** Performance Criteria – ¼ decay ratio ,IAE, ISE and ITAE - Tuning: - Process reaction curve method, Ziegler-Nichols method: open loop and closed loop tuning and Damped oscillation method – Controller tuning based on Frequency response: gain and phase margin – Autotuning- Introduction to optimization based tuning.	9
IV	**CONTROL VALVES** Signal conversion, I/P and P/I converter - Pneumatic and electric actuators - Valve Positioner - pneumatic Control Valves -Fail safe operation - Classification and types of various control valves and uses - Commercial valve bodies - Control Valve characteristics - Control valve sizing- ISA S 75.01 standard flow equations - Cavitation and Flashing - Selection of control valves for suitable applications.	9
V	**CONTROL LOOP ENHANCEMENTS** Feed-forward control - Cascade control - Ratio control - Split-range control – Averaging control - Inferential control - Adaptive control – Internal Model Control – Model Predictive Control - Introduction to multiloop/multivariable control, Examples- Case Study examples for boiler drum level control, Distillation column control - P&I diagrams.	9
	Total Instructional Hours	**45**

Course Outcome	CO1: Develop a mathematical model for first and second order process control systems. CO2: Interpret the basic control actions and controller implementation issues. CO3: Select a suitable tuning method for P/PI/PID controllers and capable to simulate them. CO4: Illustrate the working of various types of control valves and their characteristics. CO5: Apply an advanced multi loop process control schemes for a given industrial applications.

TEXT BOOKS:

T1 - Stephanopoulos. G, "Chemical Process Control - An Introduction to Theory and Practice", Prentice Hall of India, 2008.
T2 - Coughanowr, D.R., "Process systems analysis and control" McGraw Hill International , 2004

REFERENCE BOOKS:

R1 – Bequette. B.W, "Process Control Modeling, Design and Simulation", Prentice Hall of India, 2004.
R2 – Krishnaswamy.K, "Process Control", New Age International Publishers, 2015.
R3 - Johnson .C.D, "Process Control Instrument Technology", 8th Edition, Pearson Education, 2006.
R4 – D.E. Seborg, T.F. Edger, "Process Dynamics and Contro"', John Wiley and Sons, 2ndEdition, 2004.

WEB REFERENCE:

https://nptel.ac.in/courses/103/103/103103037/

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	1	-	-	-	-	-	-	2	2	3
CO2	3	3	3	2	2	-	-	-	-	-	-	3	3	3
CO3	3	2	3	2	2	-	-	-	-	-	-	2	3	3
CO4	3	3	2	2	2	-	-	-	-	-	-	3	3	3
CO5	3	3	3	2	2	-	-	-	-	-	-	3	3	3
Avg	3	2.8	2.6	2	1.8	-	-	-	-	-	-	2.8	2.8	3

1-Low, 2-Medium, 3-High, "-" No correlation

Chairman - BoS
EIE - SICET

Dean (Academics)
SICET

Programme	Course code	Name of the Course	L	T	P	C
B.E	**22HE6101**	**Professional Ethics**	**3**	**0**	**0**	**3**

Course Objective	1. To foster ethical behavior and life skills for holistic development. 2. To educate the value of Engineering Ethics 3. To inculcate the social responsibility of an engineer. 4. To impart knowledge on issues related to safety, responsibility and rights 5. To educate on professional practice on global issues

Unit	Description	Instructional Hours
I	**VALUE EDUCATION** Moral values and Right understanding- Holistic development and the Role of Value Education- Understanding Value Education- Self-exploration as the process for value Education- Integrity -Work Ethics- Empathy- Spirituality	9
II	**ENGINEERING ETHICS** Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.	9
III	**ENGINEERING AS SOCIAL EXPERIMENTATION:** Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.	9
IV	**SAFETY, RESPONSIBILITIES AND RIGHTS** Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.	9
V	**GLOBAL ISSUES** Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility	9
	Total Instructional Hours	**45**

Course Outcomes	CO1: Understand the importance of various components of human values CO2: Apply ethics in society CO3: Discuss the ethical issues related to engineering and CO4: Realize the responsibilities and rights in the society CO5: Apply professional ethics in solving global issues

TEXT BOOKS:

T1 - Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata Mc Graw Hill, New Delhi, 2003.

T2 - Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", PHI, New Delhi, 2009.

REFERENCES BOOKS:

R1 - Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.

R2 - John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003

R3 - Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	2	2	1	3	2	3	1	-	-	2	2	2
CO2	2	3	3	2	2	3	2	3	2	-	-	3	2	2
CO3	2	2	3	2	2	2	2	3	2	-	-	2	2	2
CO4	3	2	2	2	2	3	2	3	2	-	-	3	2	2
CO5	2	3	3	2	2	3	2	3	2	-	-	3	2	2
Avg	2.2	2.4	2.6	2	1.8	2.8	2	3	1.8	-	-	2.8	2	2

1-Low, 2-Medium, 3-High, "-" No correlation

Dean

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI6202	Digital Signal Processing	3	0	0	3

Course Objective

1. Enumerate signals, systems, time and frequency domain concepts.
2. Recall the concepts of z-transforms.
3. Interpret fundamental mathematical tools of DSP techniques.
4. Classify digital filters for processing of discrete time signals.
5. Categorize programmable digital signal processor and its applications.

Unit	Description	Instructional Hours
I	**SIGNALS AND SYSTEMS** Classification of systems: Continuous, discrete, linear, causal, stability, dynamic,time variance - Classification of signals: continuous and discrete, energy and power - mathematical representation of signals– correlation - Sampling and quantization	9
II	**DISCRETE TIME SYSTEM ANALYSIS** Definition - region of convergence -properties of z-transform - inverse z - transform –convolution Transform Analysis of LTI Systems - analysis of linear time invariant systems in the z domain - Solution of Difference Equations using z-Transform.	9
III	**DISCRETE FOURIER TRANSFORM AND COMPUTATION** DFT - properties - IDFT -convolution- overlap add and save method - Efficient computation of the DFT using Radix - 2 FFT algorithms - Decimation in time - Decimation in frequency.	9
IV	**DESIGN OF DIGITAL FILTERS** Design of IIR filters - characteristics of commonly used analog filters - Butterworth and Chebyshev filters - digital design using impulse invariant and bilinear transformation. Design of FIR filters - Symmetric and Antisymmetric FIR filters - Windowing techniques - Structures realization of digital filters.	9
V	**DIGITAL SIGNAL PROCESSORS** General and special purpose digital signal processors - Introduction to programmable DSPs - Architecture of TMS320C5X - assembly language instructions - instruction pipelining in C5x - application programs in C5x - DSP applications.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Understand about discrete time signals and systems.
CO2: Demonstrate the use of z transforms for signal processing applications.
CO3: Apply mathematical tools for all DSP techniques.
CO4: Analyze linear digital filters both FIR and IIR using different techniques and their associated structures.
CO5: Illustrate the selection of DSP processors for different applications.

TEXT BOOKS:

T1 - J.G. Proakis and D.G. Manolakis, "Digital Signal Processing Principles, Algorithms and Applications", Fourth Edition, Prentice Hall of India Learning Private Limited, 2008.
T2 - B.Venkataramani, M.Bhaskar, "Digital Signal Processors – Architecture, Programming and Applications", Tata McGraw Hill,2003.

REFERENCE BOOKS:

R1 –Andreas Antonious, "Digital Signal Processing – Signals, Systems and Filter",Tata McGraw Hill , 2006.
R2 – Emmanuel C. Ifeachor, Barrie W.Jervis, "Digital Signal Processing, a practical approach", Pearson Education, 2004.
R3 – S.K. Mitra, "Digital Signal Processing", Third Edition, Tata McGraw Hill, 2006.
R4- AlanV.Oppenheim,RonaldW.Schafer with John R.Buck, "Discrete Time Signal Processing", Second Edition,Pearson Education, 2009.

WEB REFERENCE:

https://nptel.ac.in/courses/117/102/117102060/

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	1	-	-	-	-	-	-	-	2	3	2
CO2	3	3	2	1	-	-	-	-	-	-	-	2	3	3
CO3	3	3	2	1	-	-	-	-	-	-	-	2	2	3
CO4	3	3	2	1	-	-	-	-	-	-	-	2	3	3
CO5	3	3	3	1	-	-	-	-	-	-	-	2	3	3
Avg	3	2.8	2.2	1	-	-	-	-	-	-	-	2	2.8	2.8

1-Low, 2-Medium, 3-High, "-" No correlation

Chairman - BoS
KIET

Dean (Academics)
KIET

Programme	Course Code	Name of the Course	L	T	P	C
B.E	22EI6001	Process Control Laboratory	0	0	3	2

Course Objective

1. To provide exposure in control of various process control systems.
2. To impart on designing of multi loop process control.
3. To familiar with the working of P, PI, PID Controllers and Tuning.
4. To experimentally verify the design and implementation of controllers for various physical processes.

Expt. No.	Description of the Experiments
Simulation Based Experiments:	
1.	Design and Simulation of First Order and Second order Systems with and without transportation lag.
2.	Design and Simulation of Second Order System with and without PID Controller.
3.	Tuning of PID controller for a mathematically described process using Ziegler-Nichols and Cohen-Coon Method.
4.	Experimental study of Level process for Servo and Regulator Operation.
5.	Experimental study of Flow process for Servo and Regulator Operation.
6.	Determination of characteristics of Pneumatically actuated Control Valve (with and without Positioner).
7.	Experimental study of Pressure process for Servo and Regulator Operation.
8.	Design and implementation of ON-OFF controller for the Temperature Process
9	Perform and analyze the Step response of Interacting and Non-interacting tanks.
10.	Implementation of PID based Position control of AC/DC servo motor.
11.	Design and implementation of Complex Control system (Ratio/Cascade/Feed forward).
12.	Study of wireless remote monitoring of process control plant using IoT.

Total Practical Hours 45

Course Outcome

CO1: Infer the effect of different control modes on various processes.
CO2: Design the controller parameters using different tuning process.
CO3: Evaluate the servo and regulator response for various process control systems.
CO4: Analyze and verify the complex multi loop control system characteristics.
CO5: Demonstrate the control system response for servo motor applications

REFERENCES:

R1-George Stephanopoulos, Chemical Process Control: An Introduction to theory and Practice, Pearson 2008.
R2- Laboratory manual prepared by the Department of Electronics and Instrumentation Engineering, 2022.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	3	-	-	-	-	2	-	2	2	3
CO2	3	3	3	2	3	-	-	-	-	2	-	2	3	3
CO3	3	2	3	2	3	-	-	-	-	2	-	2	3	3
CO4	2	3	2	2	2	-	-	-	-	3	-	3	2	3
CO5	3	3	3	2	3	-	-	-	-	2	-	2	3	3
Avg	2.8	2.8	2.6	2	2.8	-	-	-	-	2.2	-	2.2	2.6	3

1-Low, 2-Medium, 3-High, "-" No correlation

Chairman - BoS
EIE - HICET

Chairman

Dean (Academics)
HICET

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI6002	Virtual Instrumentation and Data Acquisition Laboratory	0	0	3	2

Course Objective

1. Observe the basic graphical programming knowledge using LabVIEW platform.
2. Design the programming for process control and other applications
3. Make use of data acquisition concept to interface real time instruments.

Expt. No.	Description of the Experiments
1.	Verification of Arithmetic and Boolean operations.
2.	Program to find Addition of first "n" natural numbers using FOR and WHILE loop.
3.	Implementation of Array functions.
4.	Implementation of Cluster functions.
5.	Program for implementing Seven segment displays.
6.	Program to perform Traffic light control.
7.	Generation of Waveform and its measurements.
8.	Program for controlling the speed of a DC motor using PID Controller.
9.	Design Of P, PI And PID Controller For Pressure Monitoring System Using LabVIEW
10.	Design of rectifier circuit using MULTISIM.
11.	Simulate the measurement of voltage using DMM
12.	Program to control Temperature by using Thermocouple and DAQ.

Total Practical Hours 45

Course Outcome

CO1: Discuss about basic concepts of virtual instrumentation and its programming.
CO2: Generalize the graphical programming knowledge with data flow concept.
CO3: Compose the data acquisition concepts for interfacing real-instrument.

REFERENCES:

R1-Jovitha Jerome, "Virtual Instrumentation using LabVIEW", PHI Learning Pvt. Ltd., 2010
R2- Laboratory manual prepared by the Department of Electronics and Instrumentation Engineering, 2017.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	2	-	-	-	-	-	-	2	2	3
CO2	3	3	3	2	3	-	-	-	-	-	-	2	3	3
CO3	3	2	3	2	3	-	-	-	-	-	-	2	3	3
CO4	2	3	2	2	2	-	-	-	-	-	-	3	2	3
CO5	3	3	3	2	3	-	-	-	-	-	-	2	3	3
Avg	2.8	2.8	2.6	2	2.6	-	-	-	-	-	-	2.2	2.6	3

1-Low, 2-Medium, 3-High, "-" No correlation

Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	22HE6071	Soft Skills-V	0	0	0	1

Course Objectives:

1. To make the students aware of the importance, the role and the content of soft skills through instruction, knowledge acquisition, demonstration and practice.
2. Tolearneverythingfromequationstoprobabilitywithacompletelydifferentapproach.
3. Tomakethestudentslearnonanincreasedabilitytoexplaintheproblemcomprehensively.

Unit	Description	Instructional Hours
I	**Group Discussion & Presentation Skills:** GD skills – Understanding the objective and skills tested in a GD – General types of GDs –Roles in a GD – Do's &Don'ts–Mock GD & Feedback.- Presentation Skills – Stages involved in an effective presentation – selection of topic, content, aids – Engaging the audience–Time management-Team Building–Mock Presentations& Feedback	10
II	**Interview Skills and Personality Skills:** Interview handling Skills – Self preparation checklist – Grooming tips: do's & don'ts – mock interview & feedback - Leadership Skills - Interpersonal skills-creative thinking-problem solving-analytical skills	10
III	**Business Etiquette & Ethics:** Etiquette – Telephone & E-mail etiquette – Dining etiquette – do's & Don'ts in a formal setting – how to impress - Crisis Management - Ethics–ImportanceofEthicsandValues–ChoicesandDilemmasfaced–Discussions from news headlines.	10
	Total Instruction Hours	30

Course Outcome:

CO1: Students will have learnt to keep going according to plan, coping with the unfamiliar, managing disappointment and dealing with conflict.

CO2: Students willActivelyparticipatemeetings,GroupDiscussions/interviewsandprepare& deliver presentations

CO3: Students willdefineprofessionalbehaviorandsuggeststandardsforappearance,actions and attitude in a Business environment

Chairman - BoS

Chairman

Dean (Academics)
HiCET

PROFESSIONAL ELECTIVE VERTICALS

Vertical I - Applied Instrumentation

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI6301	Optical Instrumentation	3	0	0	3

Course Objective

1. Educate the basic elements of optical fiber and its properties.
2. Understand the various optical electronic sources and their applications.
3. Impart the knowledge about Interferometry methods.
4. Learn the fundamentals of Laser.
5. Familiarize about Hologram and medical applications.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO OPTICAL FIBERS** Principles of light propagation through a fiber - Different types of fibers and their properties, fiber characteristics - Absorption losses - Scattering losses - Dispersion - Fiber Optic Connectors - Splices- Fiber termination - Optical sources - Optical detectors.	9
II	**OPTO ELECTRONIC DEVICES** Photo diode, PIN, photo-conductors, Solar cell, Phototransistors- materials used to fabricate LEDs and lasers design of LED for optical communication- response times of LEDs – LED drive circuitry- Fiber optic Sensors - Fiber optic instrumentation system - Types of modulators - Moire fringes.	9
III	**INTERFEROMETRY** Interference effect, Radiometry, types of interference phenomenon and its application, Michelson's Interferometer and its application - Refractometer, Rayleigh's interferometers, spectrographs and Monochromators, Spectrophotometers, Calorimeters, medical optical instruments.	9
IV	**LASER FUNDAMENTALS AND APPLICATIONS** Fundamental characteristics of lasers - Laser Levels - Properties of laser - Laser modes - Cavity damping - Types of lasers- gas lasers, solid lasers, liquid lasers, semi conductor lasers - Laser for measurement of distance, length, velocity, acceleration, current, voltage - Material processing - Laser heating, welding, melting and trimming of material, removal and vaporization.	9
V	**HOLOGRAPHY AND MEDICAL APPLICATIONS** Holography - Basic principle - Methods - Holographic interferometry and application, Holography for non-destructive testing - Holographic components - Medical applications of lasers - laser and tissue interactive - Laser instruments for surgery - Removal of tumors of vocal cards - Brain surgery - Plastic surgery - Gynaecology and Oncology.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Interpret the various building blocks of industrial instrumentation systems.
CO2: Classify the various Opto- electronic devices for a suitable application.
CO3: Elucidate different methods of Interferometry.
CO4: Elaborate the concepts of laser and apply for suitable industrial applications.
CO5: Demonstrate the working of various laser instruments for medical applications.

TEXT BOOKS:

T1 - R.P.Khare, "Fiber Optics and Optoelectronics", Oxford university press, 2008.
T2 - J.Wilson&J F B Hawkes, Opto Electronics: An Introduction, Prentice Hall of India,3rd edition, 2011.

REFERENCE BOOKS:

R1 - John and Harry, "Industrial lasers and their application", McGraw-Hill, 2002.
R2 - .M. Senior, "Optical Fiber Communication –Principles and Practice", Prentice Hall of India, 2010.
R3 - M. Arumugam, "Optical Fiber Communication and Sensors", Anuradha Publication, 2002.
R4 - John F. Read, "Industrial Applications of Lasers", Academic Press, 2012.

WEB RESOURCES:

https://nptel.ac.in/courses/ 102/108/102108082/#

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	1	-	-	-	-	-	-	2	2	3
CO2	3	3	3	2	2	-	1	-	-	-	-	2	3	3
CO3	3	2	3	2	2	-	1	-	-	-	-	2	3	3
CO4	2	3	2	2	2	-	-	-	-	-	-	3	2	3
CO5	3	3	3	2	2	-	-	-	-	-	-	2	3	3
Avg	2.8	2.8	2.6	2	1.8	-	0.4	-	-	-	-	2.2	2.6	3

1-Low, 2-Medium, 3-High, "-" No correlation

Chairman - BoS
EIE - HiCET

Chairman

Dean (Academics)
HiCET

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI6302	Project Engineering and Management	3	0	0	3

Course Objective

1. Learn the basic functions of management in an organization
2. Study the importance of planning and also the different types of plans.
3. Understand the different types of organization structure in management
4. Know the basis and importance of directing and controlling in management
5. Understand the importance of project management..

Unit	Description	Instructional Hours
I	**INTRODUCTION TO MANAGEMENT CONTEXT** Management definition – Science or Art – Manager versus Entrepreneur – types of managers – managerial roles and skills – Evolution of Management – Scientific, human relations , system and contingency approaches – Types of Business organization – Sole proprietorship, partnership, company-public and private sector enterprises – Organization culture and Environment – Current trends and issues in Management.	9
II	**PLANNING** Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making - steps and process.	9
III	**ORGANISING & DIRECTING** Introduction, Organizational Design, Hierarchical Systems , Organization Structure, Types of Organization Structure, Formal and Informal Organization, Factors Determining Span of Management, Centralization and Decentralization, Span of control, Understanding authority and responsibility, Principles of Delegation, Authority, Developing a culture of Innovation and performance	9
IV	**CONTROLLING AND ISSUES IN MANAGEMENT** System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – Direct And Preventive Control – Reporting. Contemporary Issues In Management: Corporate Governance Social responsibilities – Ethics in business – Recent issues.	9
V	**PROJECT MANAGEMENT** Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and nontechnical activities, Detailed Engineering activities, Pre project execution main clearances and documents, Project team: Role of each member, Importance Project site: Data required with significance, Project contracts	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Describe the concepts of management, administration and the evolution of management thoughts.
CO2: Understand and apply the planning concepts.
CO3: Explain the different organizational structures and understand the staffing process.
CO4: Analyze the various motivational and leadership theories and controlling processes.
CO5: Understand and analyze the various Contemporary Issues in Management.

TEXT BOOKS:

T1-Stephen P. Robbins and Mary Coulter, "Management", Prentice Hall of India, 8th edition. 2012
T2-Harold Koontz & Heinz Weihrich "Essentials of management" Tata Mc Graw Hill, 1998.

REFERENCE BOOKS:

R1 - Charles W L Hill, Steven L McShane, "Principles of Management", Mcgraw Hill Education, Special Indian Edition, 2007
R2 - Tripathy PC & Reddy PN, "Principles of Management", Tata McGraw Hill, 1999.
R3 - JAF Stoner, Freeman R.E and Daniel R Gilbert "Management", 6th Edition, Pearson Education, 2004.
R4-. John M. Nicholas, Herman Steyn Project Management for Engineering, Business and Technology, Taylor & Francis, 2020, ISBN: 9781000092561.

WEB RESOURCES:

https://onlinecourses.nptel.ac.in/noc20_mg58/preview

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	1	-	-	1	-	-	-	2	2	2
CO2	2	3	3	2	2	-	-	1	-	-	-	2	3	2
CO3	3	2	3	2	2	-	-	1	-	-	-	2	1	3
CO4	2	3	2	2	2	-	-	1	-	-	-	3	1	3
CO5	2	2	3	2	2	-	-	1	-	-	-	2	3	2
Avg	2.2	2.6	2.6	2	1.8	-	-	1	-	-	-	2.2	2.2	2.2

1-Low, 2-Medium, 3-High, "-" No correlation

Chairman - BoS
EIE - HiCET

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HiCET

Vertical II - Healthcare Instrumentation

Programme	Course Code	Name of the Course	L	T	P	C
B.E	22EI6303	Medical Robotics	3	0	3	3

Course Objective	1. Recall the need of medical robots 2. familiarize the concept of tracking and localization 3. Outline the design concept of medical robots 4. Infer the details of robots in surgery 5. Generalize the application of robotics in medical practice.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Introduction to medical robotics - Types of medical robots - Navigation - Motion Replication - Potential impact of medical robots, level of human intervention - Interventional radiology for engineers – State of art of robotics in the field of healthcare - DICOM – Teleoperated robots - growing healthcare challenges.	9
II	**LOCALIZATION AND TRACKING** Medical sensors - Position, Range and velocity sensors - Tracking -Tracking - Mechanical linkages- Fiber optic tracking systems - MIS Robot design concepts - Image processing and analysis – Medical imaging modalities - Robot compatibility with medical imagers - Image segmentation and modeling - Tracking devices.	9
III	**DESIGN OF MEDICAL ROBOTS** Medical robots: History - Automation and Navigation Challenges - Characterization of gestures to the design of robots - Design methodologies - Technological choices - Development of surgical robotics systems- Perceptual docking for synergistic control- Parallel manipulator - Hyper redundant and continuum Robots	9
IV	**ROBOT ASSISTED SURGERY** Minimally invasive surgery and robotic integration - Development of surgical robotics systems - Perceptual docking for synergistic control - Radiosurgery - Orthopedic Surgery - Urologic Surgery and Robotic Imaging - Cardiac Surgery -Neurosurgery - Surgical navigation Calibration Rigid and non-rigid registration	9
V	**REHABILITATION ROBOTICS** Physiological basis of neuromata recovery - Framework for neuro-rehabilitation robotics: implication and recovery - Actuators and sensors and prosthetic robots - Existing orthopedic robotic systems - Knee replacement surgery - Rehabilitation for Limbs - Robots in Physiotherapy - Rehabilitation and wearable robots -Brain Computer Interface Robot - Autism Robot - hand case studies	9
	Total Instructional Hours	**45**

Course Outcome	CO1: Identified various medical robots and their potential applications. CO2: Recognized the position tracking and hybrid systems CO3: Understand the concepts of robots in medical field. CO4: Estimate the application of medical robots in various surgical procedures. CO5: Infer medical robotic system for medical care

TEXT BOOKS:

T1 - Paula Gomes, "Medical robotics Minimally invasive surgery", Woodhead, 2013

T2 - Jaydev P Desai, Rajni V Patel, Antoine Ferreira; Sunil Kumar Agrawal, "The Encyclopedia of Medical Robotics", World Scientific Publishing Co. Pvt. Ltd, 2019

REFERENCE BOOKS:

R1 –Jocelyne Troccaz , "Medical Robotics", John Wiley & Sons Incorporated, 2013.

R2–FaridGharagozloo "Robotic Surgery", Springer, 2022.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	1	-	-	-	-	-	-	2	2	2
CO2	3	3	3	2	2	-	-	-	-	-	-	3	2	3
CO3	2	2	3	2	2	-	-	-	-	-	-	3	3	2
CO4	3	3	2	2	2	-	-	-	-	-	-	3	3	3
CO5	3	3	3	2	2	-	-	-	-	-	-	2	2	2
Avg	2.8	2.8	2.6	2	1.8	-	-	-	-	-	-	2.6	2.4	2.4

1-Low, 2-Medium, 3-High, "-" No correlation

Chairman - BoS
EIE - HiCET

Chairman

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HiCET

Programme	Course Code	Name of the Course	L	T	P	C
B.E	**22EI6304**	**Diagnostic and Therapeutic Equipments**	**3**	**0**	**3**	**3**

Course Objective

1. Familiarize the need of coronary care equipment's
2. Understand the concept of various therapy equipment
3. Outline the importance of respiratory care equipment's
4. Infer the details of sensory diagnosis
5. Generalize the techniques of therapeutic equipment.

Unit	Description	Instructional Hours
I	**CORONARY CARE EQUIPMENTS** Cardiac pacemakers: different modes of operation, external and implantable pacemakers, pacemaker standard codes -Defibrillator: AC and DC defibrillator Implantable defibrillator and automated external defibrillator- Pacer- cardioverter defibrillator, defibrillator analysers -Heart lung machine (HLM) and types of oxygenators	9
II	**PHYSIOTHERAPY, ELECTROTHERAPY AND PHOTOTHERAPY EQUIPMENTS** Short wave diathermy - Microwave diathermy - Ultrasonic therapy unit - Electro diagnostic and therapeutic apparatus - Interferential current therapy, Transcutaneous electrical nerve stimulation (TENS) - Spinal cord stimulator, bladder stimulator, deep brain stimulation - Photo therapy unit	9
III	**INSTRUMENTS DEALING WITH BONES AND RESPIRATORY CARE** Respiratory care equipments: humidifier, nebulizer, aspirators - Ventilators and types, capnography - Anesthesia machine - Baby incubator MD measurements: Single X-ray absorptiometry (SXA) - Dual X-ray absorptiometry (DXA) - Quantitative ultrasound bone densitometer	9
IV	**SENSORY DIAGNOSIS AND HEARING AID EQUIPMENTS** Mechanism of hearing, sound conduction system - basic audiometer, pure tone audiometer - Speech audiometer, bekesyaudiometer system - Evoked response audiometry system - Hearing aids, cochlear implants - Tonometry - Measurement of basal skin response and galvanic skin response	9
V	**SURGICAL AND THERAPEUTIC EQUIPMENTS** Surgical diathermy unit - Endoscopy basic components and types - Laparoscope, gastro scope, bronchoscope - Cryogenic techniques and application - Operating microscope, arthroscopy - Modern lithotripter system, laser lithotripsy	9
	Total Instructional Hours	**45**

Course Outcome

CO6: Identified various coronary care equipments.
CO7: Recognized the concept of various therapy techniques
CO8: Understand the concepts of respiratory care equipments.
CO9: Outlined the concept of sensory diagnosis
CO10: Infer the various techniques in therapeutic equipments

TEXT BOOKS:

T1 - R.S.Khandpur, 'Handbook of Bio-Medical instrumentation', Tata McGraw Hill Publishing Co Ltd., 3rd edition, 2014

T2 -Albert M.Cook and Webster.J.G, "Therapeutic Medical Devices", Prentice Hall Inc., New Jersey, 1st edition, 1982.

REFERENCE BOOKS:

R1 -Cotton.P. B, and Williams. C. B., "Endoscopic Equipment, in Practical Gastrointestinal Endoscopy: The Fundamentals", Wiley-Blackwell, Oxford, UK, 6th edition, 2008.

R2–Marc. Safran, Bobby. Chhabra. A.Miller.D., "Primer of Arthroscopy",Elsevier Health Sciences, 2nd edition, 2010.

R3 - John G.Webster, "Specifications of Medical Instrumentation Application and Design",Wiley India Pvt Ltd, India, 4th edition, 2015.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	1	-	-	-	-	-	-	2	2	2
CO2	3	3	3	2	2	-	-	-	-	-	-	2	2	3
CO3	3	2	3	2	2	-	-	-	-	-	-	2	3	2
CO4	3	3	2	2	2	-	-	-	-	-	-	3	3	3
CO5	3	3	3	2	2	-	-	-	-	-	-	2	2	2
Avg	3	2.8	2.6	2	1.8	-	-	-	-	-	-	2.2	2.4	2.4

1-Low, 2-Medium, 3-High, "-" No correlation

Chairman - BoS
EIE - HiCET

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Dean (Academics)
HiCET

Vertical III - Advanced Measurements and Control

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI6305	Virtual Instrumentation	3	0	0	3

Course Objective

1. Understand the basics of Virtual Instrumentation
2. Illustrate the programming concepts in LabVIEW .
3. Explain about Data Acquisition and Control in Virtual Instrumentation
4. Interpret the different instrument interfaces.
5. Illustrate real time control in Virtual Instrumentation.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO VIRTUAL INSTRUMENTATION** History of Virtual Instrumentation (VI), advantages, block diagram and architecture of a virtual instrument, Programming paradigms – Virtual Instrumentation - LabVIEW software – LabVIEW basics – LabVIEW environment.	9
II	**BASICS OF LABVIEW** Creating, Editing and debugging a VI in LabVIEW – Creating a sub VI – Loops and charts – Case and sequence structures – File I/O – VI customization.	9
III	**DATA ACQUISITION AND CONTROL IN VI** A/D and D/A converters, Plug-in Analog Input / Output cards – Digital Input and Output Cards, Organization of the DAQ VI system – Scanning multiple analog channels – Issues involved in selection of Data acquisition cards – Data acquisition modules with serial communication	9
IV	**INSTRUMENT INTERFACES** Current loop, RS 232C/RS 485, GPIB, System basics, Interface basics: USB, PCMCIA, networking basics for office & industrial application VISA, image acquisition & processing, Motion Control.	9
V	**REAL TIME CONTROL IN VI** Designs using VI Software - ON/OFF controller – Proportional controller – Modeling and basic control of level and reactor processes – Case studies on development of HMI, SCADA in VI	9
	Total Instructional Hours	45

Course Outcome

CO1: Summarize the fundamental concepts of Virtual Instrumentation
CO2: Outline the data flow in LabVIEW programming .
CO3: Infer about Data Acquisition cards and Control in Virtual Instrumentation
CO4: Classify the different instrument interfaces.
CO5: Develop real time control in Virtual Instrumentation

TEXT BOOKS:

T1 - Jerome, Jovitha, "Virtual Instrumentation and LABVIEW", PHI Learning, New Delhi, 1st Edition, 2010.
T2 - Gary Johnson, "LABVIEW Graphical Programming", McGraw Hill, 4 th Edition, 2006.

REFERENCE BOOKS:

R1 - Jeffrey Travis, Jim Kring "LabVIEW for Everyone: Graphical Programming", Prentice Hall, 2006
R2 - Buchanan, W. "Computer buses", CRC Press, 2006

WEB REFERENCE:

https://learn.ni.com/learn/article/labview-tutorial

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	1	-	-	-	-	-	-	2	2	3
CO2	3	3	3	2	2	-	1	-	-	-	-	2	3	3
CO3	3	2	3	2	2	-	1	-	-	-	-	2	3	3
CO4	3	3	2	2	2	-	-	-	-	-	-	3	2	3
CO5	3	3	3	2	2	-	-	-	-	-	-	2	3	3
Avg	3	2.8	2.6	2	1.8	-	0.4	-	-	-	-	2.2	2.6	3

1-Low, 2-Medium, 3-High, "-" No correlation

Chairman - BoS
EIE - HiCET

Chairman

Dean (Academics)
HiCET

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI6306	Machine Monitoring and Control	3	0	0	3

Course Objective

1. Familiarize with the concept of condition-based maintenance for effective utilization of machines.
2. Impart the knowledge of artificial intelligence for machinery fault diagnosis.
3. Give basic knowledge on vibration monitoring.
4. Study the machinery vibrations using signal processing techniques.
5. Provide knowledge on Machine learning techniques for condition monitoring.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO MACHINE CONDITION MONITORING** Maintenance and management systems, basic principles of maintenance strategies – preventive maintenance, predictive maintenance - Machinery condition monitoring - Present status - Fault prognosis - Future needs.	9
II	**MACHINERY MAINTENANCE** Condition Monitoring and Diagnostics of Transformer – transformer diagnosis using dissolved gas analysis, dielectric strength - Benefits of planned maintenance – Bath tub curve – Failure Modes Effects and Criticality Analysis (FMECA).	9
III	**INTRODUCTION TO MACHINERY VIBRATION AND MONITORING** Characteristics of Vibration systems – Mode shapes & operational deflection shapes – Experimental modal analysis – Principles of vibration monitoring – Machinery faults diagnosed by vibration analysis.	9
IV	**SIGNAL PROCESSING IN MACHINERY MONITORING** Fourier Transforms - Fourier signal Analysis – FFT properties - FFT model analysis – Time domain analysis – Time-frequency analysis – Signal filtering – Cepstrum analysis – Health condition of compressor & engine.	9
V	**MACHINE LEARNING FOR CONDITION MONITORING** Machine Learning fundamentals: Machine learning tools - Feature extraction and feature selection methods – Feature reduction – Classification techniques – Case studies of condition monitoring in Nuclear plant components, Distillation column.	9
	Total Instructional Hours	45

Course Outcome

CO1:Ability to identify the faults in machinery

CO2:Choose the proper maintenance strategies and condition monitoring techniques for identification of failure in a machine

CO3:Construct a classifier model based fault diagnosis.

CO4:Predict the faulty component in a machine by analyzing the acquired vibration signals

CO5:Ability to analyze & build a model using Machine learning tools.

TEXT BOOKS:

T1 - Cornelius Scheffer and Paresh Girdhar, "Practical Machinery Vibration Analysis and Predictive Maintenance", Elsevier, 2004.

T2 - A. R. Mohanty, "Machinery Condition Monitoring: Principles and Practices" , CRC Press, Taylor & Francis, 1st Edition, 2017.

REFERENCE BOOKS:

R1 - Stephen Marsland, Machine Learning: An Algorithmic Perspective, 2nd Edition, 2014, CRC, Press.

R2 - Collacot, "Mechanical Fault Diagnosis and Condition Monitoring", Chapman- Hall, 1st Edition, 2011.

R3 - Davies, "Handbook of Condition Monitoring – Techniques and Methodology", Springer, 1st Edition, 2011.

R4 - Ian H. Witten, Eibe Frank, Mark A. Hall, Data Mining: Practical Machine Learning Tools and Techniques, Elsevier, 3rd Edition 2011.

WEB RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc22_cs29/preview
2. https://www.udemy.com/topic/maintenance-management/

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	1	-	-	-	-	-	-	2	2	3
CO2	3	3	3	2	2	-	1	-	-	-	-	2	3	3
CO3	3	2	3	2	2	-	1	-	-	-	-	2	3	3
CO4	2	3	2	2	2	-	-	-	-	-	-	3	2	3
CO5	3	3	3	2	2	-	-	-	-	-	-	2	3	3
Avg	2.8	2.8	2.6	2	1.8	-	0.4	-	-	-	-	2.2	2.6	3

1-Low, 2-Medium, 3-High, "-" No correlation

Chairman - BoS
EIE - HiCET

Chairman

Dean (Academics)
HiCET

Vertical IV - Electronics & Communication systems

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI6307	Semiconductor Manufacturing	3	0	0	3

Course Objective	5. Introduce the basic process of semiconductor manufacturing. 6. Understand the process of oxidation based IC fabrication methods. 7. Impart the knowledge on Etching and film deposition process. 8. Explore the Manufacturing Process Integration technology. 5. Familiarize the steps or process involved in IC chip fabrication

Unit	Description	Instructional Hours
I	**INTRODUCTION TO SEMICONDUCTOR MANUFACTURING** Semiconductor physics - Historical perspective, processing overview, semiconductor materials, semiconductor devices, Fabrication steps – Semiconductor cleanroom substrates processing technology. Thermal oxidation, RTP, laser and spike processing -Doping and implantation.	9
II	**CRYSTAL GROWTH, SILICON OXIDATION, PHOTOLITHOGRAPHY** Fundamentals of Photolithography, contrast, resist, masks, multiple exposure - Silicon crystal growth, material characterization, thermal oxidation process, impurity redistribution -masking properties of silicon dioxide, oxidation thickness characteristics – EBL.	9
III	**ETCHING, DIFFUSION, ION IMPLANTATION, FILM DEPOSITION** Etching: Basic process - Wet chemical etching, Dry etching, basic diffusion process, extrinsic diffusion, lateral diffusion – Photolithography - Ion Implantation, implanted damage and annealing, epitaxial growth techniques, structures and defects, dielectric deposition.	9
IV	**PROCESS INTEGRATION** Passive components, bipolar technology, MOSFET Technology, MESFET Technology, MEMS Technology – Silicon photonics - Silicon-On-Insulator (SOI) - Fully Depleted (FD) SOI, Partially Depleted (PD) SOI, Junction Less SOI.	9
V	**IC MANUFACTURING** Electrical testing, packing, statistical process control, computer integrated manufacturing, challenges for integration, Digital circuits design, impact of device performance on digital circuits, leakage performance trade off -System-on-a-chip.	9
	Total Instructional Hours	**45**

Course Outcome	CO6: Interpret the various process involved for semiconductor manufacturing. CO7: Identify the lithographic process and its masking in fabrication technology. CO8: Explain the processes- etching, deposition involved in semiconductor manufacturing. CO9: Infer the bipolar technology integration for circuit fabrication. CO10: Illustrate the computer based IC manufacturing process and its and challenges.

TEXT BOOKS:
T1 - Stephen A. Campbell, "Fabrication Engineering at the micro-and Nanoscale", 4th Edition, Oxford University Press, 2008
T2 - Hong Xiao, Introduction to Semiconductor Manufacturing Technology – Second Edition, SPIE Press, 2012.
REFERENCE BOOKS:
R1 - M. J. Madou, Fundamentals of Micro fabrication, 2nd Edition, CRC Press, 2011.
R2 - . G. S. May and S. M. Sze, Fundamentals of Semiconductor Fabrication, Wiley India, 2004
R3 - Sunipa Roy, Solid State & Microelectronics Technology. Bentham Science Publishers, 2023
WEB RESOURCES:
https://nptel.ac.in/courses/108106181

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	1	-	-	-	-	-	-	2	2	3
CO2	3	3	3	2	2	-	1	-	-	-	-	2	3	3
CO3	3	2	3	2	2	-	1	-	-	-	-	2	3	3
CO4	3	3	2	2	2	-	-	-	-	-	-	3	2	3
CO5	3	3	3	2	2	-	-	-	-	-	-	2	3	3
Avg	3	2.8	2.6	2	1.8	-	0.4	-	-	-	-	2.2	2.6	3

1-Low, 2-Medium, 3-High, "-" No correlation

Chairman - BoS
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HiCET

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI6308	Industrial Electronics	3	0	0	3

Course Objective

1. Discuss the operation of power semiconductor devices and their switching characteristics
2. Design controlled converter circuits and learn it's applications.
3. Differentiate the operation of various chopper circuits and find suitable applications.
4. Analyse the operation of inverter circuits for 120° mode and 180° mode operation and design appropriate applications.
5. Classify DC and AC drives based on its operation.

Unit	Description	Instructional Hours
I	**POWER SEMICONDUCTOR DEVICES** Power Diode, SCR, TRIAC, GTO, BJT, MCT, MOSFET, IGBT, Power Integrated Circuits(PIC's) - Static and Dynamic characteristics - Triggering and commutation circuit for SCR - Design of Driver and snubber circuit-protection circuits- Simulation tools.	9
II	**PHASE CONTROLLED CONVERTERS** 2 pulse, 3 pulse and 6 pulse converters - performance parameters - Effect of source inductance - Dual converters - steady state analysis-Introduction to matrix converters and cycloconverters-Applications:Heating and Lighting control.	9
III	**DC TO DC CONVERTER** Step down and step up chopper - control strategy - Commutation in choppers - Switched mode regulators - Buck, Boost, Buck- Boost converter - Resonant Converters and its topologies-Applications:Battery operated Vehicles.	9
IV	**INVERTERS** Inverters Basics - PWM techniques - Single phase and Three Phase Voltage Source Inverters (120° mode and180° mode) - Current Source Inverter - Voltage and Harmonic Control - Space Vector Modulation techniques for inverters- introduction to multilevel inverters-Applications-:Solar PV systems.	9
V	**DRIVES AND CONTROL** Static and Dynamic equations of dc and ac machines – Electrical breaking – Rectifier and chopper control of DC drives – Principles of v/f control of AC drives – Open loop and Closed loop schemes for DC and AC drives(Block diagram approach only) – Introduction to vector control of AC drives.	9
	Total Instructional Hours	**45**

Course Outcome

CO1:Outline the operation of power semiconductor devices and their switching characteristics.
CO2:Illustrate the operation of power electronic rectifier circuits and it's applications.
CO3:Identify the appropriate chopper circuit for various applications.
CO4:Choose the appropriate mode of operation of the inverter and it's applications.
CO5: Compile the operation of AC and DC drives.

TEXT BOOKS:

T1 - M. H .Rashid, "Power Electronics: Circuits, Devices and Applications", Pearson Education, Fourth Edition, New Delhi, 2017.
T2 - P. S. Bhimbra "Power Electronics", Khanna Publishers, FourthEdition, 2017.

REFERENCE BOOKS:

R1 –Joseph Vithayathil, "Power Electronics, Principles and Applications", McGraw Hill ,7th Reprint, 2015.
R2 – Ned Mohan, Tore. M. Undel and, William. P. Robbins, "Power Electronics: Converters, Applications and Design", John Wiley and sons, Third Edition, 2018
R3 – M. D. Singh and K.B. Khanchandani, "Power Electronics," McGraw Hill India, 2014. R4 - MS Jamil Asghar " Power Electronics", PHI Learning 2009.

WEB RESOURCES:

https://archive.nptel.ac.in/courses/108/102/108102145/

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	1	-	-	-	-	-	-	2	2	3
CO2	3	3	3	2	2	-	1	-	-	-	-	2	3	3
CO3	3	2	3	2	2	-	1	-	-	-	-	2	3	3
CO4	2	3	2	2	2	-	-	-	-	-	-	3	2	3
CO5	3	3	3	2	2	-	-	-	-	-	-	2	3	3
Avg	2.8	2.8	2.6	2	1.8	-	0.4	-	-	-	-	2.2	2.6	3

1-Low, 2-Medium, 3-High, "-" No correlation

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Vertical V - Control and Automation

Programme	Course Code	Name of the Course	L	T	P	C
B.E	22EI6309	Advanced Control Theory	3	0	0	3

Course Objective

1. Recall the basics of state and state models.
2. List the methods of sampling and its stability tests.
3. Illustrate about non-linear systems.
4. Establish phase plane analysis on control systems.
5. Interpret about stability analysis of linear and non-linear systems.

Unit	Description	Instructional Hours
I	**STATE VARIABLE REPRESENTATION** Introduction to state concept - state equation of linear continuous time systems, matrix representation of state equations. Phase variable and canonical forms of state representation - state transition matrix - Controllability - Observability, State feedback design via pole placement technique.	9
II	**SAMPLED DATA CONTROL SYSTEMS** Sampling process - Z transform method - pulse transfer function - analysis of the sampling process - data reconstruction and hold circuits - zero order hold circuit - Sampling theorem. Stability of sampled data system - Jury's test, Bilinear Transformation.	9
III	**NONLINEAR SYSTEMS** Introduction - characteristics of nonlinear systems. Types of non-linearity -Analysis through Linearization about an operating point - harmonic linearization - Stability analysis by describing Method - application of describing function for stability analysis of autonomous system with single nonlinearity.	9
IV	**PHASE PLANE ANALYSIS** Concept - Construction of phase trajectories for nonlinear systems and linear systems with static nonlinearities - Singular points - Classification of singular points - Limit cycle - simple variable structure system.	9
V	**STABILITY ANALYSIS** Definition of stability - asymptotic stability and instability, Equilibrium points - BIBO and relative stability - Lyapunov stability criteria – Lyapunov methods to stability of linear and nonlinear systems, continuous and discrete time systems.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Develop the state space model and state feedback design for advanced control systems.
CO2: Manipulate the sampled data control systems and discrete control systems.
CO3: Classify the linear/non-linear system theory and their representations.
CO4: Constructing the phase plane trajectories for various nonlinear systems.
CO5: Evaluate advanced control system problems using various stability criterion.

TEXT BOOKS:

T1 - Katsuhiko Ogata, "Modern Control Engineering", Prentice Hall of India Learning Pvt Ltd, 5th Edition,2010.
T2 - Hassan K. Kahalil, "Non-linear Systems", Pearson Education, 2002.

REFERENCE BOOKS :

R1 - B.C.Kuo, "Automatic Control Systems", Prentice Hall of India Pvt. Ltd., New Delhi,1998.
R2 - M.Gopal, "Digital Control and State Variable Methods", Tata McGrawHill, New Delhi,2003.
R3 - A.Nagoor Kani "Advanced Control System", 2nd Edition, RBA publications, 2014.
R4 - H. Marquez;Nonlinear Control Systems, Analysis and Design, Wiley, 2003.

WEB RESOURCES:

https: nptel.ac.in/courses/108/106/108106162/

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	1	-	-	-	-	-	-	2	2	3
CO2	3	3	3	2	2	-	-	-	-	-	-	2	3	3
CO3	3	2	3	2	2	-	-	-	-	-	-	2	3	3
CO4	2	2	2	2	2	-	-	-	-	-	-	3	2	3
CO5	3	3	3	2	2	-	-	-	-	-	-	2	3	3
Avg	2.8	2.6	2.6	2	1.8	-	-	-	-	-	-	2.2	2.6	3

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI6310	Robotics and Automation	3	0	0	3

Course Objective

1. Introduce the fundamentals of Robots and its components.
2. Elucidate the concept of Kinematic mechanism of Robots.
3. Understand the working of robot drive system and grippers.
4. Impart the knowledge of Robotic sensors and its uses.
5. Learn the Robot Programming methods

Unit	Description	Instructional Hours
I	**BASICS OF ROBOTICS** Origin & various generation of robot – Laws of robots - Robotic System Components - Classification of robots – Need of sensors in robots - Degree of freedom – End effectors – Robotic manipulators - Need for automation – Types of automation - robot part's and their functions- need for robots- applications.	9
II	**ROBOT KINEMATICS** Forward kinematics, inverse kinematics and the difference: forward kinematics and inverse Kinematics of Manipulators with two, three degrees of freedom (in 2 dimensional), four degrees of freedom (in 3 dimensional) – Trajectory planning – Robot Dynamics - Homogeneous transformation matrices, translation and rotation matrices.	9
III	**ROBOT DRIVE SYSTEM AND END EFFECTORS** Pneumatic Drives – Hydraulic Drives – Mechanical Drives – Electrical Drives – D.C. Servo Motors, Stepper Motor, A.C. Servo Motors – Salient Features, Applications and Comparison. Various Control schemes of robots - End Effectors – Grippers – selection of grippers.	9
IV	**SENSORS IN ROBOTICS** Force sensors, touch and tactile sensors, proximity sensors, non-contact sensors, proximity sensors, Robotic Machine vision system - camera, frame grabber, sensing and digitizing image data – signal conversion, image storage, lighting techniques, image processing and analysis – data reduction, segmentation, feature extraction, object recognition.	9
V	**PROGRAMMING AND ROBOT AUTOMATION** Robot Programming: Teach pendant programming, lead through programming, Robot programming languages – VAL programming – Motion Commands, Sensors commands, Command, and simple programs Robots in Industrial Automation - Role of robots in inspection, assembly, material handling, underwater, space and medical fields.	9
	Total Instructional Hours	**45**

Course Outcome

CO1:Illustrate the fundamentals of robots and their role of Automation.
CO2:Gain Knowledge about the robot kinematic mechanism.
CO3:Explain the working of robot drive systems and its components.
CO4:Apply knowledge on sensors and robotic vision system.
CO5:Familiarize on various Robotic programming and applications in Industrial automation.

TEXT BOOKS:
T1 -M.P.Groover, M.Weiss, R.N. Nageland N. G.Odrej, "Industrial Robotics", McGraw-Hill,1996.
T2 - Deb S R and Deb S, —Robotics Technology and Flexible Automation‖, Tata McGraw Hill Pvt. Ltd, 2010.
REFERENCE BOOKS:
R1 - D.K. Pratihar, "Fundamentals of Robotics", Narosa Publishing House, New Delhi ,2017
R2 - K.S Fu, R.C Gonzalez, C.S.G Lee, " Robotics", McGraw-Hill 1987.
R3 - Ghosh, "Control in Robotics and Automation: Sensor Based Integration", Allied Publishers,1999.
R4 – J.J Craig, "Introduction to Robotics", Addison-Wesley 1986.
WEB REFERENCE:
https://onlinecourses.nptel.ac.in/noc20_me56/preview

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	1	-	-	-	-	-	-	2	2	3
CO2	3	3	3	2	2	-	1	-	-	-	-	2	3	3
CO3	3	2	3	2	2	-	1	-	-	-	-	2	3	3
CO4	3	3	2	2	2	-	-	-	-	-	-	3	2	3
CO5	3	3	3	2	2	-	-	-	-	-	-	2	3	3
Avg	3	2.8	2.6	2	1.8	-	0.4	-	-	-	-	2.2	2.6	3

1-Low, 2-Medium, 3-High, "-" No correlation

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Vertical VI - Process Instrumentation

Programme	Course Code	Name of the Course	L	T	P	C
B.E	22EI6311	Piping and Instrumentation Diagrams	3	0	0	3

Course Objective

1. Introduce instrumentation standards and symbols used in process control systems.
2. Impart knowledge on instrument and function symbols for various process elements.
3. Understand and interpret P&ID symbols for pipes, equipment, and their identification.
4. Discuss the control concepts and basic control loops in process systems.
5. Outline on safety interlock and alarm systems to ensure safe operations in process plants.

Unit	Description	Instructional Hours
I	**INSTRUMENT SYMBOLS AND STANDARDS:** Instrumentation standards: Purpose, Industry codes and standards, Government Regulations – Application to Industries – Application to classes of Instrumentation-Identification Systems: Identification System guidelines: Instrument Index – Multipoint, – System Identification – Loop Identification number – Identification Letter Tables.	9
II	**GRAPHIC SYMBOL SYSTEMS** Instrument Line symbols – Measurement and control devices – AND/OR function symbols – Discrete devices – Shared continuous devices – Shared On/Off devices – Multipoint, Multifunction, Multivariable devices and loops. Primary elements – Final control elements – Electrical schematic symbols.	9
III	**FUNDAMENTALS OF P&ID DEVELOPMENT** Identification of P&ID and its role in process industries - P&ID Development Activity- Anatomy of a P&ID Sheet - Reference Drawing Block – Main Body of a P&ID. Pipes and Equipments: Fluid Conductors: Pipes, Tubes, and Ducts – Pipe Identifiers – Pipe Symbol – Pipe Tag – Pipe fittings. Manual Valves and Automatic Valves – Examples.	9
IV	**INSTRUMENTATION AND CONTROL SYSTEM** Fundamentals of Instrumentation and Control - ICSS System Technology - ICSS Elements –Instruments on P&IDs - Instrument Identifier – Signals: Communication Between Instruments – Different Instrument Elements - Simple control loops – Level and Pressure, Flow and Temperature Control Loops – Composition Control Loops.	9
V	**PLANT INTERLOCKS AND ALARMS** Introduction- Safety strategies – Concept of a SIS – SIS extent – Anatomy of a SIS: SIS Element Symbols, SIS Final Elements, SIS Logic – Showing Safety Instrumented Functions on P&IDs – Discrete Control – Alarm System: Anatomy of Alarm systems, Alarm requirements, Alarm system Symbology, Concept of Common Alarm.	9
	Total Instructional Hours	**45**

Course Outcome

CO1 : Summarize the basics of instrumentation standards and symbols.
CO2 : Identify the instrument symbols and function symbols for various elements.
CO3 : Interpret the symbols of pipes and various equipments in process industry and recognize P&ID and its role in process industry.
CO4 : Implement the control concepts in basic process systems and develop simple control loops.
CO5 : Develop the safety interlock systems and alarm systems in process plants and equipments.

TEXT BOOKS:

T1 - Liptak B.G., "Instrumentation Engineers Handbook (Process Measurement & Analysis)", 4th Edition , Chilton Book Co, CRC Press, United States, 2016
T2 - Moe Toghraei, "Piping and Instrumentation Diagram Development", Wiley-Blackwell, USA, 2019.

REFERENCE BOOKS :

R1 - Ernest E. Ludwig, "Applied Process Design for Chemical and Petrochemical Plants, Vol-I", 4th Edition, Gulf Publishing Company, Houston, 2007.
R2 - Wolfe, T., "Piping and Instrumentation Diagram (P&ID) Essentials", 1st Edition, Wiley, 2017.
R3 - Johnson .C.D, "Process Control Instrument Technology", 8th Edition, Pearson Education, 2006.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	1	-	-	-	-	-	-	2	2	3
CO2	3	3	3	2	2	-	-	-	-	-	-	3	3	3
CO3	3	2	3	2	2	-	-	-	-	-	-	2	3	3
CO4	3	3	2	2	2	-	-	-	-	-	-	3	3	3
CO5	3	3	3	2	2	-	-	-	-	-	-	3	3	3
Avg	3	2.8	2.6	2	1.8	-	-	-	-	-	-	2.8	2.8	3

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E	22EI6312	Instrumentation and Control in Petrochemical Industries	3	0	0	3

Course Objective	1. Interpret the process involved in oil extraction. 2. Categorize the petroleum refining process. 3. Discuss the various products available from petroleum 4. Classify the control loops available in petrochemical industry. 5. Observe various safety instrumentation systems available in petrochemical industry.

Unit	Description	Instructional Hours
I	**OIL EXTRACTION AND PROCESSING** Techniques used for oil discovery - seismic survey - methods of oil extraction - oil rig system – Primary and Secondary recovery - Enhanced oil recovery - separation of gas and water from oil – control loops in oil gas separator - scrubber - coalescer.	9
II	**PETROLEUM REFINING PROCESS** Petroleum refining process - unit operations in refinery - thermal cracking - catalytic cracking - catalytic hydrocracking - catalytic reforming - polymerization - isomerization - alkylation - Production of ethylene, acetylene and propylene from petroleum	9
III	**CHEMICALS PRODUCTS FROM PETROLEUM** Chemicals from methane, acetylene, ethylene and propylene - production process of polyethylene, polypropylene, ethylene dioxide, methanol, xylene, benzene, toluene, styrene, VCM and PVC	9
IV	**CONTROL LOOPS IN PETROCHEMICAL INDUSTRY** Control of binary and fractional distillation columns - Control of catalytic and thermal crackers - control of catalytic reformer - control of alkylation process - Control of polyethylene production - Control of VCM and PVC production	9
V	**SAFETY IN PETROLIUM INDUSTRIES** Area and material classification as per National Electric Code (NEC) - Classification as per International Electro technical Commission (IEC) - Techniques used to reduce explosion hazards - Pressurization techniques - Intrinsic safety - Mechanical and Electrical isolation - Lower and Upper explosion limit.	9
	Total Instructional Hours	45

Course Outcome	CO1. Outline the process involved in oil extraction. CO2. Outline the methods of oil refining. CO3. Discuss the various products available from petroleum industry. CO4. Identify the appropriate control loop existing in the petrochemical industry. CO5. Appraise various safety instrumentation systems existing in petrochemical industry.

TEXT BOOKS:

T1 - Ram Prasad, "Petroleum Refining Technology", Khanna Publishers, New Delhi, 2000.
T2 - J.H.Gary, J.E.Handwork, M.J.Kaiser, "Petroleum Refining (Technology and Economics)", CRC Press, 2007.

REFERENCE BOOKS:

R1 - B.G.Liptak, "Instrumentation in Process Industries", Chilton Book Company, 2005.
R2 - A.L.Waddams, "Chemicals from Petroleum", Butter and Janner Ltd., 2000.
R3 - Oil and Gas Production Handbook, ABB, 2013.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	1	-	-	-	-	-	-	2	2	3
CO2	3	3	3	2	2	-	-	-	-	-	-	3	3	2
CO3	3	2	3	2	1	-	-	-	-	-	-	2	2	3
CO4	3	3	2	2	2	-	-	-	-	-	-	3	2	3
CO5	3	3	3	2	2	-	-	-	-	-	-	3	3	3
Avg	3	2.8	2.6	2	1.4	-	-	-	-	-	-	2.8	2.4	2.8

1-Low, 2-Medium, 3-High, "-" No correlation

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OPEN ELECTIVES

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22EI6401	Introduction to Industrial Instrumentation and Control	3	0	0	3

Course Objective

1. Educate on basics of instrumentation systems and its parameters
2. Infer the concepts of Speed, Force and Torque measurements in instrumentation.
3. Illustrate various pressure measurement instruments.
4. Discuss on various level measuring instruments
5. Outline the methods used for the measurement of temperature.

Unit	Description	Instructional Hours
I	**INTRODUCTION** Basic building blocks of Instrumentation system – Terminologies – Control system basic blocks – elements: Open and closed loop system - examples - Introduction to process control – block diagram of process control loop –Calibration - Synchros - Industrial parameter measurements: basic symbols.	9
II	**SPEED, FORCE AND TORQUE MEASUREMENT** Speed - Measurement of speed - moving iron and moving coil type - AC and DC tacho generators, photo electric pickup - stroboscope - Force - Measurement of force - Load cell, pneumatic and hydraulic load cell - Torque - Measurement of torque - Strain gauge, relative regular twist.	9
III	**PRESSURE MEASUREMENT** Units of pressure - Manometers - different types - Elastic type pressure gauges - Bourdon tube, bellows, diaphragms - Electrical methods - thermal conductivity gauges, Ionization gauge - flapper-nozzle assembly, Dead weight tester - Calibration and selection of pressure gauges.	9
IV	**LEVEL MEASUREMENT** Level measurement: Float, Displacer type and Bubbler system – Electrical level gauge:- Resistance and Capacitance – Nuclear radiation - Ultrasonic level transmitters - Guided Wave Radar Level Transmitters – vibration and microwave level switches- Boiler drum level measurement.	9
V	**TEMPERATURE MEASUREMENT** Temperature measurement: Temperature scales - bimetallic thermometer-Liquid in Glass thermometer - filled-in thermometer - Electrical method of measurement - RTD - 3wire and 4 wire RTD, Thermistor, Thermocouples, high temperature measuring thermocouples - Calibration and selection of thermocouples.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Interpret the various building blocks of industrial instrumentation systems.
CO2: Classify the Instruments used for measurement of Speed, Force and Torque.
CO3: Choose the instruments used for the measurement of pressure
CO4: Demonstrate the working of various liquid level measuring instruments.
CO5: Identify the methods used for the measurement of temperature

TEXT BOOKS:
T1 - E.O. Doebelin, "Measurement Systems – Application and Design", Tata McGraw Hill Ltd., 2003.
T2 - R.K. Jain, "Mechanical and Industrial Measurements", Khanna Publishers, New Delhi, 1999.
T3 -Eckman D.P., "Industrial Instrumentation", Wiley Eastern Limited,1990.
REFERENCE BOOKS:
R1 - D. Patranabis, "Principles of Industrial Instrumentation", Tata McGraw Hill Ltd.,1996.
R2 - A.K. Sawhney and P. Sawhney, "A Course on Mechanical Measurements, Instrumentation and Control", Dhanpat Rai and Co, 2004.
R3 - S.K. Singh, "Industrial Instrumentation and Control", Tata McGraw Hill, 2003.
R4- Liptak, B.G., "Instrumentation Engineers Handbook (Measurement)", CRC Press,2005.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	1	-	-	-	-	-	-	2	2	3
CO2	3	3	3	2	2	-	1	-	-	-	-	2	3	3
CO3	3	2	3	2	2	-	1	-	-	-	-	2	3	3
CO4	2	3	2	2	2	-	-	-	-	-	-	3	2	3
CO5	3	3	3	2	2	-	-	-	-	-	-	2	3	3
Avg	2.8	2.8	2.6	2	1.8	-	0.4	-	-	-	-	2.2	2.6	3

1-Low, 2-Medium, 3-High, "-" No correlation

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HICET

Hindusthan College of Engineering and Technology
(An Autonomous Institution, Affiliated to AnnaUniversity, Chennai
Approved by AICTE,NewDelhi &Accredited by NAAC with'A++'Grade)
Valley Campus, Pollachi Highways, Coimbatore, Tamilnadu.

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Department of Electronics and Instrumentation Engineering

SYLLABUS REVISION DETAILS FOR THE REGULATION 2022 – 2022 BATCH - VI SEMESTER						
S. NO	COURSE CODE/COURSE NAME	SUGGESTION BY EXPERTS	EXISTING CONTENT (IN THE AY2023-24 EVEN)	REVISED CONTENT(FOR AY 2024-25 EVEN)	TYPE OF REVISION DELETION/ INSERTION/ MODIFICATION	PERCENTAGE OF REVISION
NIL						
					Total Percentage Changes	NIL

New Course Introduced (2022 Regulation) – 2022 Batch - VI Semester

S.No	Regulation	Course code with Name	Credits
1.	2022	22EI6201- Process Control	3
2.	2022	22EI6202- Digital Signal Processing	3
3.	2022	22EI6001- Process Control Laboratory	2
4.	2022	22EI6002- Virtual Instrumentation and Data Acquisition Laboratory	2
5.	2022	22EI6301- Optical Instrumentation	3
6.	2022	22EI6302- Project Engineering and Management	3
7.	2022	22EI6303- Medical Robotics	3
8.	2022	22EI6304- Diagnosis and Therapeutic Equipment	3
9.	2022	22EI6305- Virtual Instrumentation	3
10.	2022	22EI6306- Machine Monitoring and Control	3
11.	2022	22EI6307- Semiconductor Manufacturing	3

Department of Electronics and Instrumentation Engineering

12.	2022	22EI6308- Industrial Electronics	3
13.	2022	22EI6309- Advanced Control Theory	3
14.	2022	22EI6310- Robotics and Automation	3
15.	2022	22EI6311- Piping and Instrumentation Diagrams	3
16.	2022	22EI6312- Instrumentation and Control in Petrochemical Industries	3
17.	2022	22EI6401- Introduction to Industrial Instrumentation and Control	3

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DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.E. ELECTRONICS AND INSTRUMENTATION ENGINEERING (UG)

REGULATION-2019

(For the students admitted during the academic year 2021-2022 and onwards)

SEMESTER I

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
			THEORY							
1	21HE1101	Technical English	HS	2	1	0	3	40	60	100
2	21MA1103	Calculus and Differential Equations	BS	3	1	0	4	40	60	100
			THEORY WITH LAB COMPONENT							
3	21PH1151	Applied Physics	BS	2	0	2	3	50	50	100
4	21CY1151	Chemistry for Engineers	BS	2	0	2	3	50	50	100
5	21CS1151	Python Programming and Practices	ES	2	0	2	3	50	50	100
6	21ME1152	Engineering Drawing	ES	1	0	4	3	50	50	100
			PRACTICAL							
7	21HE1001	Language Competency Enhancement Course-I	HS	0	0	2	1	100	0	100
			MANDATORY COURSES							
8	21HE1072	**Career Guidance Level – I** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
9	21HE1073	Entrepreneurship & Innovation	EEC	1	0	0	0	100	0	100
			Total :	**15**	**2**	**12**	**20**	**580**	**320**	**900**
		As Per AICTE Norms 3 Weeks Induction Programme is Added in the First Semester as an Audit Course								

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SEMESTER II

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21HE2101	Business English for Engineers	HS	2	1	0	3	40	60	100
2	21MA2102	Complex Variables and Transform Calculus	BS	3	1	0	4	40	60	100
THEORY WITH LAB COMPONENT										
3	21PH2151	Material Science	BS	2	0	2	3	50	50	100
4	21CY2151	Environmental Studies	BS	2	0	2	3	50	50	100
5	21EI2151	Circuit Theory	ES	2	0	2	3	50	50	100
6	21CS2152	Essentials of C and C++ Programming	ES	2	0	2	3	50	50	100
PRACTICAL										
7	21ME2001/ 21EE2001	Engineering Practices	ES	0	0	4	2	60	40	100
8	21HE2001	Language Competency Enhancement Course-II	HS	0	0	2	1	100	0	100
MANDATORY COURSES										
9	21HE2072	**Career Guidance Level – II** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
			Total :	**15**	**2**	**14**	**22**	**540**	**360**	**900**

SEMESTER III

S.No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21MA3102	Fourier Analysis and Transforms	BS	3	1	0	4	40	60	100
2	21EI3201	Electronic Devices and Circuits	PC	3	1	0	4	40	60	100
3	21EI3202	Sensors and Transducers	PC	3	0	0	3	40	60	100
4	21ME3231	Fluid Mechanics and Thermal Engineering	PC	3	0	0	3	40	60	100
THEORY WITH LAB COMPONENT										
5	21EI3251	Electrical and Electronic Measurements	PC	2	0	2	3	50	50	100
PRACTICAL										
6	21EI3001	Electronic Devices and Circuits Laboratory	PC	0	0	3	1.5	60	40	100
7	21EI3002	Sensors and Transducers Laboratory	PC	0	0	3	1.5	60	40	100
MANDATORY COURSES										
8	21MC3191	Indian Constitution	MC	2	0	0	0	100	0	100
9	21HE3072	**Career Guidance Level – III** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
10	21HE3073	Leadership Management Skills	EEC	1	0	0	0	100	0	100
			Total	**19**	**2**	**8**	**20**	**550**	**450**	**1000**

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SEMESTER IV

S.No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21MA4101	Numerical Methods	BS	3	1	0	4	40	60	100
2	21EI4201	Electrical Machines	PC	3	1	0	4	40	60	100
3	21EI4202	Integrated Circuits and Its Applications	PC	3	0	0	3	40	60	100
4	21EI4203	Industrial Instrumentation – I	PC	3	0	0	3	40	60	100
THEORY WITH LAB COMPONENT										
5	21EI4251	Digital Logic Circuits	PC	2	1	2	4	50	50	100
PRACTICAL										
6	21EI4001	Electrical Machines Laboratory	PC	0	0	3	1.5	60	40	100
7	21EI4002	Integrated Circuits Laboratory	PC	0	0	3	1.5	60	40	100
MANDATORY COURSES										
8	21MC4191	Essence of Indian tradition knowledge/Value Education	MC	2	0	0	0	100	0	100
9	21HE4072	**Career Guidance Level – IV** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
10	21HE4073	Ideation Skills	EEC	2	0	0	0	100	0	100
			Total	**20**	**3**	**8**	**21**	**550**	**450**	**1000**

SEMESTER V

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21EI5201	Industrial Instrumentation – II	PC	3	0	0	3	40	60	100
2	21EI5202	Control Systems	PC	3	1	0	4	40	60	100
3	21EI5203	Microprocessors and Microcontrollers	PC	3	0	0	3	40	60	100
4	21EI5204	Analytical Instrumentation	PC	3	0	0	3	40	60	100
5	21EI53XX	**Professional Elective -I.**	PE	3	0	0	3	40	60	100
THEORY WITH LAB COMPONENT										
6	21EI5251	Programmable Logic Controllers and SCADA	PC	2	0	2	3	50	50	100
PRACTICALS										
7	21EI5001	Industrial Instrumentation Laboratory	PC	0	0	3	1.5	60	40	100
8	21EI5002	Microprocessors and Microcontrollers Laboratory	PC	0	0	3	1.5	60	40	100
MANDATORY COURSES										
9	21HE5071	Soft Skills - I	EEC	1	0	0	1	100	0	100
10	21HE5072	Design Thinking	EEC	1	0	0	1	100	0	100
			Total	**19**	**1**	**8**	**24**	**475**	**525**	**1000**

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SEMESTER VI

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21EI6181	Industrial Safety Management	HS	3	0	0	3	40	60	100
2	21EI6201	Process Control	PC	3	0	0	3	40	60	100
3	21EI6202	Discrete Time and Signal Processing	PC	3	0	0	3	40	60	100
4	21EI63XX	**Professional Elective - II**	PE	3	0	0	3	40	60	100
5	21XX64XX	**Open Elective– I**	OE	3	0	0	3	40	60	100
THEORY WITH LAB COMPONENT										
6	21EI6251	Embedded Systems	PC	2	0	2	3	50	50	100
PRACTICALS										
7	21EI6001	Process Control Laboratory	PC	0	0	3	1.5	60	40	100
8	21EI6002	Virtual Instrumentation Laboratory	PC	0	0	3	1.5	60	40	100
MANDATORY COURSES										
9	21EI6701	Internship Training	EEC	0	0	0	1	0	100	100
10	21HE6071	Soft Skills - II	EEC	1	0	0	1	100	0	100
11	21HE6072	Intellectual Property Rights (IPR)	EEC	1	0	0	1	100	0	100
			Total	**19**	**0**	**8**	**24**	**475**	**625**	**1100**

SEMESTER VII

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21EI7201	Computer Control of Process	PC	3	0	0	3	40	60	100
2	21EI7202	Industrial Electronics	PC	3	0	0	3	40	60	100
3	21EI73XX	**Professional Elective-III**	PE	3	0	0	3	40	60	100
4	21XX74XX	**Open Elective – II**	OE	3	0	0	3	40	60	100
THEORY WITH LAB COMPONENT										
5	21EI7251	Bio-Medical Instrumentation	PC	2	0	2	3	50	50	100
PRACTICALS										
6	21EI7001	Computer Control of Process Laboratory	PC	0	0	3	1.5	60	40	100
7	21EI7002	Instrumentation System Design Laboratory	PC	0	0	3	1.5	60	40	100
PROJECT WORK										
8	21EI7901	Project Work – Phase I	EEC	0	0	4	2	50	50	100
			Total	**14**	**0**	**12**	**20**	**300**	**500**	**800**

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SEMESTER VIII

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21EI83XX	**Professional Elective –IV**	PE	3	0	0	3	40	60	100
2	21EI81XX	**Professional Elective- V**	PE	3	0	0	3	40	60	100
PROJECT WORK										
3	21EI8901	Project Work – Phase II	EEC	0	0	16	8	100	100	200
			Total	**6**	**0**	**16**	**14**	**150**	**250**	**400**

TOTAL NO OF CREDITS: 165

LIST OF PROFESSIONAL ELECTIVES

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
PROFESSIONAL ELECTIVE I										
1	21EI5301	Power Plant Instrumentation	PE	3	0	0	3	40	60	100
2	21EI5302	Communication Theory	PE	3	0	0	3	40	60	100
3	21IT5331	Fundamentals of Java Programming	PE	3	0	0	3	40	60	100
4	21EI5303	Industrial Chemical Process	PE	3	0	0	3	40	60	100
5	21EI5304	Operating Systems	PE	3	0	0	3	40	60	100
PROFESSIONAL ELECTIVE II										
1	21EI6301	VLSI Design	PE	3	0	0	3	40	60	100
2	21EI6302	Micro Electro Mechanical Systems	PE	3	0	0	3	40	60	100
3	21EI6303	Industrial Data Communication	PE	3	0	0	3	40	60	100
4	21EI6304	Digital Image Processing	PE	3	0	0	3	40	60	100
5	21EI6305	Introduction to Soft Computing	PE	3	0	0	3	40	60	100
PROFESSIONAL ELECTIVE III										
1	21EI7301	Non-Linear Control System	PE	3	0	0	3	40	60	100
2	21EI7302	Industrial IoT	PE	3	0	0	3	40	60	100
3	21EI7303	Robotics and Automation	PE	3	0	0	3	40	60	100
4	21EI7304	Microcontroller Based System Design	PE	3	0	0	3	40	60	100
5	21EI7305	Neural Networks and Fuzzy Systems	PE	3	0	0	3	40	60	100
PROFESSIONAL ELECTIVE IV										
1	21EI8301	Fiber Optics and Laser Instruments	PE	3	0	0	3	40	60	100
2	21EI8302	Instrumentation in Petrochemical Industries	PE	3	0	0	3	40	60	100
3	21EI8303	Instrumentation System Design	PE	3	0	0	3	40	60	100

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4	21EI8304	Artificial Intelligence and Machine Learning	PE	3	0	0	3	40	60	100
5	21EI8305	Instrumentation and Control in Paper Industry	PE	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE V										
S.No.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**
1	21EI8181	Disaster Management	PE	3	0	0	3	40	60	100
2	21EI8182	Total Quality Management	PE	3	0	0	3	40	60	100
3	21EI8183	Professional Ethics for Engineers	PE	3	0	0	3	40	60	100
4	21EI8184	Principles of Management	PE	3	0	0	3	40	60	100
5	21EI8185	Patent, Copyright and Competition Law	PE	3	0	0	3	40	60	100

LIST OF OPEN ELECTIVES

ELECTRONICS AND INSTRUMENTATION ENGINEERING										
S.No.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**
1	21EI6401	Smart Sensors for Engineering Applications	OE	3	0	0	3	40	60	100
2	21EI6402	Electrical Energy Management and Audit	OE	3	0	0	3	40	60	100
3	21EI7401	Introduction to Programmable Logic Controllers	OE	3	0	0	3	40	60	100
LIFE SKILL COURSES										
4	21LSZ401	General Studies for Competitive Examinations	OE	3	0	0	3	40	60	100
5	21LSZ402	Human Rights, Women's Rights and Gender Equality	OE	3	0	0	3	40	60	100
6	21LSZ403	Indian Ethos and Human Values	OE	3	0	0	3	40	60	100
7	21LSZ404	Indian Constitution and Political System	OE	3	0	0	3	40	60	100
8	21LSZ405	Yoga for Human Excellence	OE	3	0	0	3	40	60	100
NCC COURSES (Only for the students' who have opted NCC subjects in Semester I, II, III & IV are eligible)										
9	21HEZ401	NCC course level 1	OE	3	0	0	3	40	60	100
10	21HEZ402	NCC course level 2	OE	3	0	0	3	40	60	100

(Note: Z stands for semester; students can't choose twice the course)

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ADDITIONAL CREDIT COURSE FOR ELECTRONICS AND INSTRUMENTATION ENGINEERING						
S.No	**Course Code**	**Course Title**	**Category**	**Duration**	**Assessment**	**Credit**
1.	21VAEI01	Design Project	VA	30 hrs	Internal	1
2.	21VAEI02	Basics of LabVIEW	VA	30 hrs	Internal	1
3.	21VAEI03	Proficiency in Graphical System Design with Hardware	VA	30 hrs	Internal	1

ADDITIONAL CREDIT COURSE FOR NCC CADETS										
S.No.	**Course Code**	**Course Title**	**Type**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**
1	21HE1074	NCC General and National Integration	VA	1	0	0	1	100	-	100
2	21HE2074	Social services and community development	VA	1	0	0	1	100	-	100
3	21HE3074	Leadership Qualities and camp activities	VA	1	0	0	1	100	-	100
4	21HE4074	General awareness, communication and Aero engines	VA	1	0	0	1	100	-	100

Enrolment for B.E. / B. TECH. (HONOURS) / Minor Degree (optional)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only. For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes.

Clause 4.10 of Regulation 2022 is applicable for the Enrolment of B.E. / B. TECH. (HONOURS) / Minor Degree(Optional).

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VERTICALS FOR MINOR DEGREE

- Heads are requested to provide one vertical from their program to offer for other program students to register for additional courses (18 Credits) to become eligible for the B.E./B.Tech. Minor Degree.

  Note: Each programme should provide verticals for minor degree –

ELECTRONICS AND INSTRUMENTATION ENGINEERING OFFERING MINOR DEGREE

S No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1.	21EI5601	Sem 5: Transducer Engineering	MDC	3	0	0	3	3
2.	21EI6601	Sem 6: Measurements and Measuring Instruments	MDC	3	0	0	3	3
3.	21EI6602	Sem 6: Industrial Instrumentation	MDC	3	0	0	3	3
4.	21EI7601	Sem 7: Industrial data Communication	MDC	3	0	0	3	3
5.	21EI7602	Sem 7: Powerplant Instrumentation	MDC	3	0	0	3	3
6.	21EI8601	Sem 8: Industrial Automation	MDC	3	0	0	3	3

*MDC – Minor Degree Course

In addition to the above the following additional courses for Minor Degree can also be given to the student's common to all the branches.

Vertical I Fintech and Block Chain	Vertical II Entrepreneurship	Vertical III Environment and Sustainability
Financial Management	Foundations of Entrepreneurship	Sustainable infrastructure Development
Fundamentals of Investment	Introduction to Business Venture	Sustainable Agriculture and Environmental Management
Banking, Financial Services and Insurance	Team Building & Leadership Management for Business	Sustainable Bio Materials
Introduction to Blockchain and its Applications	Creativity & Innovation in Entrepreneurship	Materials for Energy Sustainability
Fintech Personal Finance and Payments	Principles of Marketing Management for Business	Green Technology
Introduction to Fintech	Human Resource Management for Entrepreneurs	Environmental Quality Monitoring and Analysis
	Financing New Business Ventures	

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Vertical I
Fintech and Block Chain

S No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	21CS5601	Financial Management	MDC	3	0	0	3	3
2	21CS6601	Fundamentals of Investment	MDC	3	0	0	3	3
3	21CS6602	Banking, Financial Services and Insurance	MDC	3	0	0	3	3
4	21CS7601	Introduction to Blockchain and its Applications	MDC	3	0	0	3	3
5	21CS7602	Fintech Personal Finance and Payments	MDC	3	0	0	3	3
6	21CS8601	Introduction to Fintech	MDC	3	0	0	3	3

Vertical II
Entrepreneurship

S No.	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	21BA5601	Foundations of Entrepreneurship	MDC	3	0	0	3	3
2	21BA6601	Introduction to Business Venture	MDC	3	0	0	3	3
3	21BA6602	Team Building & Leadership Management for Business	MDC	3	0	0	3	3
4	21BA7601	Creativity & Innovation in Entrepreneurship	MDC	3	0	0	3	3
5	21BA7602	Principles of Marketing Management For Business	MDC	3	0	0	3	3
6	21BA8601	Human Resource Management for Entrepreneurs	MDC	3	0	0	3	3
7	21BA8602	Financing New Business Ventures	MDC	3	0	0	3	3

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Vertical III
Environment and Sustainability

S No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1	21CE5601	Sustainable infrastructure Development	MDC	3	0	0	3	3
2	21CE6601	Sustainable Agriculture and Environmental Management	MDC	3	0	0	3	3
3	21CE6602	Sustainable Bio Materials	MDC	3	0	0	3	3
4	21CE7601	Materials for Energy Sustainability	MDC	3	0	0	3	3
5	21CE7602	Green Technology	MDC	3	0	0	3	3
6	21CE8601	Environmental Quality Monitoring and Analysis	MDC	3	0	0	3	3

B.E (Hons) ELECTRONICS AND INSTRUMENTATION ENGINEERING

Vertical I **IoT and Smart Sensors**	**Vertical II** **Process Control**	**Vertical III** **Industrial Automation**
21EI5205 Introduction to Internet of Things	21EI5206 Instrumentation Practices in Industries	21EI5207 Drives and Control system for Automation
21EI6203 Principle of Sensors and Signal Conditioning	21EI6205 Adaptive control	21EI6207 Applied Industrial Instrumentation
21EI6204 Embedded systems for IoT	21EI6206 Advanced Process Control	21EI6208 Instrumentation in Building Automation
21EI7203 IoT for Industry Automation	21EI7205 Unit operation and control	21EI7207 Machine vision system
21EI7204 Optical sensors and photonics	21EI7206 Advanced Instrumentation Systems	21EI7208 SCADA systems and its applications
21EI8201 Smart Instrumentation	21EI8202 Industrial safety and Hazard Management	21EI8203 Technological Trends in Automation

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Vertical I
B.E (Hons) Electronics and Instrumentation Engineering with Specialization in IoT and Smart Sensors

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	21EI5205	Sem 5: Introduction to Internet of Things	PC	3	0	0	3	4	40	60	100
2.	21EI6203	Sem 6: Principle of Sensors and Signal Conditioning	PC	3	0	0	3	4	40	60	100
3.	21EI6204	Sem 6: Embedded systems for IoT	PC	3	0	0	3	4	40	60	100
4.	21EI7203	Sem 7: IoT for Industry Automation	PC	3	0	0	3	4	40	60	100
5.	21EI7204	Sem 7: Optical sensors and photonics	PC	3	0	0	3	4	40	60	100
6.	21EI8201	Sem 8: Smart Instrumentation	PC	3	0	0	3	4	40	60	100

Vertical II
B.E (Hons) Electronics and Instrumentation Engineering with Specialization in Process Control

S.No.	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	21EI5206	Sem 5: Instrumentation Practices in Industries	PC	3	0	0	3	4	40	60	100
2.	21EI6205	Sem 6: Adaptive control	PC	3	0	0	3	4	40	60	100
3.	21EI6206	Sem 6: Advanced Process Control	PC	3	0	0	3	4	40	60	100
4.	21EI7205	Sem 7: Unit operation and control	PC	3	0	0	3	4	40	60	100
5.	21EI7206	Sem 7: Advanced Instrumentation Systems	PC	3	0	0	3	4	40	60	100
6.	21EI8202	Sem 8: Industrial safety and Hazard Management	PC	3	0	0	3	4	40	60	100

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Vertical III

B.E (Hons) Electronics and Instrumentation Engineering with Specialization in Industrial Automation

S.No	Course Code	Course Title	Category	Periods per Week				TCP	CIA	ESE	Total
				L	T	P	C				
1.	21EI5207	Sem 5: Drives and control system for Automation	PC	3	0	0	3	4	40	60	100
2.	21EI6207	Sem 6: Applied Industrial Instrumentation	PC	3	0	0	3	4	40	60	100
3.	21EI6208	Sem 6: Instrumentation in Building Automation	PC	3	0	0	3	4	40	60	100
4.	21EI7207	Sem 7: Machine vision system	PC	3	0	0	3	4	40	60	100
5.	21EI7208	Sem 7: SCADA systems and its applications	PC	3	0	0	3	4	40	60	100
6.	21EI8203	Sem 8: Technological Trends in Automation	PC	3	0	0	3	4	40	60	100

Legends

BS – Basic Science Course

HS – Humanities and Social Science including Management Course

ES – Engineering Science Course

PC – Professional Core Course

PE – Professional Elective Course

OE – Open Elective Course

VA – Value Added Course

MC – Mandatory Course

EEC – Employability Enhancement Courses

CIA – Continues Internal Assessment

ESE – End Semester Examinations

SEMESTER-WISE CREDIT DISTRIBUTION

B.E. / B.TECH. PROGRAMMES										
S.No.	Course Area	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HS	04	04	-	-	-	03	-	-	11
2	BS	10	10	04	04	-	-	-	-	28
3	ES	06	05	-	-	-	-	-	-	11
4	PC	-	03	16	17	19	12	12		79
5	PE	-	-	-	-	03	03	03	06	15
6	OE	-	-	-	-	-	03	03	-	06
7	EEC	-	-	-	-	02	03	02	08	15
	Total	**20**	**22**	**20**	**21**	**24**	**24**	**20**	**14**	**165**

CREDIT DISTRIBUTION R 2019

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	20	22	20	21	24	24	20	14	**165**

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EIE - HiCET

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Dean (Academics)
HiCET

Principal
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COIMBATORE - 641 032.

HICET

Hindusthan College of Engineering and Technology

(An Autonomous Institution, Affiliated to AnnaUniversity, Chennai
Approved by AICTE,NewDelhi &Accredited by NAAC with'A++'Grade)
Valley Campus, Pollachi Highways, Coimbatore, Tamilnadu.

TÜVRheinland CERTIFIED

Department of Electronics and Instrumentation Engineering

SYLLABUS REVISION DETAILS FOR THE REGULATION 2019 with Amendment – 2021 BATCH - VIII SEMESTER

S. NO	COURSE CODE/COURSE NAME	SUGGESTION BY EXPERTS	EXISTING CONTENT (IN THE AY2023-24 EVEN)	REVISED CONTENT(FOR AY 2024-25 EVEN)	TYPE OF REVISION DELETION/ INSERTION/ MODIFICATION	PERCENTAGE OF REVISION
NIL						
					Total Percentage Changes	NIL

New Course Introduced (Regulation 2019 with Amendment) – 2021 Batch - VIII Semester

S.No	Regulation	Course code with Name	Credits
1.	2019	21EI8601 – Industrial Automation	3
2.	2019	21EI8201 – Smart Instrumentation	3
3.	2019	21EI8202- Industrial safety and Hazard Management	3
4.	2019	21EI8203- Technological Trends in Automation	3

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EIE - HiCET

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Dean-Academics
Dean (Academics)
HiCET

SEMESTER – VIII

Programme	Course Code	Name of the Course	L	T	P	C
B.E	21EI8901	Project Work - Phase II	0	0	16	8

Course Objectives	1. Apply a methodology to extend a project ideas and able to work in a team. 2. Transform the ideas behind the project into a product. 3. Test and validate the technical report.

The Project work (Phase II) shall be pursued for a minimum prescribed period as per regulation.
The project work shall be supervised by a supervisor of the department, (and an expert in industry if it is a industrial project), and the student shall be instructed to meet the supervisor periodically and to attend the review committee meeting for evaluation of the progress.
The Project report shall be prepared and submitted according to the approved guidelines as given by the Controller of Examination and bonafied duly signed by Supervisor and the Head of the Department.

Course Outcome	CO1: Implement the skills acquired in the previous semesters to solve complex engineering problems. CO2: Develop a model / prototype of an idea related to the field of specialization. CO3: Establish the work individually or in a team to identify, troubleshoot and build products for environmental and societal issues. CO4: Perform presentation of ideas with clarity. CO5: Evaluate surveys towards developing a product which helps in life time learning.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	1	1	-	1	-	-	-	2	2	2	3	3
CO2	3	3	2	1	-	2	-	-	-	2	2	2	3	3
CO3	3	3	1	1	-	-	-	-	-	2	2	2	3	3
CO4	3	3	2	3	-	1	1	-	-	2	2	2	3	3
CO5	3	3	3	3	-	1	1	-	-	2	2	2	3	3
Avg	3	2.8	1.8	2.2	-	1.2	0.4	-	-	2	2	2	2.6	3

1-Low, 2-Medium, 3-High, "-" No correlation

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Professional Elective IV

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21EI8301	Fiber Optics and Laser Instruments	3	0	0	3

Course Objective

1. Recall the fundamentals of optical fiber and its properties.
2. Infer the industrial applications of optical fiber.
3. Relate the concepts of lasers fundamentals.
4. Apply lasers in various applications.
5. Interpret hologram and medical applications.

Unit	Description	Instructional Hours
I	**OPTICAL FIBRES AND THEIR PROPERTIES** Principles of light propagation through a fiber - Different types of fibers and their properties, fiber characteristics - Absorption losses - Scattering losses - Dispersion - Fiber Optic Connectors - Splices- Fiber termination - Optical sources - Optical detectors.	9
II	**INDUSTRIAL APPLICATIONS OF OPTICAL FIBRES** Sensors - Fiber optic instrumentation system - Different types of modulators - Interferometric method of measurement of length - Moire fringes - Measurement of pressure, temperature, current, voltage, liquid level and strain.	9
III	**LASER FUNDAMENTALS** Fundamental characteristics of lasers - Laser Levels - Properties of laser - Laser modes - Resonator configuration Q-switching and mode locking - Cavity damping - Types of lasers- gas lasers, solid lasers, liquid lasers, semi conductor lasers.	9
IV	**INDUSTRIAL APPLICATION OF LASERS** Laser for measurement of distance, length, velocity, acceleration, current, voltage and Atmospheric effect - Material processing - Laser heating, welding, melting and trimming of material, removal and vaporization.	9
V	**HOLOGRAM AND MEDICAL APPLICATIONS** Holography - Basic principle - Methods - Holographic interferometry and application, Holography for non-destructive testing - Holographic components - Medical applications of lasers - laser and tissue interactive - Laser instruments for surgery - Removal of tumors of vocal cards - Brain surgery - Plastic surgery - Gynaecology and Oncology.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Apply the basic concepts of optical fibers in applications.
CO2: Demonstrate fibre optic instrumentation system in industrial applications.
CO3: Develop applications based on lasers.
CO4: Validate the industrial applications of lasers
CO5: Establish industrial application of holography and medical applications of lasers

TEXT BOOKS:
T1 - R.P.Khare, "Fiber Optics and Optoelectronics", Oxford university press, 2008.
T2 - John and Harry, "Industrial lasers and their application", McGraw-Hill, 2002.
REFERENCE BOOKS:
R1- J.M. Senior, "Optical Fiber Communication -Principles and Practice", Prentice Hall of India, 2010.
R2 - Asu Ram Jha, "Fiber Optic Technology Applications to commercial, Industrial, Military and Space Optical systems", Prentice Hall of India learning Private limited, 2009.

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	1	-	-	-	-	-	-	2	2	3
CO2	2	3	3	2	2	-	1	-	-	-	-	2	3	3
CO3	3	2	3	2	2	-	1	-	-	-	-	2	3	3
CO4	3	3	2	2	2	-	1	-	-	-	-	3	3	3
CO5	3	3	3	2	2	-	-	-	-	-	-	2	3	3
Avg	2.8	2.8	2.6	2	1.8	-	0.6	-	-	-	-	2.2	2.8	3

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21EI8302	Instrumentation in Petrochemical Industries	3	0	0	3

Course Objective

1. Interpret the process involved in oil extraction.
2. Categorize the petroleum refining process.
3. Discuss the various products available from petroleum
4. Classify the control loops available in petrochemical industry.
5. Observe various safety instrumentation systems available in petrochemical industry.

Unit	Description	Instructional Hours
I	**PETROLEUM PROCESSING** Petroleum exploration – seismic survey -Recovery techniques – Oil – Gas separation - Processing wet gases – Refining of crude oil.	9
II	**OPERATIONS IN PETROLEUM INDUSTRY** Thermal cracking – Catalytic cracking – Catalytic reforming – Polymerisation – Alkylation – Isomerization – Production of ethylene, acetylene and propylene from petroleum.	9
III	**CHEMICALS FROM PETROLEUM PRODUCTS** Chemicals from petroleum – Methane derivatives – Acetylene derivatives – Ethylene derivatives – Propylene derivatives – Other products	9
IV	**MEASUREMENTS IN PETROCHEMICAL INDUSTRY** Parameters to be measured in refinery and petrochemical industry – Selection and maintenance of measuring instruments – Intrinsic safety of Instruments.	9
V	**CONTROL LOOPS IN PETROCHEMICAL INDUSTRY** Process control in refinery and petrochemical industry – Control of distillation column – Control of catalytic crackers and pyrolysis unit – Automatic control of polyethylene production – Control of vinyl chloride and PVC production.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Outline the process involved in oil extraction.
CO2: Outline the methods of oil refining.
CO3: Discuss the various products available from petroleum industry.
CO4: Identify the appropriate control loop existing in the petrochemical industry.
CO5: Appraise various safety instrumentation systems existing in petrochemical industry.

TEXT BOOKS:

T1 - Ram Prasad, "Petroleum Refining Technology", Khanna Publishers, New Delhi, 2000.
T2 - J.H.Gary, J.E.Handwork, M.J.Kaiser, "Petroleum Refining (Technology and Economics)", CRC Press, 2007.

REFERENCE BOOKS:

R1 - B.G.Liptak, "Instrumentation in Process Industries", Chilton Book Company, 2005.
R2 - A.L.Waddams, "Chemicals from Petroleum", Butter and Janner Ltd., 2000.
R3 - Oil and Gas Production Handbook, ABB, 2013.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	1	-	1	-	-	-	-	2	2	3
CO2	2	3	3	2	2	-	1	-	-	-	-	2	3	3
CO3	3	2	3	2	2	-	1	-	-	-	-	2	3	3
CO4	3	3	2	2	2	-	1	-	-	-	-	3	3	3
CO5	3	3	3	2	2	-	-	-	-	-	-	2	3	3
Avg	2.8	2.8	2.6	2	1.8	-	1.2	-	-	-	-	2.2	2.8	3

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21EI8303	Instrumentation System Design	3	0	0	3

Course Objective

1. Infer the basic concepts of instrument design.
2. Outline the design aspects of instruments.
3. Design printed circuit board.
4. Discuss about the control panel design.
5. Interpret the reliability concepts.

Unit	Description	Instructional Hours
I	**BASIC CONCEPTS ON INSTRUMENT DESIGN** Functional Requirements and Specification - Operational Environment - Commercial, Industrial, Military - NEMA, DIN, BIS And ANSI Standards with special reference packaging - One Line Diagram of Hydraulic, Pneumatic and Electrical Instrumentation System - Instruments Symbols and Signals.	9
II	**DESIGN ASPECTS** Performance Characteristics and Selection Criteria for Flow, Temperature, Pressure and Level Transducers - Range, Specification Standards and Recommended Practice for Instruments - Interface Primary Element with End Devices - Engineering Display- Calibrating and Testing Standards for Instruments and Transducers.	9
III	**PRINTED CIRCUIT BOARD DESIGN** Design Guideline - General Components, Layout Scheme, PCB Size, Design Rules for Digital Circuit and Analog Circuit PCB's Single and Multiplayer Boards - Automation and Computer in PCB Design - Artwork and CAD Packages and Tools - Electronic Circuit and Minimum System Design by using PCB Design Software Packages.	9
IV	**CONTROL PANEL DESIGN** Operating Console and Control Room Panel Design - Control Room Environment for Electronic Equipment - Requirement of Instrument Quality, Air Heat Dissipation, Forced Air Circulation and Humidity Consideration - Enclosure Design Guidelines - Grounding and Shielding Techniques - Packaging for Various Operational Environments including IP-51, IP-54 and IP-67.	9
V	**RELIABILITY CONCEPTS** MTTR - MTBF - Concepts of Availability - Instrument Evaluation (Test/Inspection Method) - Failure Rate Analysis - Product Quality Variance Report - Control Charts - SQC - TQM Principles - ISO Series - Quality Standards Procedure - Certifications Policies - Quality Audit.	9
	Total Instructional Hours	45

Course Outcome

CO1: Apply acquired skill in designing instrument.
CO2: Analyze various design aspects involved in manufacturing instruments.
CO3: Demonstrate printed circuit board.
CO4: Summarize the concepts of designing a control panel.
CO5: Illustrate various reliability concepts involved in the design and operation of instruments.

TEXT BOOKS:

T1 - Warren Boxleitner, "Electrostatic Discharge and Electronic Equipment", IEEE press., 1988.
T2 - E. Balguruswamy, "Reliability Engineering", Tata Mc Graw Hill, 2013.

REFERENCE BOOKS:

R1 - B.G. Liptak, "Process control ", CRC Press, 2005.
R2 - Christopher.T. Robertson, "Printed Circuit Boards", Prentice Hall of India, 2015.
R3 - R.S. Khandpur, "Printed Circuit Boards", Tata Mc Graw Hill, 2005.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	1	-	-	-	-	-	-	2	2	3
CO2	2	3	3	2	2	-	1	-	-	-	-	2	3	3
CO3	3	2	3	2	2	-	1	-	-	-	-	2	3	3
CO4	3	3	2	2	2	-	1	-	-	-	-	3	3	3
CO5	3	3	3	2	2	-	-	-	-	-	-	2	3	3
Avg	2.8	2.8	2.6	2	1.8	-	0.6	-	-	-	-	2.2	2.8	3

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21EI8304	Artificial Intelligence and Machine Learning	3	0	0	3

Course Objective	1. learn the basics of Artificial Intelligent systems 2. Describe about knowledge representations in AI. 3. Educate on AI inferences. 4. Understand on Machine Learning 5. Know the application areas of AI & ML.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO ARTIFICIAL INTELLIGENCE** Introduction to AI-Problem formulation, Problem Definition -Production systems, Control strategies, Search strategies. Problem characteristics - Problem solving methods - Problem graphs, Matching, Indexing and Heuristic functions –Hill Climbing-Depth first and Breath first, Constraints satisfaction - Related algorithms, Measure of performance and analysis of search algorithms.	9
II	**REPRESENTATION OF KNOWLEDGE** Game playing - Knowledge representation, Knowledge representation using Predicate logic, Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic- Structured representation of knowledge.	9
III	**KNOWLEDGE INFERENCE** Knowledge representation -Production based system, Frame based system. Inference – Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning - Certainty factors, Bayesian Theory-Bayesian Network-Dempster - Shafer theory.	9
IV	**INTRODUCTION TO MACHINE LEARNING** Machine Learning–Types –Machine learning process- preliminaries, testing Machine Learning algorithms, turning data into Probabilities, and Statistics for Machine Learning- Probability theory – Probability Distributions – Supervised and Unsupervised learning - Decision Tree Learning – Bayesian Learning - Clustering- K-means - Components Analysis.	9
V	**APPLICATIONS OF AI AND ML** AI applications: Language models – natural language processing – information retrieval – Speech Translation – Robot path planning and moving. ML Applications: Speech recognition – Product recommendations - Virtual Assistants – Self driving cars.	9
	Total Instructional Hours	**45**

Course Outcome	CO1: Identify problems that are amenable to solution by AI methods CO2: Identify appropriate AI methods to solve a given problem. CO3 :Formalize a given problem in the language/framework of different AI methods. CO4 :Familiarize on machine learning methods. CO5 :Apply the AI & ML algorithms to a real-world problems.

TEXT BOOKS:

T1 - Kevin Night and Elaine Rich, Nair B., "Artificial Intelligence (SIE)", Mc Graw Hill- 2008.
T2 - Ethem Alpaydin, "Introduction to Machine Learning", PHI learning Second Edition 2010.

REFERENCE BOOKS:

R1 - Stuart Russel and Peter Norvig "AI – A Modern Approach", 2nd Edition, Pearson Education 2007.
R2 - Deepak Khemani "Artificial Intelligence", Tata Mc Graw Hill Education 2013.
R3- Christopher M. Bishop, "Pattern Recognition and Machine Learning". Springer 2006.
R4 - Mitchell Tom, "Machine Learning", McGraw Hill, 1997.

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2. nptel.ac.in/courses/106/105/106105152

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	1	-	-	-	-	-	-	2	2	3
CO2	2	3	3	2	2	-	1	-	-	-	-	2	3	3
CO3	3	2	3	2	2	-	1	-	-	-	-	2	3	3
CO4	3	3	2	2	2	-	1	-	-	-	-	3	3	3
CO5	3	3	3	2	2	-	-	-	-	-	-	2	3	3
Avg	2.8	2.8	2.6	2	1.8	-	0.6	-	-	-	-	2.2	2.8	3

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21EI8305	Instrumentation and Control in Paper Industry	3	0	0	3

Course Objective	1. Categorize the process parameters involved in paper making. 2. Differentiate the properties of paper and its measurement methods. 3. Analyse methods for measurement of consistency. 4. Infer about the working and quality parameters of paper making machine. 5. Analyse various control aspects involved in paper production.

Unit	Description	Instructional Hours
I	**OVERVIEW OF PAPER MAKING PROCESS** Paper making process- Raw materials, Pulp separation, Screening, Bleaching, Cooking, Chemical reaction, Chippers, Types of digesters, H factor and Kappa factors, Stock preparation, Instrumentation needs, Energy conservation and paper quality control.	9
II	**PAPER PROPERTIES AND ITS MEASUREMENT** Physical, electrical, optical and chemical properties of paper - compressive test method-quality measurement method - optical testing-ultrasonic measurement - standards in testing.	9
III	**CONSISTENCY MEASUREMENT** Definition of consistency, Techniques for head box consistency measurement, Stock consistency measurement and control. Paper Making Machine: Functioning of Paper making machine- Quality parameters, Moisture, Basic weight, Caliper, Brightness, Color, Ash content, Strength, Gloss and tensile strength, Parameters monitoring Instrumentation.	9
IV	**WET END INSTRUMENTATION** Conventional measurements at wet end- Pressure, Vacuum, Temperature, Liquid density, Specific gravity, Level–flow consistency measurement – pH – ORP measurement, Freeness measurement. Dry End Instrumentation Conventional measurements: Moisture, Basis weight, Caliper, coat thickness, Optical variables, Measurement of length, Speed, Digester, Rotary, Batch type.	9
V	**PUMPS AND CONTROL VALVES** Flow box, Wet end variables, Evaporator feedback, Feed forward control, Lime mud density control, Stock proportioning system, Refiner control instrumentation, Basic pulper instrumentation, Head box, Rush/drag control, Instrumentation for size preparation, Coating preparation, Coating weight control, Batch digester, K/Kappa number control, Bleach plant chlorine stage control. Control Aspects: Machine and cross direction control technique, Consistency, Moisture and basic weight control, Dryer control, Computer based control systems, Mill wide control.	9
	Total Instructional Hours	45

Course Outcome	CO1: Apply the process learnt in real time application. CO2: Summarise various properties of paper and it's testing methods. CO3 : Demonstrate the consistency of paper through the learnt methodologies. CO4 : Appraise about the quality parameters associated in production of paper. CO5 : Point out the appropriate control technique involved in production of paper.

TEXT BOOKS:

T1 - B.G Liptak, "Instrumentation in Process Industries", Chilton Book Company, 2003

T2 - P.E.Sankaranarayanan, "Pulp and Paper Industries- Technology and Instrumentation", Kotharis Desk book Series, 1995.

REFERENCE BOOKS:

R1 - Britt K.W, "Handbook of Pulp and Paper Technology", Reinbold Company Second Edition, 2004.

R2 - James P.Casey , "Pulp and Paper Chemistry and Chemical Technology", John Wiley and sons, 1981.

R3- Randolph Norris Shreve and George, "Shreve's Chemical Process Industries", McGraw Hill, Singapore,1985.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	1	-	-	-	-	-	-	2	2	3
CO2	2	3	3	2	2	-	1	-	-	-	-	2	3	3
CO3	3	2	3	2	2	-	1	-	-	-	-	2	3	3
CO4	3	3	2	2	2	-	1	-	-	-	-	3	3	3
CO5	3	3	3	2	2	-	-	-	-	-	-	2	3	3
Avg	2.8	2.8	2.6	2	1.8	-	0.6	-	-	-	-	2.2	2.8	3

1-Low, 2-Medium, 3-High, "-" No correlation

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Professional Elective V

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21EI8181	Disaster Management	3	0	0	3

Course Objective

1. Interpret the basic knowledge of disaster management.
2. Discuss about the exposure of environmental disaster.
3. Create awareness about earthquake and Tsunami.
4. Express the cyclone management techniques.
5. Apply the technologies in disaster management..

Unit	Description	Instructional Hours
I	**INTRODUCTION** Disaster - Disaster management - Disaster prevention and preparedness measures - Types of Disaster Causal factor of Disaster - Natural, Manmade and creeping disaster - Disaster in the Indian context- various measures - Disaster related policy goals - United Nations Development Program (UNDP) - United Nations Disaster Relief Organization (UNDRO) - Govt. of India.	9
II	**ENVIRONMENTAL DISASTER** Environmental hazards - Typolcgy - Assessment and response - the strategies - the scale of disaster - Vulnerability - Disaster trends - Paradigms towards a balanced view - Chemical hazards and Toxicology - Biological hazards - Hazard caused by world climate change - Risk analysis - other technological disasters.	9
III	**EARTHQUAKE AND TSUNAMI** Earthquake - Causes of earthquake - Earthquake scales - Measures of earth quake - Magnitude and Intensity - Seismic zone - Earthquake disaster mitigation - Forecasting techniques and Risk analysis – Tsunami - Causes of Tsunami - Effects of Tsunami - Tsunami warning system in India - International status of Tsunami warning and communication system - Tsunami warning centers - Pacific Tsunami Warning Center (PTWC) - Institutional arrangements and design criteria for Tsunami mitigation.	9
IV	**CYCLONE** Tropical cyclone - Warning system - Protection of buildings from cyclones - Precaution before and during cyclones - Tropical cyclone warning strategy in India - Cyclone related problems - Aerial survey - Management strategy - risk reduction by public awareness and education.	9
V	**APPLICATION OF TECHNOLOGY IN DIASTER MANAGEMENT** Hazard map - Multi hazard mapping - Application of satellites in Disaster Management - Application of remote sensing in forecasting and disaster relief - Use of digital image processing in disaster management - GIS in disaster management - Spatial data - GIS data base design - Convention mapping concepts and Coordinate system - Methods of spatial Interpolation in GIS.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Associate the basic concepts of disaster management in real life
CO2: Summarize the vulnerability of environmental disaster
CO3: Determine the measures to be taken during environmental disaster
CO4: Predict the consequences of cyclones
CO5: Innovate the technology in disaster management

TEXT BOOKS:

T1 - Pardeep Sahni, Madhavi malalgoda and Ariyabandu, "Disaster Risk Reduction in South Asia", Prentice Hall of India 2003.
T2 - Amita Sinhal, "Understanding Earthquake Disasters", Tata McGraw-Hill, 2010.

REFERENCE BOOKS:

R1 -Pardeep Sahni, Alka Dhameja and Uma medury, "Disaster Mitigation: Experiences and Reflections", Prentice Hall of India ,2004.
R2 - Jeff Groman, "The Atlas of Natural Disasters", Michael Friedman Publication, 2002.
R3 -Jaikrishna & Chandrasekar, "Elements of Earthquake Engineering", South Asian Publishers Pvt ltd, 2000.

WEB REFERENCE :

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Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	-	3	3	-	-	-	-	2	2	3
CO2	2	3	2	2	-	3	3	-	-	-	-	2	3	3
CO3	3	2	3	2	-	2	2	-	-	-	-	2	3	3
CO4	3	3	2	2	-	3	3	-	-	-	-	3	3	3
CO5	3	3	3	2	-	3	3	-	-	-	-	2	3	3
Avg	2.8	2.8	2.4	2	-	2.8	2.8	-	-	-	-	2.2	2.8	3

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21EI8182	Total Quality Management	3	0	0	3

Course Objective

1. Infer the basic concepts of quality management.
2. Interpret the concepts of TQM principles.
3. Interpret the various statistical process control charts
4. Categorize various tools for quality improvement.
5. Interpret the concept of Quality Management Systems and recognize the need for ISO 9000 and ISO 14000 Quality Systems

Unit	Description	Instructional Hours
I	**INTRODUCTION TO QUALITY MANAGEMENT** Definitions - TOM Framework, Benefits, Awareness and Obstacles. Quality - Vision, Mission and Policy Statements. Customer Focus - Customer Perception of Quality, Translating needs into requirements, Customer Retention. Dimensions of Product and Service Quality. Cost of Quality.	9
II	**TQM PRINCIPLES** Leadership - Strategic quality planning, Quality Councils -Employee involvement - Motivation, Empowerment, Team and Teamwork, Quality circles, Recognition and Reward, Performance Appraisal - Continuous Process Improvement – PDCA cycle, 5S, Kaizen - Supplier Partnership - Partnering, Supplier Selection, Supplier Rating.	9
III	**TQM TOOLS AND TECHNIQUES I** Seven Traditional Tools of Quality - New Management Tools - Six Sigma: Concepts, Methodology, Applications to Manufacturing, Service Sector including IT - Bench Marking - Reason to Bench Mark, Bench Marking Process - FMEA - Stages, Types.	9
IV	**TQM TOOLS AND TECHNIQUES II** Control Charts- Process Capability- Concepts of Six Sigma - Quality Function Development (QFD) - Taguchi Quality Loss Function – TPM - Concepts, Improvement Needs - Performance Measures.	9
V	**QUALITY SYSTEMS ORGANIZING AND IMPLEMENTATION** Introduction to IS/ISO 9004:2000 – Quality Management Systems – Guidelines for Performance Improvements. Quality Audits. TQM Culture, Leadership – Quality Council, Employee Involvement, Motivation, Empowerment, Recognition and Reward- Introduction to Software Quality.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Conceptualize and imbibe the different TQM principles.
CO2: Recall various quality concepts like employee involvement and performance measurements
CO3: Apply the various statistical process control charts to improve the quality of the product.
CO4: Apply various tools like QFD and FMEA for quality improvement.
CO5: Apply the concept of Quality Management Systems

TEXT BOOKS:

T1 - Dale H. Besterfiled, et at., "Total Quality Management", Pearson Education Asia, 3rd Edition, Reprint 2006.
T2 - Shridhara Bhat K, "Total Quality Management – Text and Cases", Himalaya Publishing, 2002.

REFERENCE BOOKS:

R1 - James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, First Indian Edition,Cengage Learning, 2012.
R2 - Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.
R3 -Janakiraman. B and Gopal .R.K., "Total Quality Management – Text and Cases", PHI Ltd., 2006.

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2. https://nptel.ac.in/courses/110/104/110104080/

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	-	3	3	-	-	-	-	2	2	3
CO2	2	3	2	2	-	3	3	-	-	-	-	2	3	3
CO3	3	2	3	2	-	2	2	-	-	-	-	2	3	3
CO4	3	3	2	2	-	2	3	-	-	-	-	3	3	3
CO5	3	3	3	2	-	3	3	-	-	-	-	2	3	3
Avg	2.8	2.8	2.4	2	-	2.6	2.8	-	-	-	-	2.2	2.8	3

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21EI8183	Professional Ethics for Engineers	3	0	0	3

Course Objective

1. Infer the essentials of engineering ethics.
2. Interpret the rudiments of engineers as social experimentation.
3. Speculate the responsibilities of engineers for safety.
4. Create awareness on social responsibilities and rights.
5. Outline the global issues in environment.

Unit	Description	Instructional Hours
I	**ENGINEERING ETHICS** Senses of Engineering Ethics - Variety of moral issues - Types of inquiry - Moral dilemmas - Moral Autonomy - Kohlberg's theory - Gilligan's theory - Consensus and Controversy - Professions and Professionalism - Professional ideals and virtues - Use of ethical theories.	9
II	**ENGINEERING AS SOCIAL EXPERIMENTATION** Engineering as experimentation - Engineers as responsible experimenters - Research ethics - Codes of ethics - Industrial Standards - Case Study of Space Shuttle Challenger Disaster.	9
III	**ENGINEERS' RESPONSIBILITY FOR SAFETY** Safety and risk - Assessment of safety and risk - Risk Benefit Analysis - Reducing risk - Case Studies: Chernobyl and Bhopal Disaster.	9
IV	**RESPONSIBILITIES AND RIGHTS** Collegiality and Loyalty - Respect for Authority –Collective Bargaining- Confidentiality - Conflicts of Interest - Occupational Crime - Professional Rights - Employee Rights - Intellectual Property Rights (IPR) - Discrimination.	9
V	**GLOBAL ISSUES** Multinational Corporations - Business Ethics - Environmental Ethics -Computer Ethics -Weapons Development- Engineers as Managers - Consulting Engineers - Engineers as Expert Witnesses and Advisors - Honesty - Moral Leadership - Sample code of conduct.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Practice engineering ethics and human values for a moral life.
CO2: Develop the codes of conduct for engineers in the society.
CO3: Experiment the safety measures as a responsible engineer.
CO4: Interpret the responsibilities, professional rights and moralities for enhancement of an organization.
CO5: Validate the broad range of contemporary global issues.

TEXT BOOKS:

T1 - Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York, 2013.
T2 - Charles D Fleddermann, "Engineering Ethics", Prentice Hall of India, 2004.

REFERENCE BOOKS:

R1 - Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics – Concepts and Cases", Cengage Learning, 2009.
R2 - John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi,2003.
R3 -Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.
R4 - Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	-	3	3	3	-	-	-	2	2	3
CO2	2	3	2	2	-	3	3	3	-	-	-	2	3	2
CO3	3	2	3	2	-	2	2	2	-	-	-	2	3	2
CO4	3	3	2	2	-	3	3	3	-	-	-	3	3	3
CO5	3	3	3	2	-	3	3	3	-	-	-	2	3	2
Avg	2.8	2.8	2.4	2	-	2.8	2.8	2.8	-	-	-	2.2	2.8	2.2

1-Low, 2-Medium, 3-High, "-" No correlation

Chairman - BoS
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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	**21EI8184**	**Principles of Management**	**3**	**0**	**0**	**3**

Course Objective	
	1. Learn the basic functions of management in an organization 2. Study the importance of planning and also the different types of plans. 3. Understand the different types of organization structure in management 4. Know the basis and importance of directing and controlling in management 5. Understand to the importance of corporate governance and social issues.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO MANAGEMENT CONTEXT** Management definition – Science or Art – Manager versus Entrepreneur – types of managers – managerial roles and skills – Evolution of Management – Scientific, human relations , system and contingency approaches – Types of Business organization – Sole proprietorship, partnership, company-public and private sector enterprises – Organization culture and Environment – Current trends and issues in Management.	9
II	**PLANNING** Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making - steps and process.	9
III	**ORGANISING** Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design – Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management.	9
IV	**DIRECTING** Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication – communication and IT.	9
V	**CONTROLLING AND ISSUES IN MANAGEMENT** System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – Direct And Preventive Control – Reporting. Contemporary Issues In Management: Corporate Governance Social responsibilities – Ethics in business – Recent issues.	9
	Total Instructional Hours	**45**

Course Outcome	
	CO1: Describe the concepts of management, administration and the evolution of management thoughts. CO2: Understand and apply the planning concepts. CO3: Explain the different organizational structures and understand the staffing process. CO4: Analyze the various motivational and leadership theories and controlling processes. CO5: Understand and analyze the various Contemporary Issues in Management.

TEXT BOOKS:

T1-Stephen P. Robbins and Mary Coulter, "Management", Prentice Hall of India, 8th edition. 2012

T2-Harold Koontz & Heinz Weihrich "Essentials of management" Tata Mc Graw Hill, 1998.

.REFERENCE BOOKS:

R1 - Charles W L Hill, Steven L McShane, "Principles of Management", Mcgraw Hill Education, Special Indian Edition, 2007

R2 - Tripathy PC & Reddy PN, "Principles of Management", Tata McGraw Hill, 1999.

R3 - JAF Stoner, Freeman R.E and Daniel R Gilbert "Management", 6th Edition, Pearson Education, 2004.

R4 -Robert Kreitner & Mamata Mohapatra, "Management", Biztantra, 2008.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	-	3	3	1	-	-	-	2	2	3
CO2	2	3	2	2	-	3	3	1	-	-	-	2	2	2
CO3	3	2	3	2	-	2	2	1	-	-	-	2	2	2
CO4	3	3	2	2	-	3	3	1	-	-	-	3	3	3
CO5	3	3	3	2	-	3	3	1	-	-	-	2	3	2
Avg	2.8	2.8	2.4	2	-	2.8	2.8	1	-	-	-	2.2	2.4	2.2

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21EI8185	Patent, Copyright and Competition Law	3	0	0	3

Course Objectives	1. Outline the basic concepts of Intellectual Property Rights and Laws 2. Illustrate the Patent registration aspects 3. Classify the agreements and legislations and copyrights 4. Illustrate the innovations in Intellectual Property Rights 5. Interpret various competition Law

Unit	Description	Instructional Hours
I	**INTRODUCTION** Introduction to IPRs, Basic concepts and need for Intellectual Property – Patents, Copyrights, Geographical Indications, IPR in India and Abroad – Genesis and Development – the way from WTO to WIPO –TRIPS, Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.	9
II	**PATENTS AND REGISTRATION** Elements of Patents, Research exemption Introduction to Patents - Concepts, Novelty, Utility - Patent Act 1970 - Patentable subject matter, Patentability criteria, non-patentable inventions - Software Patents - Rights of patentee - Working of Patents, Compulsory License Acquisition, Surrender, Revocation, restoration Transfer of patent rights.	9
III	**AGREEMENTS, LEGISLATIONS AND COPYRIGHT** International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Design Act, Trademark Act, Geographical Indication Act. Copyright and Neighboring - Rights Concept and Principle - Berne Convention, Universal Copyright Convention, Copyright Act 1957 - Copyright Registrar -Procedure Copyright Societies, Ownership, Assignment, License, Translation of Copyright.	9
IV	**DIGITAL PRODUCTS AND LAW** Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and Digital Content Protection – Unfair Competition – Meaning and Relationship between Unfair Competition and IP Laws – Case Studies.	9
V	**COMPETITION LAW** Introduction to competition Law- Indian Competition Act and IPR protection - Anticompetitive agreement and abuse of dominance in IPR protection- relationship and Interaction between IPR and competition law - IPR issues in merger and acquisition; Harmonization of IP protection and competition Law in India.	9
	Total Instructional Hours	**45**

Course Outcome	CO1: Explain basic concepts of Intellectual Property Rights. CO2: Apply the patent registration aspects. CO3: Summarize the agreements and legislations and Copyrights. CO4: Understand the innovations in Intellectual Property Rights CO5: Infer the various competition enforcement laws and its issues

TEXT BOOKS:

T1 - V. Scople Vinod, "Managing Intellectual Property", Prentice Hall of India, Second edition, 2012.

T2 - S. V. Satakar, "Intellectual Property Rights and Copy Rights", Ess Ess Publications,2nd edition,2014

REFERENCE BOOKS:

R1 -Deborah E. Bouchoux, "Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets",Cengage Learning, Third Edition, 2012.

R2 - H. K. Saharay , "Competition Law" Universal law publishinh, second edition 2016.

R3 - K.Bansal& P.Bansal ,"Fundamentals ofIP for Engineers" - Cengage learning 2012.

WEB REFERENCES:

1. https://nptel.ac.in/courses/110/105/110105139/
2. https://nptel.ac.in/courses/109/106/109106137/

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	1	-	-	-	-	-	-	2	2	2
CO2	2	3	3	2	2	-	1	-	-	-	-	2	2	2
CO3	3	2	3	2	2	-	1	-	-	-	-	2	2	2
CO4	3	3	2	2	2	-	1	-	-	-	-	3	2	2
CO5	3	3	3	2	2	-	-	-	-	-	-	3	2	2
Avg	2.8	2.8	2.6	2	1.8	-	0.6	-	-	-	-	2.4	2	2

1-Low, 2-Medium, 3-High, "-" No correlation

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SYLLABUS – MINOR DEGREE –SEMESTER VIII

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	**21EI8601**	**Industrial Automation**	3	0	0	3

Course Objective	1. Provide an overview on industrial automation 2. Paraphrase the Programmable Logic Controller hardware and operation 3. Interpret on the basic PLC Programming 4. Explain on Distributed Control Systems and SCADA 5. Understand on the Internet of Things

Unit	Description	Instructional Hours
I	**INTRODUCTION TO INDUSTRIAL AUTOMATION** Automation - Industrial Automation vs. Industrial Information Technology - Role of automation in industry - Types of production systems - Types of Automation Systems - The Functional Elements of Industrial Automation - Industrial Sensors and Instrument Systems - Role of computers in measurement and control.	9
II	**PROGRAMMABLE LOGIC CONTROLLER(PLC) AN OVERVIEW** Parts of a PLC -Principle of operation. PLC Hardware Components: Discrete I/O Modules- Analog I/O modules – The Central Processing Unit (CPU) – Programming Terminal Devices. Converting Relay Schematics into PLC Ladder Programs.	9
III	**PLC PROGRAMMING** Programming Timers: Timer Instructions - On-Delay Timer Instruction - Off-Delay Timer Instruction - Retentive Timer. Programming Counters: Counter Instructions – Up-Counter – Down - Program Control Instructions: Master Control Reset Instruction - Subroutine Functions - Data Manipulation Instructions: Data Compare Instructions - Math Instructions	9
IV	**DISTRIBUTED CONTROL SYSTEMS AND SCADA** Evolution of Distributed Control Systems: Emergence of the Distributed Control System architecture. Local control unit architecture: Basic elements of a microprocessor based controller – Introduction and architecture of SCADA.	9
V	**INTERNET OF THINGS - AN OVERVIEW** Introduction - Internet of Things Definition Evaluation – IOT Architectures – IOT Data Management and Analytics – Communication Protocols - Internet of Things Applications – Security – Identity Management and Authentication – Privacy – Standardization and Regulatory Limitations	9
	Total Instructional Hours	**45**

Course Outcome	CO1 Explain the concepts about basics of automation system CO2 Develop programming with PLC CO3 Analyze theory of operation in advanced PLC and SCADA CO4 Interpret the architectural interfaces and operation about DCS CO5 Illustrate the advanced technologies, opportunities, challenges to bring out industry 4.0

TEXT BOOKS:

T1 - Frank D. Petruzella, "Programmable Logic Controllers", 5th Edition, Tata McGraw Hill Education Private Limited, India, 2019.

T2 - Rajkumar Buyya & Amir Vahid Dastjerdi, "Internet of Things Principles and Paradigms", 1st Edition, Morgan Kaufmann (Imprint of Elsevier), USA, 2016.

REFERENCE BOOKS:

R1 - Michael P.Lukas, "Distributed Control System", Van Nostrand Reinhold Co., Canada 1986.

R2 - John W.Webb, Ronald A.Reis. "Programmable Logic Controllers: Principles and Applications", 5th Edition, PHI Learning Pvt. Ltd., New Delhi, 2013.

R3 - Stuart A. Boyer, "SCADA: Supervisory Control and Data Acquisition", 4th Edition, ISA Press, USA, 2009.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	3	1	-	-	-	-	-	-	2	3	3
CO2	3	3	3	3	1	-	-	-	-	-	-	2	2	3
CO3	3	3	3	3	1	-	-	-	-	-	-	2	3	2
CO4	3	3	3	3	1	-	-	-	-	-	-	2	3	3
CO5	2	3	3	2	1	-	-	-	-	-	-	2	3	3
Avg	2.8	3	3	2.8	1	-	-	-	-	-	-	2	2.8	2.8

1-Low, 2-Medium, 3-High, "-" No correlation

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SYLLABUS – HONOUR DEGREE –SEMESTER VIII

Programme	Course Code	Name of the Course	L	T	P	C
B.E	21EI8201	Smart Instrumentation	3	0	0	3

Course Objective

1. Understand the fundamentals of smart instrumentation.
2. Categorize various types of smart sensors and their technologies.
3. Interpret the architecture of virtual instruments.
4. Understand the principles of interfacing instruments with computers.
5. Explore the applications of smart instruments in industrial applications.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO SMART INSTRUMENTATION** Instrumentation system overview - Key components of smart instrumentation - Smart Sensors, Actuators, Microcontrollers and Embedded systems- Smart Instrumentation Features - Components - Block Diagram - Industry standards	9
II	**SMART SENSORS** Sensor Classification-Thermal sensors -Humidity sensors -Capacitive Sensors-Planar Inter digital Sensors- Planar Electromagnetic Sensors-Light Sensing Technology-Moisture Sensing Technology-Carbon Dioxide (CO_2) sensing technology-Sensors Parameters	9
III	**VIRTUAL INSTRUMENTATION** Architecture of Virtual instrument and its relation to operating system. Software overview: LABVIEW, Graphical User Interface (GUI), Control and indicators: G programming- Data type, Data flow programming editing and running a virtual instrument.	9
IV	**INTERFACING INSTRUMENTS AND COMPUTERS** Interfacing: Basic connections, issues- Address decoding - Data transfer control; A/D converter; D/A converter – sample and hold circuits- Other interface considerations – wireless transmitters, receives – implementation issues.	9
V	**APPLICATIONS OF SMART INSTRUMENTS** Smart Sensors for Industrial Automation - Integration of Smart Sensors in Autonomous Vehicles- Predictive Maintenance Using Smart Instrumentation- Automation in Smart Manufacturing with IoT Sensors - Intelligent Robotics for Industrial Automation - Smart Instrumentation in Renewable Energy Systems	9
	Total Instructional Hours	45

Course Outcome

CO1 : Design and analyze smart instrumentation systems
CO2 : Apply the appropriate smart sensor technologies for real-world applications.
CO3: Design, program, and operate virtual instruments using LabVIEW for real-time data.
CO4: Design and implement interfacing solutions.
CO5: Implement and integrate smart instrumentation technologies

TEXT BOOKS:

T1 - Subhas Chandra Mukhopadhyay, Smart Sensors, Measurement and Instrumentation, Springer Heidelberg, New York, Dordrecht London, 2013.
T2 -UvaisQidwai, "Smart Instrumentation: A data flow approach to Interfacing", Chapman & Hall, 1st Edition, 2013.

REFERENCE BOOKS :

R1 - Barney G.C.V., Intelligent Instrumentation: Prentice Hall of India Pvt. Ltd., New Delhi, 1988.
R2 - Jovitha Jerome, Virtual Instrumentation Using LabVIEW, PHI Learning, 2nd Edition, 2016.
R3 – Kevin James," PC interfacing and data acquisition", Newnes publications Ltd., 2000

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	1	-	-	1	-	-	-	2	2	3
CO2	3	3	3	2	2	-	-	1	-	-	-	3	3	3
CO3	3	2	3	2	2	-	-	1	-	-	-	2	3	3
CO4	3	3	2	2	2	-	-	1	-	-	-	3	3	3
CO5	3	3	3	2	2	-	-	1	-	-	-	3	3	3
Avg	3	2.8	2.6	2	1.8	-	-	1	-	-	-	2.8	2.8	3

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21EI8202	Industry Safety and Hazard Management	3	0	0	3

Course Objective	
	1. Educate on Engineering Safety. 2. Enumerate about industrial accident investigation. 3. Illustrate on safety performance analysis. 4. Assess the potential hazards and risks. 5. Identify the thermal and mechanical hazards.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO SAFETY ENGINEERING** Evolution of modern safety concept – Need for safety - Introduction to Safety systems Engineering(SSE) - safety standards – types - safety audit – reason, benefits ,audit programs – safety performance monitoring; Important Acts: factories act 1948, Environment act 1986; Safety in industries : machine guarding, welding process, cold and hot working process and its hazards.	9
II	**ACCIDENT INVESTIGATION** Cause of Accidents in industries – Learning from accidents - Accident ratio - reportable and non reportable accidents, Accident recall – methods, recall aids - NEMIRR systems – benefits - Supervisory role - Overall accident investigation process –Major Disasters: The Bhopal disaster 1984 - The Flixborough disaster 1974 – HAZOP(Qualitative treatment only).	9
III	**SAFETY PERFORMANCE ANALYSIS, TRAINING** Safety performance monitoring – roles – performance and review, evaluation – Recordkeeping, inspection of records, maintenance –Incident rate, accident rate - Fatal Accident rate (FAR) –Safety training – Personal protective equipment (PPE), types - "In-situ" safety training – Brainstorming - motivation, communication.	9
IV	**HAZARD, RISK ISSUES AND HAZARD ASSESSMENT** Introduction, hazard, hazard monitoring-risk issue - Hazard assessment, procedure, methodology; safety audit, checklist analysis, what-if analysis, safety review, preliminary hazard analysis (PHA), hazard operability studies (HAZOP).	9
V	**THERMAL AND MECHANICAL HAZARD ASSESSMENT** Applications of Advanced Equipment's and Instruments, Thermo Calorimetry, Differential Scanning Calorimeter (DSC), Thermo Gravimetric Analyzer (TGA), Accelerated Rate Calorimeter (ARC), Principles of operations, Controlling parameters, Applications-Explosive Testing, Deflagration Test, Minimum ignition energy Test, Sensitiveness Test, Impact Sensitiveness Test (BAM) and Friction Sensitiveness Test (BAM).	9
	Total Instructional Hours	**45**

Course Outcome	
	CO1: Explain the concepts of Engineering Safety and its acts. CO2: Appraise the accident investigation strategies for an industry. CO3: Summarize the various Safety performance monitoring and apply them. CO4: Understand the basics of hazards and classification of the its assessment CO5: Illustrate various advanced equipment for thermal and mechanical hazard assessment.

TEXT BOOKS:

T1 - R.K Jain, "Industrial Safety, Health and Environment management systems", Khanna Publications 2000.

T2 -Dan Petersen, "Techniques of Safety Management: A System Approach". American Society of Safety Engineers, USA.2003

REFERENCE BOOKS:

R1 - Danuta Koradecka, Hand book of "Occupational Safety and Health", CRC Press. 2010

R2 - John Ridley & John Channing, "Safety at Work" Routledge, 7th Edition.2008

R3 - The manufacture, storage and import of hazardous chemical rules 1989, Madras Book Agency, Chennai.

R4 - The Factories Act 1948, Madras Book Agency, Chennai, 2000.

WEB RESOURCES:

https://onlinecourses.nptel.ac.in/noc20_mg43/preview

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	1	-	1	-	-	-	-	2	2	3
CO2	3	3	3	2	2	-	1	-	-	-	-	2	3	3
CO3	3	2	3	2	2	-	1	-	-	-	-	2	3	2
CO4	2	3	2	2	2	-	1	-	-	-	-	3	2	3
CO5	3	3	3	2	2	-	1	-	-	-	-	2	3	3
Avg	2.8	2.8	2.6	2	1.8	-	1	-	-	-	-	2.2	2.6	2.8

1-Low, 2-Medium, 3-High, "-" No correlation

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Programme	Course Code	Name of the Course	L	T	P	C
B.E	21EI8203	Technological Trends in Automation	3	0	0	3

Course Objective

1. Understand the basics of smart manufacturing systems.
2. Acquire knowledge about AI techniques in Industrial automation.
3. Learn the basics of cyber security systems.
4. Impart knowledge on DCS and its various architectures.
5. Introduce the concept of Industry 4.0 and its technologies.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO SMART MANUFACTURING** Industrial Automation Trends, Approaches and Issues-. Automation in Production System- Role of sensors in manufacturing automation- Principles and Strategies of Automation - Basic Elements of an Automated System- Advanced Automation Functions- Levels of Automations- Production Economics –LEAN manufacturing – RPA – Additive manufacturing.	9
II	**AI IN INDUSTRIAL AUTOMATION** Introduction to Artificial Intelligence – concepts - Foundations of AI- History of AI- Intelligent agents: Agents and Environment- Reactive agent- deliberative- goal driven- utility driven and learning agents – Applications of Industrial AI in Monitoring, optimization and control.AI applications in Industry Automation.	9
III	**CYBER SECURITY IN INDUSTRIAL AUTOMATION** Industrial Automation Security- basics – Protocols, TCP/IP and OPC model - Information System Security Technology- Types and classes of attack, Policies, Standards, Guidelines, Risk management- Introduction to Cyber Physical Systems (CPS), Architecture of CPS- Components, Data science and technology for CPS, Emerging applications of CPS in different fields.	9
IV	**DCS IN INDUSTRIES** Introduction to computer based Industrial automation- Direct Digital Control (DDC), Distributed Control System (DCS) – DCS: Various Architectures-Local Control Unit (LCU) architecture, Interfaces in DCS-Process Interfacing Issues, Overview of different LCU security design approaches, Networking and communication with DCS.	9
V	**INDUSTRY 4.0** Evolution of technologies in industries, Introduction to Industry 4.0, Challenges in industry 4.0, Impact of Industry 4.0, Introduction to Internet of Things (IoT)-basic elements and its applications, Industrial IOT-basic elements-Smart supply chain and Case studies: Oil, chemical and pharmaceutical industry, Applications of UAVs in Industries.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Interpret the various levels of smart automation systems.
CO2: Apply AI techniques for manufacturing.
CO3: Understand the various cyber security models and its issues in automation.
CO4: Develop the DCS model for industrial applications.
CO5: Implement IoT for smart manufacturing for the need of Industry 4.0.

TEXT BOOKS:

T1 - M. P. Grover "Automation, Production Systems and Computer-Integrated Manufacturing" Pearson Education, 4th Edition, 2016.
T2 - Ronald L. Krutz, "Industrial Automation and Control System Security Principles: Protecting the Critical Infrastructure", 2nd Edition, International Society of Automation, 2017
T3 - Rich and Knight, "Artificial Intelligence", 3rd Edition, Tata McGraw Hill, 2014.

REFERENCE BOOKS:

R1 - D. Patranabis, "Principles of Industrial Instrumentation", Tata McGraw Hill Ltd.,1996.
R2 - Christoph Jan Bartodziej, "The Concept Industry 4.0 – An Empirical Analysis of Technologies and Application in Production Logistics", Spinger Gabler, 2015

R3 - Bahga and V. Madisetti, Internet of Things, A hands-on approach, Create Space Independent Publishing Platform, 1st edition, 2014
R4- Lukas M.P, " Distributed Control Systems", Van Nostrand Reinhold Co., New York, 1986.

Mapping of COs with POs and PSOs

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	3	1	-	-	-	-	-	-	2	3	3
CO2	3	3	3	3	1	-	-	-	-	-	-	2	2	3
CO3	3	3	3	3	1	-	-	-	-	-	-	2	3	2
CO4	3	3	3	3	1	-	-	-	-	-	-	2	3	3
CO5	2	3	3	2	1	-	-	-	-	-	-	2	3	3
Avg	2.8	3	3	2.8	1	-	-	-	-	-	-	2	2.8	2.8

1-Low, 2-Medium, 3-High, "-" No correlation

Chairman - BoS
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VALUE ADDED COURSES - SYLLABUS

Programme	Course Code	Name of the Course
B.E	22EIVAC04	INDUSTRIAL AUTOMATION WITH PLC, SCADA AND HMI

Course Objective: Students will be able to

1. Acquire strong knowledge on PLC , SCADA and HMI fundamentals.
2. Learn the hardware wiring methodologies.
3. Understand the SCADA systems and its programming.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO AUTOMATION AND PLC** Scope of Automation – Applications - Automation Components - Basics of wiring - Relay working - Relay logics - Applications examples of Relay.	35
II	**PROGRAMMABLE LOGIC CONTROLLER** PLC Introduction - Features, Architecture - Classification, Scan cycle - Programming Devices ing Languages - Diagram Based Languages - Coding Based Languages.	
III	**PLC PROGRAMMING** Ladder Diagram - Basics of Ladder Programming - Logical & Sequential Function - Timer Function - Counter Function - Arithmetic and Comparison Function – PLC programming practical.	
IV	**INTRODUCTION TO SCADA AND DESIGNING** SCADA Introduction - Application of SCADA - Basics of SCADA Designing - Toggle Switch & Push Button.	
V	**SCADA DESIGNING PRACTICAL** Indicator - Value Display - Value Entry - Increment & Decrement Animation - Trend View & Security.	

Course Outcome: At the end Students will be able to

1. Write PLC programming for various industrial logic and case studies.
2. Carryout the PLC hardware wiring and Relays.
3. Design SCADA modeling for an industrial application.

Reference Books:

1. Frank D. Petruzella, "Programmable Logic Controllers", 5th Edition, Tata McGraw Hill Education Private Limited, India, 2019.
2. John W.Webb, Ronald A.Reis. "Programmable Logic Controllers: Principles and Applications", 5th Edition, PHI Learning Pvt. Ltd., New Delhi, 2013.
3. Stuart A. Boyer, "SCADA: Supervisory Control and Data Acquisition", 4th Edition, ISA Press, USA, 2009.

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Programme	Course Code	Name of the Course
B.E	22EIVAC05	EMBEDDED WITH IoT

Course Objective: Students will be able to

1. Understand the concepts of Embedded controllers with IoT
2. Learn ARDUINO programming.
3. Establish OS communication with sensors.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO EMBEDDED SYSTEMS AND IOT** Overview of Embedded Systems and IoT - Importance and applications of IoT- Components of IoT: Sensors- Actuators- Microcontrollers- Communication Modules Scope of Automation – Applications - Automation Components - Basics of wiring - Relay working - Relay logics - Applications examples of Relay.	35
II	**ARDUINO PROGRAMMING** Introduction to Arduino- Types and Features - Setting up the Arduino IDE - Basic Programming with Arduino: Digital and Analog I/O- Hands-on: LED Blinking, Reading Analog Sensors (Potentiometer)	
III	**MICROCONTROLLERS AND SENSORS** Arduino Advanced Programming - Interfacing Digital Sensors: Ultrasonic, PIR - Interfacing Analog Sensors: Temperature, Light- Serial Communication: UART, I2C, SPI - Hands-on: Sensor Data Acquisition and Display.	
IV	**INTRODUCTION TO RASPBERRY PI** Overview of Raspberry Pi: Models and Features - Setting up Raspbian OS - Basic Python Programming on Raspberry Pi - Hands-on: Controlling GPIO Pins with Python.	
V	**WIRELESS COMMUNICATION AND ESP32** Features of ESP32 - Setting up Arduino IDE for ESP32- Basic Programming with ESP32- Hands-on: Wi-Fi Connectivity and Simple Web Server - Overview of Wi-Fi, Bluetooth, and Zigbee - Implementing Wi-Fi with ESP32 - Hands-on: Sending Sensor Data to the Cloud using ESP32.	

Course Outcome: At the end Students will be able to

1. Develop embedded programming and design with ARDUINO.
2. Carryout the Interfacing with sensors and wiring.
3. Interpret the knowledge on wireless communication for an application.

Reference Books:

1. Michael J. Pont, "Embedded C", Pearson Education, 2007.
2. Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", CISCO Press, 2017.
3. Wayne Wolf, "Computers as Components: Principles of Embedded Computer System Design", Elsevier, 2006.

Chairman - BoS
EIE - HiCET

Dean (Academics)
HiCET