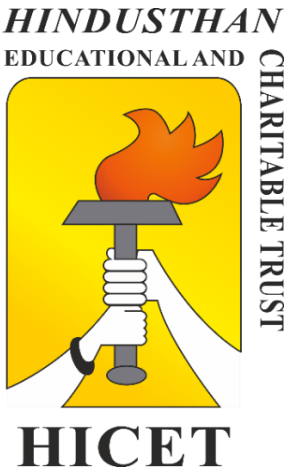
HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution Affiliated to Anna University, Chennai)

(Approved by AICTE, New Delhi, Accredited by NAAC with 'A'Grade)

Coimbatore - 641032.

B.E ELECTRONICS AND INSTRUMENTATION ENGINEERING



CHOICE BASED CREDIT SYSTEM

Revised Curriculum and Syllabus for the Even semester

Academic year 2023-24

(Academic Council Meeting Held on 19.06.2023)

REGULATIONS 2022

CURRICULUM
R2022

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)	AEC	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**	**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 -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
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**	**24**	**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	PCC15	2	0	2	3	4	50	50	100
PRACTICAL											
7.	22EI5001	Industrial Instrumentation Laboratory	PCC16	0	0	4	1.5	3	60	40	100
8.	22EE5002	Microprocessors and Microcontrollers Laboratory	PCC16	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**	**21**	**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
PRACTICAL											
6.	22EI6001	Process Control Laboratory	PCC	0	0	4	2	4	60	40	100
7.	22EI6002	Virtual Instrumentation and Data Acquisition Laboratory	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
8.	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			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	CATEGORY	PERIODS PERWEEK			TOTAL CONTACTPERIODS	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			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

S No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1.	22EI5231	Sem 5: Measurements and Measuring Instruments	MDC	3	0	0	3	3
2.	22EI6231	Sem 6: Transducer Engineering	MDC	3	0	0	3	3
3.	22EI6232	Sem 6: Industrial Instrumentation	MDC	3	0	0	3	3
4.	22EI7231	Sem 7: Industrial data Communication	MDC	3	0	0	3	3
5.	22EI7232	Sem 7: Powerplant Instrumentation	MDC	3	0	0	3	3
6.	22EI8231	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	22MB5231	Financial Management	MDC	3	0	0	3	3
2	22MB6231	Fundamentals of Investment	MDC	3	0	0	3	3
3	22MB6232	Banking, Financial Services and Insurance	MDC	3	0	0	3	3
4	22MB7231	Introduction to Blockchain and its Applications	MDC	3	0	0	3	3
5	22MB7232	Fintech Personal Finance and Payments	MDC	3	0	0	3	3
6	22MB8231	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	22MB5232	Foundations of Entrepreneurship	MDC	3	0	0	3	3
2	22MB6233	Team Building & Leadership Management for Business	MDC	3	0	0	3	3
3	22MB6234	Creativity & Innovation in Entrepreneurship	MDC	3	0	0	3	3
4	22MB7233	Principles of Marketing Management For Business	MDC	3	0	0	3	3
5	22MB7234	Human Resource Management for Entrepreneurs	MDC	3	0	0	3	3
6	22MB8232	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	22CE5232	Sustainable infrastructure Development	MDC	3	0	0	3	3
2	22AG6233	Sustainable Agriculture and Environmental Management	MDC	3	0	0	3	3
3	22BM6233	Sustainable Bio Materials	MDC	3	0	0	3	3
4	22ME7233	Materials for Energy Sustainability	MDC	3	0	0	3	3
5	22CE7233	Green Technology	MDC	3	0	0	3	3
6	22CE8232	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
22EIXXXX Internet of Things: Architecture, Protocols and Applications	22EIXXXX Instrumentation Practices in Industries	22EIXXXX Introduction to Sensor Technology & Instrumentation
22EIXXXX Principles of Sensors and Signal Conditioning	22EIXXXX Unit operation and control	22EIXXXX Drives and control system for Automation
22EIXXXX Embedded systems for IoT	22EIXXXX Adaptive control	22EIXXXX Applied Industrial Instrumentation

22EIXXXX Introduction to Wireless Sensor Networks & IoT Standards	22EIXXXX Advanced Process Control	22EIXXXX Building Automation
22EIXXXX Wireless Technologies for IoT	22EIXXXX Industry 4.0	22EIXXXX Machine vision system
22EIXXXX IoT for Industry Automation	22EIXXXX Advanced Instrumentation Techniques	22EIXXXX Industrial Internet of Things
22EIXXXX Optical sensors and photonics	22EIXXXX Industrial safety and Hazard Management	22EIXXXX SCADA systems and its applications
22EIXXXX Smart Instrumentation	22EIXXXX Intelligent Actuators and Mechatronics	22EIXXXX 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	22EIXXX	Internet of Things: Architecture, Protocols and Applications	PC	3	0	0	3	3
2	22EIXXX	Principles of Sensors and Signal Conditioning	PC	3	0	0	3	3
3	22EIXXX	Embedded systems for IoT	PC	3	0	0	3	3
4	22EIXXX	Introduction to Wireless Sensor Networks & IoT Standards	PC	3	0	0	3	3
5	22EIXXX	Wireless Technologies for IoT	PC	3	0	0	3	3
6	22EIXXX	IoT for Industry Automation	PC	3	0	0	3	3
7	22EIXXX	Optical sensors and photonics	PC	3	0	0	3	3
8	22EIXXX	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	22EIXXX	Instrumentation Practices in Industries	PC	3	0	0	3	3
2	22EIXXX	Unit operation and control	PC	3	0	0	3	3
3	22EIXXX	Adaptive control	PC	3	0	0	3	3
4	22EIXXX	Advanced Process Control	PC	3	0	0	3	3
5	22EIXXX	Industry 4.0	PC	3	0	0	3	3
6	22EIXXX	Advanced Instrumentation Techniques	PC	3	0	0	3	3
7	22EIXXX	Industrial safety and Hazard Management	PC	3	0	0	3	3
8	22EIXXX	Intelligent Actuators and Mechatronics	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	22EIXXX	Introduction to Sensor Technology & Instrumentation	PC	3	0	0	3	3
2	22EIXXX	Drives and control system for Automation	PC	3	0	0	3	3
3	22EIXXX	Applied Industrial Instrumentation	PC	3	0	0	3	3
4	22EIXXX	Building Automation	PC	3	0	0	3	3
5	22EIXXX	Machine vision system	PC	3	0	0	3	3
6	22EIXXX	Industrial Internet of Things	PC	3	0	0	3	3
7	22EIXXX	SCADA systems and its applications	PC	3	0	0	3	3
8	22EIXXX	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	MCC	√	√							
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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SYLLABUS

SEMESTER - I

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

The learner should be able to

Course Objective

1. Construct the characteristic polynomial of a matrix and use it to identify eigenvalues and Eigenvectors
2. Impart the knowledge of sequences and series.
3. Analyseanddiscussthemaximaandminimaofthefunctionsofseveralvariables.
4. Evaluate the multiple integrals and apply in solving problems.
5. Apply 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, Jacobian, Maxima, minima and saddle points; Method of Lagrange 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; 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: Compute partial derivatives of function of several variables and write Taylor's series for functions with two variables.

CO4: Evaluate multiple integral and its applications in finding area, volume.

CO5: Apply the concept of vector calculus in two and three dimensional spaces.

TEXTBOOKS:

T1:G.B.ThomasandR.L.Finney,"CalculusandAnalyticalGeometry",9thEditionAddisonWesleyPublishing Company,2016.

T2:ErwinKreyszig,"AdvancedEngineeringMathematics",JohnWiley&Sons,2019.

T3:K.P.UmaandS.Padma,"EngineeringMathematicsI(MatricesandCalculus) ",PearsonLtd,2022.

REFERENCEBOOKS:

R1-JerroldE.Marsden,AnthonyTromba,"VectorCalculus",W.H.Freeman,2003

R2-StraussM.J,G.L.BradleyandK.J.Smith,"Multivariablecalculus",PrenticeHall,2002.

R3-VeerarajanT,"EngineeringMathematics",McGrawHillEducation(India)PvtLtd,NewDelhi,2016.

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B.E./B.Tech/ I	22HE1151	ENGLISH FOR ENGINEERS (Common to all Branches)	L	T	P	C
			2	0	2	3

The student should be able

Course Objective

1. To improve the communicative proficiency of learners.
2. To help learners use language effectively in professional writing.
3. To advance the skills of maintaining the suitable one of communication.
4. To introduce the professional life skills.
5. To impart official communication etiquette.

Unit	Description	Instructional Hours
I	**Language Proficiency:** Types of Sentences, Functional Units, Framing question. **Writing:** process description, Writing Checklist.**Vocabulary –** words on environment. **Practical Component: Listening**- Watching short videos and answer the questions, **Speaking**- Self introduction ,formal & semi-formal**,Reading**- Purpose of Reading - Churning & Assimilation, Interpreting Ideas - Interpreting Graphs in Technical Writing.	7+2
II	**Language Proficiency**: Tenses, Adjectives and adverbs. **Writing:** Formal letters (letters conveying positive and negative news), Formal and informal email writing (using emoticons, abbreviations& acronyms), reading comprehension**. Vocabulary–** words on entertainment. **Practical Component: Listening**-Comprehensions based on TED talks**Speaking-** Narrating a short story or an event happened in their life **Reading -** Skimming – Scanning – Reading: Scientific Texts – Literary Texts .	7+2
III	**Language Proficiency:** Prepositions, phrasal verbs. **Writing:** Formal thanks giving, Congratulating, warning and apologizing letters, cloze test. **Vocabulary –** words on tools.**PracticalComponent:Listening**-Listen to songs and answer the questions**Speaking**-Justaminute**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, Prefixes & suffixes. **Writing:**Preparing agenda &minutes, writing an event report. **Vocabulary–** words on engineering process. **Practical Component: Listening**- Comprehensions based on Talk of orators or interview shows **Speaking**-Presentation on a general topic with ppt. **Reading**- Reading Comprehension - Techniques for Good Comprehension - - Sequencing of Sentences.	5+4
V	**Language Proficiency:** Modal Auxiliaries, Active & passive voice, **Writing:** Project report (proposal & progress) ,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:Tocommunicateinaprofessional forum

CO2:Tospeakorwriteacontentintheproficientlanguage

CO3: To maintain and use appropriate one of the communication.

CO4:To read ,write and present in a professional way.

CO5:To follow the etiquettes in formal communication.

TEXTBOOKS:

T1- Norman Whitby, "Business Benchmark-Pre-intermediate to Intermediate", Cambridge University Press,2016.T2- Raymond Murphy, "Essential English Grammar", Cambridge UniversityPress,2019.

REFERENCEBOOKS:

R1- Meenakshi Raman and Sangeetha Sharma. "Technical Communication- Principles and Practice", Oxford University Press, 2009.

R2-RaymondMurphy, "English GrammarinUse"-4theditionCambridgeUniversityPress,2004.

R3-KamaleshSadanan"AFoundationCoursefortheSpeakersofTamil-Part-I&II",Orient Blackswan,2010.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E/B.Tech	**22CY1151**	**Chemistry for Circuit Engineering (ECE, EEE, EIE, BME,CSE, IT, AIML)**	2	0	2	3

Course Objective

The learner should be able to

1. Acquire knowledge on the concepts of chemistry involved in day today life.
2. Identify the water related problems and water treatment techniques.
3. Enhance the fundamental knowledge on electrochemistry and the mechanism of corrosion and its control.
4. Gain knowledge on the nuclear energy source and batteries.
5. Extend the knowledge on the concepts of spectroscopy and its applications.

Unit	Description	Instructional Hours
I	**CHEMISTRY IN EVERYDAY LIFE** Chemicals in food – Food colors – Artificial sweeteners – Food preservatives. Soaps and Detergents – Soaps – Types of Soap – Detergents – Types of detergents. Drugs – Classification of drugs - Therapeutic Action of Different Classes of Drugs. Chemicals in Cosmetics – Creams – Talcum powders- Deodorants – Perfumes. Plastics – Thermoplastics- Preparation, properties and uses of PVC, Teflon and Thermosetting plastics - Preparation, properties and uses of Polyester and Polyurethane.	6
II	**WATER TECHNOLOGY** Impurities in Water, Hardness of Water, Boiler feed Water – Boiler troubles -Sludge and scale formation, Caustic embrittlement, priming and foaming, boiler corrosion- -Softening Methods (Zeolite & Ion-Exchange Methods)- Desalination of Brackish Water - Reverse Osmosis, Potable water and treatment. **Estimation of total, permanent and temporary 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
III	**ELECTROCHEMISTRY AND CORROSION** Electrochemical cells – reversible and irreversible cells - EMF- Single electrode potential – Nernst equation (derivation only) – Conductometric titrations. Chemical corrosion – Pilling – Bedworth rule – electrochemical corrosion – different types –galvanic corrosion – differential aeration corrosion – corrosion control – sacrificial anode and impressed cathodic current methods. **Conductometric titration of strong acid vs strong base (HClvsNaOH). Estimation of Ferrous iron by Potentiometry.**	6+6
IV	**ENERGY SOURCES AND STORAGE DEVICES** Introduction- nuclear energy- nuclear fission- controlled nuclear fission- nuclear fusion differences between nuclear fission and fusion- nuclear chain reactions- nuclear reactor power generator- classification of nuclear reactor- light water reactor- breeder reactor. Batteries and fuel cells: Types of batteries- alkaline battery- lead storage battery- lithium ion battery- fuel cell H_2 -O_2 fuel cell applications.	6
V	**SPECTROSCOPY** Beer-Lambert's law – UV-visible spectroscopy and IR spectroscopy – principles – instrumentation (block diagram only) - applications – flame photometry – principle – instrumentation (block diagram only) – estimation of sodium by flame photometry – atomic absorption spectroscopy – principles – instrumentation (block diagram only) – Estimation of nickel by atomic absorption spectroscopy.	6
	Total Instructional Hours	**45**

Course Outcome

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

CO1: List out the chemicals used in food, soaps and detergents, drugs, cosmetics and plastics

CO2: Differentiate hard and soft water and solve the related problems on water purification in domestic as well as in industries.

CO3: Develop knowledge on the basic principles of electrochemistry and understand the causes of corrosion, its consequences to minimize corrosion to improve industrial design

CO4: Develop knowledge about the renewable energy resources and batteries along with the need of new materials to improve energy storage capabilities

CO5: List out the applications of spectroscopic techniques in various engineering fields.

TEXT BOOKS

T1 - P.C.Jain& Monica Jain, "Engineering Chemistry" DhanpatRai Pub, Co., New Delhi (2018).

T2 -O.G.Palanna, "Engineering chemistry" McGraw Hill Education India (2017).

REFERENCES

R1 - ShikhaAgarwal "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).

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Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech	22CS1151	PROBLEM SOLVING USING C PROGRAMMING (EEE, EIE, CSE, IT)	2	0	2	3

The learner should be able

Course Objective

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. (Wipro 2022) **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. (Cognizant) Note : The input other than 4 digit positive number[includes negative and 0] is considered as invalid.	10
III	**DECISION MAKING, ARRAYS, STRINGS AND POINTERS** Two-way collection – Multi-way Collection – 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. (Wipro 2022) **Input** • The first line of the input consists of an integer numbers, 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. (Wipro 2022) 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.	10

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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. (Wipro 2022)
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. (TCS NQT 2022)
Note : The output will be a positive or negative integer based on number of '*' and '#' in the input string.
(*>#): positive integer
(#>*): negative integer
(#=*): 0

IV	**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. 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. (TCS NQT 2022) Enter your PlainText: All the best Enter the Key: 1 The encrypted Text is: BmmuifCftu	9
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.	9
	Total Instructional Hours	**45**

Course Outcome

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech	22EI1201	**Fundamentals of Electrical, Electronics and Instrumentation Engineering**	3	0	0	3

The learner should be able to

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 measurements and instrumentation.

Unit	Description	Instructional Hours
I	**BASICS OF ELECTRICAL ENGINEERING** 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.	9
II	**AC CIRCUITS** AC Fundamentals, Introduction to AC Circuits- 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.	9
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 – SMPS, UPS.	9
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.	9
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.	9
	Total Instructional Hours	**45**

Course Outcome

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

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 basics of measurements and measuring instruments.

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.
T3-Sawhney A.K, "A Course in Electrical and Electronics measurements and instrumentation", 19th edition, Dhanpat Rai, 2011.

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.

Web References:

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

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Programme	Course Code	Name of the Course	L	T	P	C
B TECH IT	22HE1072	ENTREPRENEURSHIP &INNOVATION	1	0	0	1

Course Objective

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

Course Outcome

CO1: Understand the nature of business opportunities, resources, and industries in critical and creative 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 customers, competitors, and industry attractiveness.
CO5:Develop a business model for a new venture, including revenue. Margins, operations, Working capital, and investment

TEXTBOOKS

T1**:**AryaKumar"Entrepreneurship–CreatingandleadinganEntrepreneurialOrganization",Pearson,SecondEdition(2012).
T2: Emrah Yayici "Design Thinking Methodology", Artbiztech, FirstEdition(2016).

REFERENCEBOOKS

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

WEBRESOURCES

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

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Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	22HE1073	**INTRODUCTION TO SOFT SKILLS**	**1**	**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 **Quantitative Aptitude**	11
III	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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GE3152 **தமிழர் மரபு** **L T P C**
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அலகு I **மொழி மற்றும் இலக்கியம்**: 3
இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – 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 **நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்**: 3
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு IV **தமிழர்களின் திணைக் கோட்பாடுகள்**: 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 **இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு**: 3
இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

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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 Civilization on the banks of river Vaigai' (Jointly Published by: Department ofArchaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech	22HE1095	UNIVERSAL HUMAN VALUES (COMMON TO ALL BRANCHES)	2	0	0	0

Course Objectives

The student should be made

1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. TofacilitatethedevelopmentofaHolisticperspectiveamongstudentstowardslifeandprofession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3. To highlight plausible implications of such a Holistic understanding Interms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

Unit	Description	Instructional Hours
I	**Introduction to Value Education** Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)-Understanding Value Education - Self-exploration as the Process for Value Education - Continuous Happiness and Prosperity – the Basic Human Aspirations - Happiness and Prosperity – Current Scenario - Method to Fulfill the Basic Human Aspirations	6
II	**Harmony in the Human Being and Harmony in the Family** Understanding Human being as the Co-existence of the Self and the Body - Distinguishing between the Needs of the Self and the Body - The Body as an Instrument of the Self - Understanding Harmony in the Self- Harmony of the Self with the Body - Programme to ensure self-regulation and Health	6
III	**Harmony in the Family and Society** Harmony in the Family – the Basic Unit of Human Interaction. Values in Human to Human Relationship 'Trust' – the Foundational Value in Relationship Values in Human to Human Relationship 'Respect' – as the Right Evaluation Understanding Harmony in the Society	6
IV	**Harmony in the Nature / Existence** Understanding Harmony in the Nature. Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature- Understanding Existence as Co-existence of mutually interacting units in all pervasive space Realizing Existence as Co-existence at All Levels The Holistic Perception of Harmony in Existence. Vision for the Universal Human Order	6
V	**Implications of the Holistic Understanding – a Look at Professional Ethics** Natural Acceptance of Human Values Definitiveness of (Ethical) Human Conduct A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order-Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models-Typical Case Studies Strategies for Transition towards Value-based Life and Profession	6
	Total Instructional Hours	**30**

Course Outcome

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

CO1: To become more aware of holistic vision of life - themselves and their surroundings.

CO2: To become more responsible in life, in the Society and in handling problems with sustainable Solutions.

CO3: To sensitive towards their commitment towards what they understood towards environment andSocially responsible behavior.

CO4: To able to apply what have learnt to their own self in different day-to-day settings in real life andIn handling problems with sustainable solutions.

CO5: To develop competence and capabilities for maintaining Health and Hygiene.

Reference Books:

R1.A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria,2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

R2.Teachers'ManualforAFoundationCourseinHumanValuesandProfessionalEthics,RRGaur, R Asthana,G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93- 87034-53-2

R3.JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak,1999.

R4.Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

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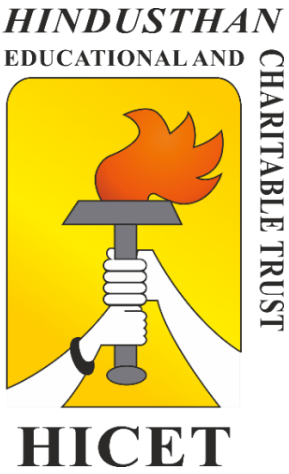
HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution Affiliated to Anna University, Chennai)

(Approved by AICTE, New Delhi, Accredited by NAAC with 'A'Grade)

Coimbatore - 641032.

B.E ELECTRONICS AND INSTRUMENTATION ENGINEERING



CHOICE BASED CREDIT SYSTEM

Revised Curriculum and Syllabus for the Even semester

Academic year 2022-23

(Academic Council Meeting Held on 03.03.2023)

REGULATIONS 2022

CURRICULUM
R2022

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)	BSC1	3	1	0	4	4	40	60	100
2.	22EI1201	Fundamentals of Electrical, Electronics and Instrumentation Engineering	PCC1	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
3.	22HE1151	English for Engineers (Common to all branches)	HSC1	2	0	2	3	4	50	50	100
4.	22CY1151	Chemistry for Circuit Engineering	BSC2	2	0	2	3	4	50	50	100
5.	22CS1151	Problem Solving using C Programming	ESC2	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	□□□□□□□□ □□□□□□□□□□□□□□□ / 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	BSC3	3	1	0	4	4	40	60	100
2.	22CY2101	Environmental Studies	ESC3	2	0	0	2	3	40	60	100
3.	22PH2101	Basics of Material Science	BSC4	2	0	0	2	3	40	60	100
THEORY WITH LAB COMPONENT											
4.	22HE2151	Effective Technical Communication (Common to all)	HSC2	2	0	2	3	4	50	50	100
5.	22PH2151	Physics For Circuit Engineering	BSC5	2	0	2	3	4	50	50	100
6.	22EI2251	Electronic Devices and Circuits	PCC2	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	□□□□□□ □□□□ /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	BSC6	3	1	0	4	4	40	60	100
2.	22EI3201	Electronic Instrumentation	ESC5	3	0	0	3	3	40	60	100
3.	22EE3202	Electric Circuit Analysis	PCC2	3	1	0	4	4	40	60	100
4.	22EI3203	Sensors and Transducers	PCC3	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
5.	22EI3251	Digital Electronics	PCC4	2	1	2	4	4	50	50	100

PRACTICAL											
6.	22EE3001	Electric Circuits Laboratory	ESC6	0	0	4	2	4	60	40	100
7.	22EI3002	Sensors and Transducers Laboratory	PCC5	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
8.	22HE3071	Soft Skills -II (Common to all)	SEC2	1	0	0	1	1	100	0	100
9.	22HE3072	Fundamentals of JAVA Programming	AEC4	2	0	0	2	2	40	60	100
			TOTAL	**17**	**3**	**10**	**25**	**29**	**470**	**430**	**900**

SEMESTER IV

S. No	Course Code	Course Title	Category	L	T	P	C	TCP	CIA	ESE	Total
THEORY											
1.	22HE4101	IPR and Start-ups	HSC5	2	0	0	2	2	40	60	100
2.	22EI4201	Electrical Machines	PCC6	3	0	0	3	3	40	60	100
3.	22EE4202	Integrated Circuits and Its Applications	PCC7	3	1	0	4	4	40	60	100
4.	22EI4203	Industrial Instrumentation - I	PCC8	3	0	0	3	3	40	60	100
5.	22EI4204	Analytical Instrumentation	PCC9	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
6.	22EI4251	Electrical and Electronic Measurements	PCC 10	2	0	2	3	4	50	50	100
PRACTICAL											
7.	22EI4001	Electrical Machines Laboratory	PCC11	0	0	4	2	4	60	40	100
8.	22EE4002	Integrated Circuits Laboratory	PCC12	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
NON CREDIT - MANDATORY COURSE											
10.	22MC4191	Essence of Indian Traditional Knowledge	MC	2	0	0	0	2	100	0	100
			TOTAL	**20**	**2**	**8**	**24**	**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	PCC13	3	0	0	3	3	40	60	100
2.	22EE5202	Microprocessors and Microcontrollers	PCC14	3	0	0	3	3	40	60	100

3.	22EI53XX	Professional Elective-1	PEC1	3	0	0	3	3	40	60	100
4.	22EI53XX	Professional Elective-2	PEC2	3	0	0	3	3	40	60	100
5.	22EI53XX	Professional Elective-3	PEC3	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
6.	22EI5251	Control Systems	PCC15	2	0	2	3	4	50	50	100
PRACTICAL											
7.	22EI5001	Industrial Instrumentation Laboratory	PCC16	0	0	4	1.5	3	60	40	100
8.	22EE5002	Microprocessors and Microcontrollers Laboratory	PCC16	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**	**21**	**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	PCC17	3	0	0	3	3	40	60	100
2.	22HE6101	Professional Ethics	HSC6	3	0	0	3	3	40	60	100
3.	22EI63XX	Professional Elective-4	PEC4	3	0	0	3	3	40	60	100
4.	22EI63XX	Professional Elective-5	PEC5	3	0	0	3	3	40	60	100
5.	22XX64XX	Open Elective – 1*	OEC1	3	0	0	3	3	40	60	100
PRACTICAL											
6.	22EI6001	Process Control Laboratory	PCC18	0	0	4	2	4	60	40	100
7.	22EI6002	Virtual Instrumentation and Data Acquisition Laboratory	PCC19	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
8.	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	PCC20	3	0	0	3	3	40	60	100
2.	22EI73XX	Professional Elective-6	PEC6	3	0	0	3	3	40	60	100
3.	22XX7401	Open Elective – 3*	OEC3	3	0	0	3	3	40	60	100
4.	22LS74XX	Open Elective – 4*	OEC4	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
5.	22EI7251	VLSI Design	PCC21	2	0	2	3	4	40	60	100

PRACTICAL											
6.	22EI7001	Industrial Automation Laboratory	PCC 22	0	0	4	1.5	3	60	40	100
7.	22EI7001	Instrumentation System Design Laboratory	PCC 22	0	0	4	1.5	3	60	40	100
EEC COURSES (SE/AE)											
8.	22EI7701	Internship Training	SEC8	-	-	-	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	SEC9	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			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	CATEGORY	PERIODS PERWEEK			TOTAL CONTACT PERIODS	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			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

S No	Course Code	Course Title	Category	Periods Per week			Total Contact Periods	Credits
				L	T	P		
1.	22EI5231	Sem 5: Measurements and Measuring Instruments	MDC	3	0	0	3	3
2.	22EI6231	Sem 6: Transducer Engineering	MDC	3	0	0	3	3
3.	22EI6232	Sem 6: Industrial Instrumentation	MDC	3	0	0	3	3
4.	22EI7231	Sem 7: Industrial data Communication	MDC	3	0	0	3	3
5.	22EI7232	Sem 7: Powerplant Instrumentation	MDC	3	0	0	3	3
6.	22EI8231	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	22MB5231	Financial Management	MDC	3	0	0	3	3
2	22MB6231	Fundamentals of Investment	MDC	3	0	0	3	3
3	22MB6232	Banking, Financial Services and Insurance	MDC	3	0	0	3	3
4	22MB7231	Introduction to Blockchain and its Applications	MDC	3	0	0	3	3
5	22MB7232	Fintech Personal Finance and Payments	MDC	3	0	0	3	3
6	22MB8231	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	22MB5232	Foundations of Entrepreneurship	MDC	3	0	0	3	3
2	22MB6233	Team Building & Leadership Management for Business	MDC	3	0	0	3	3
3	22MB6234	Creativity & Innovation in Entrepreneurship	MDC	3	0	0	3	3
4	22MB7233	Principles of Marketing Management For Business	MDC	3	0	0	3	3
5	22MB7234	Human Resource Management for Entrepreneurs	MDC	3	0	0	3	3
6	22MB8232	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	22CE5232	Sustainable infrastructure Development	MDC	3	0	0	3	3
2	22AG6233	Sustainable Agriculture and Environmental Management	MDC	3	0	0	3	3
3	22BM6233	Sustainable Bio Materials	MDC	3	0	0	3	3
4	22ME7233	Materials for Energy Sustainability	MDC	3	0	0	3	3
5	22CE7233	Green Technology	MDC	3	0	0	3	3
6	22CE8232	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
22EIXXXX Internet of Things: Architecture, Protocols and Applications	22EIXXXX Instrumentation Practices in Industries	22EIXXXX Introduction to Sensor Technology & Instrumentation
22EIXXXX Principles of Sensors and Signal Conditioning	22EIXXXX Unit operation and control	22EIXXXX Drives and control system for Automation
22EIXXXX Embedded systems for IoT	22EIXXXX Adaptive control	22EIXXXX Applied Industrial Instrumentation

22EIXXXX Introduction to Wireless Sensor Networks & IoT Standards	22EIXXXX Advanced Process Control	22EIXXXX Building Automation
22EIXXXX Wireless Technologies for IoT	22EIXXXX Industry 4.0	22EIXXXX Machine vision system
22EIXXXX IoT for Industry Automation	22EIXXXX Advanced Instrumentation Techniques	22EIXXXX Industrial Internet of Things
22EIXXXX Optical sensors and photonics	22EIXXXX Industrial safety and Hazard Management	22EIXXXX SCADA systems and its applications
22EIXXXX Smart Instrumentation	22EIXXXX Intelligent Actuators and Mechatronics	22EIXXXX 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	22EIXXX	Internet of Things: Architecture, Protocols and Applications	PC	3	0	0	3	3
2	22EIXXX	Principles of Sensors and Signal Conditioning	PC	3	0	0	3	3
3	22EIXXX	Embedded systems for IoT	PC	3	0	0	3	3
4	22EIXXX	Introduction to Wireless Sensor Networks & IoT Standards	PC	3	0	0	3	3
5	22EIXXX	Wireless Technologies for IoT	PC	3	0	0	3	3
6	22EIXXX	IoT for Industry Automation	PC	3	0	0	3	3
7	22EIXXX	Optical sensors and photonics	PC	3	0	0	3	3
8	22EIXXX	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	22EIXXX	Instrumentation Practices in Industries	PC	3	0	0	3	3
2	22EIXXX	Unit operation and control	PC	3	0	0	3	3
3	22EIXXX	Adaptive control	PC	3	0	0	3	3
4	22EIXXX	Advanced Process Control	PC	3	0	0	3	3
5	22EIXXX	Industry 4.0	PC	3	0	0	3	3
6	22EIXXX	Advanced Instrumentation Techniques	PC	3	0	0	3	3
7	22EIXXX	Industrial safety and Hazard Management	PC	3	0	0	3	3
8	22EIXXX	Intelligent Actuators and Mechatronics	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	22EIXXX	Introduction to Sensor Technology & Instrumentation	PC	3	0	0	3	3
2	22EIXXX	Drives and control system for Automation	PC	3	0	0	3	3
3	22EIXXX	Applied Industrial Instrumentation	PC	3	0	0	3	3
4	22EIXXX	Building Automation	PC	3	0	0	3	3
5	22EIXXX	Machine vision system	PC	3	0	0	3	3
6	22EIXXX	Industrial Internet of Things	PC	3	0	0	3	3
7	22EIXXX	SCADA systems and its applications	PC	3	0	0	3	3
8	22EIXXX	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	MCC	√	√							
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**

Chairman BoS **Dean Academics** **Principal**

SYLLABUS

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. Introduction to analytic functions and its properties.
2. Understand Cauchy's theorem and its applications in evaluation of integral.
3. Analyze Fourier series which is central to many applications in engineering
4. Apply Fourier transform techniques in various situations.
5. Analyze 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: Understand 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: Illustrate the Z- transforms for analyzing discrete-time signals and systems

Chairman - BoS
EIE - HiCET

Chairman

Dean (Academics)
HiCET

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

Programme	Course Code	Name of the Course	L	T	P	C

Chairman - BoS
EIE - HiCET

Chairman

Dean (Academics)
HiCET

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.

Chairman - BoS
EIE - HiCET

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HiCET

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.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	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", 6thEdition, Tata McGraw Hill, New Delhi, 2011.
R2 - Patranabis. D, "Sensors and Transducers", Prentice Hall of India, 2003.

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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 introduce the fundamentals of number system and logic families.
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 VHDL.

Unit	Description	Instructional Hours
I	**NUMBER SYSTEMS AND LOGIC FAMILIES** Number system, error detection, corrections & codes conversions, Boolean algebra and laws: De Morgan's theorem, K-maps minimization & Quine Mc Cluskey method - Digital Logic Families: comparison of RTL, DTL, TTL, ECL and MOS families - operation, characteristics of digital logic family. ***Implementation of Boolean function using KMap.***	9+3
II	**COMBINATIONAL CIRCUITS** Combinational logic - representation of logic functions - SOP and POS forms, K-map representations - minimization using K maps - simplification and implementation of combinational logic – multiplexers and de multiplexers - code converters, adders, subtractors, Encoders and Decoders. ***Analysis 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 - counters - asynchronous and synchronous type - Modulo counters: state diagram; state reduction; state assignment. - Shift registers - design of synchronous sequential circuits – Moore and Mealy models. ***Excess 3 to BCD and vice versa***	9+3
IV	**ASYNCHRONOUS SEQUENTIAL CIRCUITS AND PROGRAMMABLE LOGIC DEVICES** Analysis of Asynchronous sequential logic Circuits-Transition stability, flow stability-race conditions, hazards &errors in digital circuits; Introduction to Programmability Logic Devices: PROM – PLA –PAL- CPLD-FPGA. ***Experimental analysis of race conditions in digital circuits***	9+3
V	**VHDL** RTL Design – combinational logic – Sequential circuit – Operators – Introduction to Packages – Subprograms – Test bench. (Simulation /Tutorial Examples: adders, counters, flip flops, Multiplexers & Demultiplexers).***Implementation of Multiplexer and Demultiplexer***.	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: Use VHDL for simulating and testing RTL, combinatorial and sequential circuits

TEXT BOOKS:

T2 - M. Morris Mano, 'Digital Design with an introduction to the VHDL', Pearson Education, 2013.
T2 - Donald D.Givone, 'Digital Principles and Design', Tata McGraw Hill,1st Edition, 2003

REFERENCE BOOKS:

R1- Raj Kamal, 'Digital systems-Principles and Design', Pearson Education 1st Edition, 2012.
R2 - Tocci R.J., Neal S. Widmer, 'Digital Systems: Principles and Applications', Pearson Education Asia, 12th Edition, 2017.
R3-Anand Kumar, "Fundamentals of Digital Circuits",PHI,2013.

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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

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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 Electronicsand Instrumentation Engineering, 2016.

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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 (Revised on June 2023)

(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	25	75	100
2	21MA1103	Calculus and Differential Equations	BS	3	1	0	4	25	75	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	0	100	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**	**450**	**450**	**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	25	75	100
2	21MA2102	Complex Variables and Transform Calculus	BS	3	1	0	4	25	75	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	50	50	100
8	21HE2001	Language Competency Enhancement Course-II	HS	0	0	2	1	0	100	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**	**400**	**500**	**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	25	75	100
2	21EI3201	Electronic Devices and Circuits	PC	3	1	0	4	25	75	100
3	21EI3202	Sensors and Transducers	PC	3	0	0	3	25	75	100
4	21ME3231	Fluid Mechanics and Thermal Engineering	PC	3	0	0	3	25	75	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	50	50	100
7	21EI3002	Sensors and Transducers Laboratory	PC	0	0	3	1.5	50	50	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	25	75	100
2	21EI4201	Electrical Machines	PC	3	1	0	4	25	75	100
3	21EI4202	Integrated Circuits and Its Applications	PC	3	0	0	3	25	75	100
4	21EI4203	Industrial Instrumentation – I	PC	3	0	0	3	25	75	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	50	50	100
7	21EI4002	Integrated Circuits Laboratory	PC	0	0	3	1.5	50	50	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	25	75	100
2	21EI5202	Control Systems	PC	3	1	0	4	25	75	100
3	21EI5203	Microprocessors and Microcontrollers	PC	3	0	0	3	25	75	100

4	21EI5204	Analytical Instrumentation	PC	3	0	0	3	25	75	100
5	21EI53XX	**Professional Elective -I**	PE	3	0	0	3	25	75	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	50	50	100
8	21EI5002	Microprocessors and Microcontrollers Laboratory	PC	0	0	3	1.5	50	50	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	25	75	100
2	21EI6201	Process Control	PC	3	0	0	3	25	75	100
3	21EI6202	Discrete Time and Signal Processing	PC	3	0	0	3	25	75	100
4	21EI63XX	**Professional Elective - II**	PE	3	0	0	3	25	75	100
5	21XX64XX	**Open Elective– I**	OE	3	0	0	3	25	75	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	50	50	100
8	21EI6002	Virtual Instrumentation Laboratory	PC	0	0	3	1.5	50	50	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	25	75	100
2	21EI7202	Industrial Electronics	PC	3	0	0	3	25	75	100
3	21EI73XX	**Professional Elective-III**	PE	3	0	0	3	25	75	100
4	21XX74XX	**Open Elective – II**	OE	3	0	0	3	25	75	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	50	50	100
7	21EI7002	Instrumentation System Design Laboratory	PC	0	0	3	1.5	50	50	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	25	75	100
2	21EI81XX	**Professional Elective- V**	PE	3	0	0	3	25	75	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	25	75	100
2	21EI5302	Communication Theory	PE	3	0	0	3	25	75	100
3	21IT5331	Fundamentals of Java Programming	PE	3	0	0	3	25	75	100
4	21EI5303	Industrial Chemical Process	PE	3	0	0	3	25	75	100
5	21EI5304	Operating Systems	PE	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE II										
1	21EI6301	VLSI Design	PE	3	0	0	3	25	75	100
2	21EI6302	Micro Electro Mechanical Systems	PE	3	0	0	3	25	75	100
3	21EI6303	Industrial Data Communication	PE	3	0	0	3	25	75	100
4	21EI6304	Digital Image Processing	PE	3	0	0	3	25	75	100
5	21EI6305	Introduction to Soft Computing	PE	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE III										
1	21EI7301	Non-Linear Control System	PE	3	0	0	3	25	75	100
2	21EI7302	Industrial IoT	PE	3	0	0	3	25	75	100
3	21EI7303	Robotics and Automation	PE	3	0	0	3	25	75	100
4	21EI7304	Microcontroller Based System Design	PE	3	0	0	3	25	75	100
5	21EI7305	Neural Networks and Fuzzy Systems	PE	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE IV										
1	21EI8301	Fiber Optics and Laser Instruments	PE	3	0	0	3	25	75	100
2	21EI8302	Instrumentation in Petrochemical Industries	PE	3	0	0	3	25	75	100
3	21EI8303	Instrumentation System Design	PE	3	0	0	3	25	75	100
4	21EI8304	Artificial Intelligence and Machine Learning	PE	3	0	0	3	25	75	100
5	21EI8305	Instrumentation and Control in Paper Industry	PE	3	0	0	3	25	75	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	25	75	100
2	21EI8182	Total Quality Management	PE	3	0	0	3	25	75	100
3	21EI8183	Professional Ethics for Engineers	PE	3	0	0	3	25	75	100
4	21EI8184	Principles of Management	PE	3	0	0	3	25	75	100
5	21EI8185	Patent, Copyright and Competition Law	PE	3	0	0	3	25	75	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	25	75	100
2	21EI6402	Electrical Energy Management and Audit	OE	3	0	0	3	25	75	100
3	21EI7401	Introduction to Programmable Logic Controllers	OE	3	0	0	3	25	75	100
LIFE SKILL COURSES										
4	21LSZ401	General Studies for Competitive Examinations	OE	3	0	0	3	25	75	100
5	21LSZ402	Human Rights, Women's Rights and Gender Equality	OE	3	0	0	3	25	75	100
6	21LSZ403	Indian Ethos and Human Values	OE	3	0	0	3	25	75	100
7	21LSZ404	Indian Constitution and Political System	OE	3	0	0	3	25	75	100
8	21LSZ405	Yoga for Human Excellence	OE	3	0	0	3	25	75	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	25	75	100
10	21HEZ402	NCC course level 2	OE	3	0	0	3	25	75	100

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

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).

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.	21EI5231	Sem 5: Transducer Engineering	MDC	3	0	0	3	3
2.	21EI6231	Sem 6: Measurements and Measuring Instruments	MDC	3	0	0	3	3
3.	21EI6232	Sem 6: Industrial Instrumentation	MDC	3	0	0	3	3
4.	21EI7231	Sem 7: Industrial data Communication	MDC	3	0	0	3	3
5.	21EI7232	Sem 7: Powerplant Instrumentation	MDC	3	0	0	3	3
6.	21EI8231	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	Team Building & Leadership Management for Business	Sustainable Agriculture and Environmental Management
Banking, Financial Services and Insurance	Creativity & Innovation in Entrepreneurship	Sustainable Bio Materials
Introduction to Blockchain and its Applications	Principles of Marketing Management for Business	Materials for Energy Sustainability
Fintech Personal Finance and Payments	Human Resource Management for Entrepreneurs	Green Technology
Introduction to Fintech	Financing New Business Ventures	Environmental Quality Monitoring and Analysis

Vertical I

Fintech and Block Chain

S No	**Course Code**	**Course Title**	**Category**	**Periods Per week**			**Total Contact Periods**	**Credits**
				L	T	P		
1	21MB5231	Financial Management	MDC	3	0	0	3	3
2	21MB6231	Fundamentals of Investment	MDC	3	0	0	3	3
3	21MB6232	Banking, Financial Services and Insurance	MDC	3	0	0	3	3
4	21MB7231	Introduction to Blockchain and its Applications	MDC	3	0	0	3	3
5	21MB7232	Fintech Personal Finance and Payments	MDC	3	0	0	3	3
6	21MB8231	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	Team Building & Leadership Management for Business	MDC	3	0	0	3	3
3	21BA6602	Creativity & Innovation in Entrepreneurship	MDC	3	0	0	3	3
4	21BA7601	Principles of Marketing Management For Business	MDC	3	0	0	3	3
5	21BA7602	Human Resource Management for Entrepreneurs	MDC	3	0	0	3	3
6	21BA8601	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	21AG6233	Sustainable Agriculture and Environmental Management	MDC	3	0	0	3	3

3	21BM6233	Sustainable Bio Materials	MDC	3	0	0	3	3
4	21ME7233	Materials for Energy Sustainability	MDC	3	0	0	3	3
5	21CE7233	Green Technology	MDC	3	0	0	3	3
6	21CE8232	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 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: 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**

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

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SYLLABUS

Semester IV

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21MA4101	Numerical Methods (Common to AERO,AUTO,MECH,MCTS,EEE & EIE)	3	1	0	4

Course Objective

1. Solve algebraic, transcendental and system of linear equations by using various techniques.
2. Analyze various methods to find the intermediate values for the given data.
3. Explain concepts of numerical differentiation and numerical integration of the unknown functions.
4. Explain single and multi step methods to solve Ordinary differential equations
5. Describe various methods to solve ordinary differential equations and partial differential equations.

Unit	Description	Instructional Hours
I	**SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS** Solution of Algebraic and Transcendental equations: Newton Raphson method . Solution of linear system: Gauss Elilmination - Gauss Jordan method -Gauss seidel method. Matrix inversion by Gauss Jordan method.	12
II	**INTERPOLATION** Interpolation - Newton's forward and backward difference formulae – Newton's divided difference formula and Lagrangian interpolation for unequal intervals.	12
III	**NUMERICAL DIFFERENTIATION AND INTEGRATION** Numerical Differentiation: Newton's forward and backward interpolation formulae for equal intervals –Newton's divided difference formula for unequal intervals. Numerical integration: Trapezoidal and Simpson's 1/3 rule - Double integration using Trapezoidal and Simpson's rules.	12
IV	**INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS** Single step methods for solving first order equations: Taylor's series method – Euler and Modified Euler methods – Fourth order Runge-kutta method -Multi step method: Milne's predictor and corrector method.	12
V	**BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS** Solution of second order ordinary differential equation by Finite difference method – Solution of partial differential equation: one dimensional heat equation by Bender schmidt method – One dimensional Wave equation by Explicit method– Poisson Equations by Finite difference method.	12
	Total Instructional Hours	**60**

Course Outcome

CO1:Solve the system of linear algebraic equations which extends its applications in the field of engineering
CO2: Apply various methods to find the intermediate values for the given data.
CO3:Identify various methods to perform numerical differentiation and l integration
CO4: Classify and solve ordinary differential equations by using single and multi step methods.
CO5: Illustrate various methods to find the solution of ordinary and partial differential equations.

TEXT BOOKS:

T1 - Erwin Kreyszig,"Advanced Engineering Mathematics",10th Edition,Wiley India New Delhi, 2018.
T2 -Kreyszig.E."Advanced Engineering Mathematics", Tenth Edition, John Wiley and sons (Asia) limited,2017

REFERENCE BOOKS :

R1- M.K.Jain,S.R.K.Iyengar, R.K.Jain "Numerical methods for Scientific and Engineering Computation", Fifth Edition, New Age International publishers 2010.
R2- Grewal B.S. and Grewal J.S. "Numerical Methods in Engineering and Science ", 6th Edition , Khanna publishers, New Delhi 2015.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21EI4201	Electrical Machines	3	1	0	4

Course Objective

1. Understand the principles of operations of Electrical Machines
2. Define the construction details of Transformers
3. Understand the construction of AC Electrical Machines
4. Outline the phasor diagram of Various Machines
5. Illustrate the function of various Special Electrical Machines

Unit	Description	Instructional Hours
I	**D.C. MACHINES** D.C. Generator - Principle of Operation and Construction of DC Generator - EMF Equation - Characteristics - Armature Reaction - Commutation. D.C. Motor - Types - Torque Equation - Characteristics - Starting and Speed Control of D.C. Motor.	12
II	**TRANSFORMERS** Principle - Theory of ideal transformer - EMF equation - Construction details of shell and core type transformers - Tests on transformers - Equivalent circuit - Phasor diagram - Regulation and efficiency of a transformer - Introduction to three-phase transformer connections.	12
III	**SYNCHRONOUS MACHINES** Synchronous Generator - Principle of operation and construction - types - EMF Equation - Vector diagram. Synchronous motor- Starting Methods - Torque equation - V curves - Speed control – Hunting.	12
IV	**INDUCTION MACHINES** Three phase Induction Motor-Principle of Operation - Types - Torque-Slip and Torque-Speed Characteristics - Starting Methods and Speed Control of Induction Motors - Single Phase Induction Motors - Introduction to Induction Generators.	12
V	**SPECIAL ELECTRICAL MACHINES (QUANTITATIVE TREATMENT ONLY)** Repulsion Type Motor - Universal Motor - Hysteresis Motor - Switched Reluctance Motor - Brushless D.C Motor - Stepper Motor.	12
	Total Instructional Hours	**60**

Course Outcome

CO1: State the principle of operation and construction of D.C. machines
CO2: Ability to write the transformers operation and construction
CO3: List the operation of synchronous machines
CO4: Explain the operation and control of induction machines
CO5: Illustrate the operation of special electrical machines

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.

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” S.Chand and Company, 2013.
R3 - C.A.Gross, “Electric Machines”, CRC Press 2010.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21EI4202	Integrated Circuits and Its Applications (Common to EIE and EEE)	3	0	0	3

Course Objective

1. Infer adequate knowledge on IC fabrication procedure.
2. Relate the characteristics of linear integrated circuits and their applications.
3. Apply OP-AMP on various applications like Timers, PLL circuits, ADC's and DAC's.
4. Impart the basic knowledge of regulator circuits and special function IC's
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.	9
II	**CHARACTERISTICS OF OP-AMP** Basic information of OP-AMP – The Ideal OP-AMP characteristics - DC characteristics - AC characteristics - frequency response of OP-AMP - Slew Rate- 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.	9
III	**APPLICATIONS OF OP-AMP** Instrumentation amplifier - First order LPF - First order HPF - First order BPFand Band reject filters - Comparators - Multivibrators –Triangular wave generator – clippers – clampers - peak detector- - D/A converter : R- 2R ladder and weighted resistor types - A/D converters : Successive Approximations- Dual Slope.	9
IV	**SPECIAL IC's** Functional block- characteristics & application circuits with IC 555 Timer - Application: Missing pulse detector, PWM, FSK Generator, PPM,SCHMITT Trigger - IC566 voltage controlled oscillator - IC565 - Phase Lock Loop IC - PLL application: frequency multiplication/division, AM Detection.	9
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.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Interpret the IC fabrication procedure.
CO2: Analyze the characteristics of operational amplifiers.
CO3: Outline the applications of OP-AMP.
CO4: Understand the working principle of special IC's.
CO5: Outline the function of voltage regulator as special IC's.

TEXT BOOKS:

T1- D. Roy Choudhary, Shail B. Jain, "Linear Integrated Circuits", 5th Edition, New Age Publishers,2018.
T2-S Salivahanan, V S Kanchana Bhaaskaran," 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.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21EI4203	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	**PRESSURE MEASUREMENT** Terminologies–Units - Manometer types – Elastic elements: Bourdon tube-Bellows- Diaphragm. Electrical Methods: elastic elements with LVDT and strain gauges-capacitive type pressure gauge - piezo resistive pressure sensors- Low pressure measurement: McLeod gauge-thermal conductivity gauges-Ionization gauge-Cold cathode and hot cathode types – Testing and calibration of pressure gauges: Dead weight tester.	9
II	**LEVEL MEASUREMENT** Units - Sight glass – dip stick - Float type - level measurement in open and closed head tanks - bubbler method- differential pressure method- Mounting Issues - Purge system - Electrical methods of level measurement using resistance, capacitance, nuclear radiation and ultrasonic sensors - radar-tuning fork and displacer methods - Level switches.	9
III	**TEMPERATURE MEASUREMENT** Units - Filled-in systems: Different types, sources of errors and their compensation, Bimetallic thermometer, Electrical methods of temperature measurement: RTD –Types of RTDs - 3 wire and 4 wire RTDs, thermistor – linearization, Diode type sensors - Integrated circuit sensors – Temperature switches and thermostats.	9
IV	**THERMOCOUPLES AND RADIATION PYROMETERS** Thermocouple – Laws and types of thermocouple - fabrication of industrial thermocouples, signal conditioning, cold junction compensation, Thermocouple burnout detection, special techniques for measuring high temperature using thermocouples – Radiation methods of temperature measurement: Radiation fundamentals - Radiation pyrometers – Total radiation pyrometers, optical radiation pyrometers – ultrasonic thermometers – fiber optic temperature measurement.	9
V	**MEASUREMENT OF VISCOSITY, HUMIDITY, DENSITY AND MOISTURE** Units- Viscosity -terminologies - Say bolt viscometer – rotameter type viscometer – humidity terms – dry and wet bulb psychrometers - hotwire electrode type hygrometer-dew cell – electrolysis type hygrometer – density measurement using weight, buoyancy, hydrostatic head and radiation- moisture measurement – electrical methods.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Interpret the measurement of pressure in instrumentation
CO2: Choose the instruments used for the measurement of level.
CO3: Identify the methods used for the measurement of temperature
CO4: Choose the High temperature measuring instruments
CO5: Classify the Instruments used for measurement of Viscocity,Humidity, Density and Moisture

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 - D. Patranabis, “Principles of Industrial Instrumentation”, Tata McGraw Hill Ltd.,2011.
R2 - A.K. Sawhney and P. Sawhney, “A Course on Mechanical Measurements, Instrumentation and Control”, Dhanpat Rai and Co, 2011.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21EI4251	Digital Logic Circuits (Common to EIE and EEE)	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 - Implementation 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 - Experiment Analysis 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 synchronoussequential circuits – Moore and Melay models- state diagram-state reduction- stateassignment. Implementation 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 - Experimental analysis 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 - Implementation 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:

T1 - 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.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21EI4001	Electrical Machines Laboratory	0	0	3	1.5

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.

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Programme	Course Code	Name of the Course	L	T	P	C
BE	21EI4002	Integrated Circuits Laboratory (Common to EEE and EIE)	0	0	3	1.5

Course Objective

1. Understand the performance characteristics of Op-amp.
2. Implement of Op-amp applications.
3. Construct and test waveform generation circuits

S.No	Description of the Experiments
1.	Performance characteristics of Op-Amp IC.
2.	Implementation of inverting and non-inverting amplifiers using Op-Amp.
3.	Construct and testing of Adder and Subtractor using Op-Amp.
4.	Implementation of differential amplifier and voltage follower using Op-Amp.
5.	Implementation of Integrator and Differentiator using Op-Amp.
6.	Frequency response characteristics of first order low pass and high pass filters.
7.	Construct and testing of D/A and A/D Converter.
8.	Construct and testing Astable and Monostablemultivibrator using IC 555 timer.
9.	Implementation of Schmitt Trigger.
10	Construct and testing of Regulated DC power supply using IC 723.
11.	Study of VCO and PLL ICs.

Total Practical Hours 45

Course Outcome

CO1: Understand the performance characteristicsof Op-amp.
CO2: Implementation of various applications of Op-amp.
CO3: Understand the performance of filters and converters.
CO4: Construct multivibrator and regulated power supply circuits using IC
CO4: Assimilate the knowledge on VCO and PLL ICS.

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.

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MANDATORY COURSES

Programme	Course Code	Course Title	L	T	P	C
B.E/ B.TECH	21HE5071	Soft Skills - I	1	0	0	1

Course Objectives:

1.To employ soft skills to enhance employability and ensure workplace and career success.
2.To enrich students' numerical ability of an individual and is available in technical flavor.
3.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	3
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 nonverbal Communication - Importance of feelings in communication - dealing with feelings in communication.	4
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.	3
IV	**Quantitative Aptitude:** Averages - Profit and loss - Partnerships - Time and work - Time, Speed and Distance - Problems based on trains - Problems based on boats and streams	3
V	**Logical Reasoning:** Clocks - Calendars - Direction Sense - Data Interpretation: Tables, Pie Chart, Bar Graph - Data Sufficiency	2

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
CO4:	Students will be able to make sense of problems, develop strategies to find solutions, and persevere in solving them.
CO5:	Students will demonstrate an enhanced ability to draw logical conclusions and implications to solve logical problems.

REFERENCE BOOKS:

R1: Soft Skills Training: A Workbook to Develop Skills for Employment - Frederick H. Wentz
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: A New Approach To Reasoning Verbal & Non-Verbal By B.S. Sijwali
R5: Quantitative Aptitude for Competitive Examinations - Dr. R.S. Aggarwal, S. Chand

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Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech.	21HE5072	Design Thinking	1	0	0	1

Course Objective

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	**4**
II	**DESIGNING TO WIN** Formula One Designing – Radical Innovations – City Car Design – Learning From Failures – Design Process and Working Methods	**4**
III	**DESIGN TO PLEASE AND DESIGNING TOGETHER** Background – Product Innovations – Teamwork versus Individual work – Roles and Responsibilities – Avoiding and Resolving Conflicts.	**4**
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	**3**
	Total Instructional Hours	**15**

Course Outcome

Upon completion of the course, students 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 - 1. Nigel Cross, “Design Thinking”, Kindle Edition.

REFERENCE BOOKS:

R1 - Tom Kelley, “Creative Confidence”, 2013.
R2 - 3. Tim Brown, “Change by Design”, 2009.

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Programme	Course Code	Name of the course	L	T	P	C
BE/B.Tech	**21BA5601**	**Foundations of Entrepreneurship**	**3**	**0**	**0**	**3**

Course Objective	CO1: To enable students gain insights on entrepreneurship. CO2: To make students understand the sources of product & business ideas. CO3: To provide knowledge on business opportunity identification. CO4: To enable students to develop business plan CO5: To enable students to prepare feasibility reports and understand trends in entrepreneurship.

Unit	Description	Instructional Hours
I	**Introduction to Entrepreneurship:** Entrepreneurial growth in India; sources of entrepreneurship in India. Entrepreneurship process; entrepreneurial mindset: concept and impact; Entrepreneurial growth strategies. Characteristics of an Entrepreneur – Qualities of an Entrepreneur. Entrepreneurial success and failure - reasons and remedies.	9
II	**Product Development:** Introduction and Meaning of a Product – Sources of Business or Product Ideas – Criteria for Selecting a Product – Barriers to the successful development of New Products – Why do new products fail. Technology - Considerations in selecting technology.	9
III	**Business Opportunity Identification:** Need and Importance - Steps in identification of Business Opportunity. Techniques of market Survey – Market Research Procedure.	9
IV	**Business Plan Development**: Business modelling: concept, types and functions; Innovation and Entrepreneurship: concept and challenges. The business plan as an entrepreneurial tool, Elements of business planning, Objectives, Market analysis, development of Product/idea, Marketing, Finance, Organization and management, Ownership, Critical risk contingencies of the proposal, Scheduling and milestones.	9
V	**Feasibility Report & trends:** Contents of a feasibility report – Considerations while preparing a feasibility report – Proforma of a feasibility report. Technical, Financial, Marketing, Personnel, and management feasibility reports. Trends in entrepreneurship: Rural, Social and women entrepreneurship.	9
	Total Instructional Hours	**45**

Course Outcome	CO1: Understand the basics of entrepreneurship and its process.
	CO2: Understand the concept of product development and the role of technology.
	CO3: Able to understand and identify business opportunity
	CO4: Able to develop business plan / business model
	CO5: Able to prepare feasibility reports and understand the trends in entrepreneurship.

TEXT BOOKS:
T1- S.Anil Kumar, S.C.Poornima, Mini KAbraham, K.Jayashree "Entrepreneurship Development",New Age International Publishers.
T2- Jasmer singh Sain, Entrepreneurship and small Business" Deep and Deep publication
T3- Shankar Raj, "Entrepreneurship Theory and Practice" Vijay Nicole Imprints Pvt ltd.
T4- Khanka, S.S, "Entrepreneurship Development", S. Chand & company

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T5- Vasant Desai, “Fundamentals of Entrepreneurship “Himalaya Publishing House.
REFERENCE BOOKS:
R1- Khanna, S. S., Entrepreneurial Development, S. Chand, New Delhi.
R2- Hisrich D. Robert, Michael P. Peters, Dean A. Sheperd, Entrepreneurship, McGraw-Hill,6 ed.
R3- Zimmerer W. Thomas,Norman M.Scarborough, Essentials of Entrepreneurship and Small Business Management, PHI,4 ed.
R4- Holt H. David, Entrepreneurship: New Venture Creation, Prentice- Hall of India, New Delhi, Latest edition.
R5- Kuratko, F. Donald, Richard M. Hodgetts, Entrepreneurship: Theory, Process, Practice, Thomson, 7ed.
R6- Desai, Vasant, Dynamics of Entrepreneurship: New Venture Creation, Prentice-Hall of India, New Delhi, Latest edition.
R7- Patel, V. G., The Seven Business Crises and How to Beat Them, Tata McGraw-Hill, New Delhi, 1995.
R8- Roberts, Edward B.(ed.), Innovation: Driving Product, Process, and Market Change, San Francisco: Jossey Bass, 2002.

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Hindusthan College of Engineering and Technology

(An Autonomous Institution, Affiliated to Anna University, Chennai
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Valley Campus, Pollachi Highways, Coimbatore, Tamilnadu.

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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 (Revised on June 2023)

(For the students admitted during the academic year 2020-2021 and onwards)

SEMESTER I

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19HE1101	Technical English	HS	2	1	0	3	25	75	100
2	19MA1103	Calculus and Differential Equations	BS	3	1	0	4	25	75	100
THEORY WITH LAB COMPONENT										
3	19PH1151	Applied Physics	BS	2	0	2	3	50	50	100
4	19CY1151	Chemistry for Engineers	BS	2	0	2	3	50	50	100
5	19CS1151	Python Programming and Practices	ES	2	0	2	3	50	50	100
6	19ME1152	Engineering Drawing	ES	1	0	4	3	50	50	100
PRACTICAL										
7	19HE1071	Language Competency Enhancement Course-I	HS	0	0	2	1	0	100	100
MANDATORY COURSES										
8	19HE1072	**Career Guidance Level** – I Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
9	19HE1073	Entrepreneurship & Innovation	EEC	1	0	0	0	100	0	100
			Total :	**15**	**2**	**12**	**20**	**450**	**450**	**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	19HE2101	Business English for Engineers	HS	2	1	0	3	25	75	100
2	19MA2102	Complex Variables and Transform Calculus	BS	3	1	0	4	25	75	100
THEORY WITH LAB COMPONENT										
3	19PH2151	Material Science	BS	2	0	2	3	50	50	100
4	19CY2151	Environmental Studies	BS	2	0	2	3	50	50	100
5	19EI2151	Circuit Theory	ES	2	0	2	3	50	50	100
6	19CS2152	Essentials of C and C++ Programming	ES	2	0	2	3	50	50	100
PRACTICAL										
7	19ME2001/ 19EE2001	Engineering Practices	ES	0	0	4	2	50	50	100
8	19HE2071	Language Competency Enhancement Course-II	HS	0	0	2	1	0	100	100
MANDATORY COURSES										
9	19HE2072	**Career Guidance Level – II** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
			Total :	**15**	**2**	**14**	**22**	**400**	**500**	**900**

SEMESTER III

S.No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19MA3102	Fourier Analysis and Transforms	BS	3	1	0	4	25	75	100
2	19EI3201	Electronic Devices and Circuits	PC	3	1	0	4	25	75	100
3	19EI3202	Sensors and Transducers	PC	3	0	0	3	25	75	100
4	19ME3231	Fluid Mechanics and Thermal Engineering	PC	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
5	19EI3251	Electrical and Electronic Measurements	PC	2	0	2	3	50	50	100
PRACTICAL										
6	19EI3001	Electronic Devices and Circuits Laboratory	PC	0	0	3	1.5	50	50	100
7	19EI3002	Sensors and Transducers Laboratory	PC	0	0	3	1.5	50	50	100

MANDATORY COURSES										
8	19MC3191	Indian Constitution	MC	2	0	0	0	100	0	100
9	19HE3072	**Career Guidance Level – III** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
10	19HE3073	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	19MA4101	Numerical Methods	BS	3	1	0	4	25	75	100
2	19EI4201	Electrical Machines	PC	3	1	0	4	25	75	100
3	19EI4202	Integrated Circuits and Its Applications	PC	3	0	0	3	25	75	100
4	19EI4203	Industrial Instrumentation – I	PC	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
5	19EI4251	Digital Logic Circuits	PC	2	1	2	4	50	50	100
PRACTICAL										
6	19EI4001	Electrical Machines Laboratory	PC	0	0	3	1.5	50	50	100
7	19EI4002	Integrated Circuits Laboratory	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
8	19MC4191	Essence of Indian tradition knowledge/Value Education	MC	2	0	0	0	100	0	100
9	19HE4072	**Career Guidance Level – IV** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	0	100
10	19HE4073	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	19EI5201	Industrial Instrumentation – II	PC	3	0	0	3	25	75	100

2	19EI5202	Control Systems	PC	3	1	0	4	25	75	100
3	19EI5203	Microprocessors and Microcontrollers	PC	3	0	0	3	25	75	100
4	19EI5204	Analytical Instrumentation	PC	3	0	0	3	25	75	100
5	19EI53XX	**Professional Elective -I**	PE	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
6	19EI5251	Programmable Logic Controllers and SCADA	PC	2	0	2	3	50	50	100
PRACTICALS										
7	19EI5001	Industrial Instrumentation Laboratory	PC	0	0	3	1.5	50	50	100
8	19EI5002	Microprocessors and Microcontrollers Laboratory	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
9	19HE5071	Soft Skills - I	EEC	1	0	0	1	100	0	100
10	19HE5072	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	19EI6181R	Industrial Safety Management	HS	3	0	0	3	25	75	100
2	19EI6201	Process Control	PC	3	0	0	3	25	75	100
3	19EI6202	Discrete Time and Signal Processing	PC	3	0	0	3	25	75	100
4	19EI63XX	**Professional Elective - II**	PE	3	0	0	3	25	75	100
5	19XX64XX	**Open Elective– I**	OE	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
6	19EI6251R	Embedded Systems	PC	2	0	2	3	50	50	100
PRACTICALS										
7	19EI6001	Process Control Laboratory	PC	0	0	3	1.5	50	50	100
8	19EI6002	Virtual Instrumentation Laboratory	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
9	19EI6701	Internship Training	EEC	0	0	0	1	0	100	100
10	19HE6071	Soft Skills - II	EEC	1	0	0	1	100	0	100
11	19HE6072	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	19EI7201R	Computer Control of Process	PC	3	0	0	3	25	75	100
2	19EI7202	Industrial Electronics	PC	3	0	0	3	25	75	100
3	19EI73XX	**Professional Elective-III**	PE	3	0	0	3	25	75	100
4	19XX74XX	**Open Elective – II**	OE	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
5	19EI7251R	Bio-Medical Instrumentation	PC	2	0	2	3	50	50	100
PRACTICALS										
6	19EI7001	Computer Control of Process Laboratory	PC	0	0	3	1.5	50	50	100
7	19EI7002	Instrumentation System Design Laboratory	PC	0	0	3	1.5	50	50	100
PROJECT WORK										
8	19EI7901	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	19EI83XX	**Professional Elective –IV**	PE	3	0	0	3	25	75	100
2	19EI81XX	**Professional Elective- V**	PE	3	0	0	3	25	75	100
PROJECT WORK										
3	19EI8901	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	19EI5301	Power Plant Instrumentation	PE	3	0	0	3	25	75	100
2	19EI5302	Communication Theory	PE	3	0	0	3	25	75	100
3	19IT5331	Fundamentals of Java Programming	PE	3	0	0	3	25	75	100
4	19EI5303	Industrial Chemical Process	PE	3	0	0	3	25	75	100
5	19EI5304	Operating Systems	PE	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE II										
1	19EI6301	VLSI Design	PE	3	0	0	3	25	75	100
2	19EI6302	Micro Electro Mechanical Systems	PE	3	0	0	3	25	75	100
3	19EI6303R	Industrial Data Communication	PE	3	0	0	3	25	75	100
4	19EI6304	Digital Image Processing	PE	3	0	0	3	25	75	100
5	19EI6305	Introduction to Soft Computing	PE	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE III										
1	19EI7301	Non-Linear Control System	PE	3	0	0	3	25	75	100
2	19EI7302	Industrial IoT	PE	3	0	0	3	25	75	100
3	19EI7303	Robotics and Automation	PE	3	0	0	3	25	75	100
4	19EI7304	Microcontroller Based System Design	PE	3	0	0	3	25	75	100
5	19EI7305	Neural Networks and Fuzzy Systems	PE	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE IV										
1	19EI8301	Fiber Optics and Laser Instruments	PE	3	0	0	3	25	75	100
2	19EI8302	Instrumentation in Petrochemical Industries	PE	3	0	0	3	25	75	100
3	19EI8303	Instrumentation System Design	PE	3	0	0	3	25	75	100
4	19EI8304	Artificial Intelligence and Machine Learning	PE	3	0	0	3	25	75	100
5	19EI8305	Instrumentation and Control in Paper Industry	PE	3	0	0	3	25	75	100

6	19EI8306	Chemical Process Instrumentation	PE	3	0	0	3	25	75	100

PROFESSIONAL ELECTIVE V										
S.No.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**
1	19EI8181	Disaster Management	PE	3	0	0	3	25	75	100
2	19EI8182	Total Quality Management	PE	3	0	0	3	25	75	100
3	19EI8183	Professional Ethics for Engineers	PE	3	0	0	3	25	75	100
4	19EI8184	Principles of Management	PE	3	0	0	3	25	75	100
5	19EI8185	Patent, Copyright and Competition Law	PE	3	0	0	3	25	75	100

LIST OF OPEN ELECTIVES

ELECTRONICS AND INSTRUMENTATION ENGINEERING										
S.No.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**
1	19EI6401	Smart Sensors for Engineering Applications	OE	3	0	0	3	25	75	100
2	19EI6402	Electrical Energy Management and Audit	OE	3	0	0	3	25	75	100
3	19EI7401	Introduction to Programmable Logic Controllers	OE	3	0	0	3	25	75	100
LIFE SKILL COURSES										
4	19LSZ401	General Studies for Competitive Examinations	OE	3	0	0	3	25	75	100
5	19LSZ402	Human Rights, Women's Rights and Gender Equality	OE	3	0	0	3	25	75	100
6	19LSZ403	Indian Ethos and Human Values	OE	3	0	0	3	25	75	100
7	19LSZ404	Indian Constitution and Political System	OE	3	0	0	3	25	75	100
8	19LSZ405	Yoga for Human Excellence	OE	3	0	0	3	25	75	100

(Note: Z Stands for semester, students can't choose twice the course)

ADDITIONAL CREDIT COURSE FOR ELECTRONICS AND INSTRUMENTATION ENGINEERING						
S.No	**Course Code**	**Course Title**	**Category**	**Duration**	**Assessment**	**Credit**
1.	19VAEI01	Design Project	VA	30 hrs	Internal	1
2.	19VAEI02	Basics of LabVIEW	VA	30 hrs	Internal	1
3.	19VAEI03	Proficiency in Graphical System Design with Hardware	VA	30 hrs	Internal	1

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 R2019

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

*** Student can earn extra credit 35 over and above the total credits**

Chairman BoS **Dean Academics** **Principal**

SYLLABUS REVISION

DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

Syllabus Revision R2019

Sl.No	Course Code & Name	Existing Syllabus	Revised Content	% Revision
1	**19EI7201- COMPUTER CONTROL OF PROCESS**	**UNIT – III** **PROCESS DYNAMICS** Basics elements of dynamic analysis- Process Model – Dynamic behavior of linear lower and linear higher order systems. Frequency response analysis- Inverse response systems, Time delay systems.	**UNIT – III** **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.	**20**
		UNIT – IV **PROCESS MODELLING AND IDENTIFICATION** Theoretical process modeling: Development, Examples, Parameter estimation and Validation. Process Identification: Principle of empirical modeling - Step, Impulse, Frequency response.	**UNIT-IV** System identification: LSE, RLSE.	
2	**19EI7251- BIO-MEDICAL INSTRUMENTATION**	**UNIT- II** **BIOPOTENTIAL ELECTRODES** Sources of bio electric potential - The origin of biopotentials : Electrical activity of excitable cells - ENG, EMG, ECG, ERG, EEG, MEG Electrode Theory - Biopotential electrodes : Electrode –electrolyte interface – Polarizable and non polarizable electrodes. Body surface recording electrodes, Internal electrodes, Electrode arrays, Micro electrode. ***Identify and measure the signals from the Metal plate, Disposable foam pad, Flexible, Internal, Implantable, Micro and Array***	**UNIT-II** Electrical safety in medical environment: shock hazards, leakage current-Instruments for checking safety parameters of biomedical equipment.	**25**

		type electrodes.		
		UNIT-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. ***Identification, inference & diagnostic study of imaging reports from X-Ray, Ultrasonic and Thermal Imaging systems.***	**UNIT-IV** Retinal Imaging - Imaging application in Biometric systems.	
		UNIT-V **THERAPEUTIC EQUIPMENTS** Cardiac pacemakers – Cardiac defibrillators – Instruments for surgery – Physitheraphy and electro theraphy equipment- Haemodialysis machines- Lithotriptors – Anaesthesia machine – Ventilators – Radiotheraphy equipment – Automatic drug delivery systems. ***Field study report on certain Recording & Monitoring instruments, Imaging systems & Therapeutic equipments at Hospital.***	**UNIT-V THERAPEUTIC AND ROBOTIC EQUIPMENTS** ICCU patient monitoring system - Nano Robots - Robotic surgery	

SYLLABUS

SEMESTER – VII

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19EI7201R	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.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19EI7202	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.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19EI7251R	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 – Radiotheraphy 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.

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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.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19EI7001	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.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19EI7002	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.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19EI7901	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.

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Professional Elective III

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19EI7301	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.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19EI7302R	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.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19EI7303	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.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19EI7304	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.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19EI7305	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.

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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

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Open Elective

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19EI7401	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.

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LIFE SKILL COURSES – OPEN ELECTIVE

Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech.	19LS6401	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.

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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.	19LS6402	**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".

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Programme	Course Code	Name of the Course	L	T	P	C
B.E./B.Tech.	19LS6403	**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.	19LS6404	**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.	19LS6405	**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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ADDITIONAL CREDIT COURSES FOR ELECTRONICS AND INSTRUMENTATION ENGINEERING – VALUE ADDED

Programme	Course code	Name of the course	L	T	P	C
B.E	19VAEI01	Design Project	0	0	2	1

Course Objective

1. Motivate the students to do develop a mini project in their area of interest.
2. Educate with the concept of building practical electronics project from simple design and development to specific application.
3. Building confidence and capability amongst the students for team building in specific application field.
4. Demonstrates the students about the stages of developing a project.

S.No.	Guidelines
1.	Students need to address solution to a problem of some basic real life applications.
2.	It is desirable that the electronic circuit/systems developed by the students have some novel ideas.
3.	Group of maximum three/four students can be permitted to work on a single mini project.
4.	The electronic circuit for the selected problem should have at least 10 to 25 components.
5.	The mini project must have hardware part.
6.	Students should understand and test various components and develop the necessary circuitry by mounting on bread board.
7.	Soldering of components should be carried out by students.
8.	Students may develop a necessary PCB for the circuit.
9.	Students should see that final circuit submitted by them is in working condition.
10.	20-25 pages report must be submitted by students along with the data sheets of Electronics, Electrical and Instrumentation devices/components used in the mini project.
11.	Demonstration with poster presentation of all mini projects developed has to be made by the students at the end of semester.

Course Outcome

CO1: Enable the students to design, fabricate the circuits for a project.
CO2: Familiarity with the concept of basic electrical and electronic circuits for the design and development of simple applications.
CO3: Develop team-building skills and enhance technical knowledge through design projects
CO4: Developing confidence and capability amongst the students for building major projects.
CO5: Usage of data Sheets for the selection of Electronics Electrical and Instrumentation devices/components.

REFERENCES:

1. Arsath Natheem S, “300 Electronic projects for inventors”, Kindle Edition.
2. Nikhil Shukla, “71 Electrical & Electronic Projects for Beginners, Intermediate and Engineering Students”, 2017.
3. Earl Boysen, Nancy C. Muir “Electronics Projects for Dummies”, Wiley 2006.
4. Neerparaj Rai, “ Arduino Projects for Engineers”, BPB publications, 2016

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Programme	Course code	Name of the Course	L	T	P	C
B.E	19VAEI02	Basics of LabVIEW	0	0	0	1

REVIEW OF VIRTUAL INSTRUMENTATION

Historical perspective, Need of VI, Advantages of VI, Define VI, block diagram & architecture of VI, data flow techniques, graphical programming in data flow, comparison with conventional programming..

LABVIEW PROGRAMMING ENVIRONMENT

Setting up and using a LabVIEW Project- Data Types - Predicting order-of-execution - Using basic functions to create a simple Acquire-Analyze-Visualize application.

LABVIEW PROGRAMMING FUNDAMENTALS

Loops - Arrays - Conditional code creation - Reading and Writing data to a file - Error handling using error clusters – Troubleshooting

PROGRAMMING BEST PRACTICES

SubVIs - Reusing Code; Clusters - Grouping Data of Mixed Data Types; Type Defs - Propagate Data Type Changes; Introduction to DAQmx

Course Outcome

1. Understand the basics of Virtual Instruments.
2. Interpret the LabVIEW programming environment.
3. Introduce the programming fundamentals.
4. Infer the best practices in programming environment.

REFERENCES:

1. National Instruments - LabVIEW Core 1 and Core 2 manual.
2. Jeffrey Travis, Jim Kring, “LabVIEW for Everyone”, 2007, 3rd edition, Prentice Hall Publications.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E	19VAEI03	Proficiency in Graphical System Design with Hardware	0	0	0	1

NI myDAQ - Data Acquisition and Signal Conditioning basics, analyzing the characteristics of circuits and electronic components

NI ELVIS II+ Analog and Digital electronics based experiments, Analyzing analog and digital signals.

NI myRIO - Data Acquisition basics, Measurement of Displacement and temperature, motor control, motion control.

PITSCO myTEMP - Multi-sensor temperature measurement and control system

EMONA myDSP - Signals and System analyzing and implementation of IIR and FIR filters.

EMONA myGLCD - Concepts related to enhancing myDAQ and myRIO applications with a local graphic display panel.

myQUAKE - Study of seismic wave propagation in building structures.

myVTOL - Basic concepts related flight dynamics with a vertical take-off and landing plant

cDAQ 9714 - Data acquisition of Sensor outputs and electrical measurements

NI 9219 - Measurement of signals from sensors such as strain gages, resistance temperature detectors (RTDs), thermocouples, load cells, and other powered sensors, quarter-bridge, half-bridge, and full-bridge current measurements.

Course Outcome

1. Understand the basics of Data Acquisition and analyzing hardwares.
2. Interpret the LabVIEW programming environment with the DAQ devices.
3. Test multi level projects.
4. Analyze theory concepts using real-time data.

REFERENCES:

1. National Instruments – myDAQ, myRIO, NI ELVIS II+ user manual.
2. Behzad Ehsani, "Data Acquisition using LabVIEW", 2017, 1st edition, Packt Publishing.

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Hindusthan College of Engineering And Technology
Approved by AICTE, New Delhi, Accredited with 'A' Grade by NAAC
(An Autonomous Institution, Affiliated to Anna University, Chennai)
Coimbatore - 641032

DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

ACADEMIC YEAR 2023-2024

REGULATIONS 2022 & 2019

CO'S, PO'S & PSO'S MAPPING

REGULATIONS 2022

SEMESTER I

22MA1101- Matrices and Calculus

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	3	-	-	-	-	-	-	2	2	1
CO2	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO3	3	3	3	2	3	-	-	-	-	-	-	2	2	2
CO4	3	3	3	3	3	-	-	-	-	-	-	2	2	3
CO5	3	3	3	3	3	-	-	-	-	-	-	2	1	2
Avg	3	3	3	2.6	2.8	-	-	-	-	-	-	2	1.8	2

22HE1151- English for Engineers

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	-	-	-	-	1	2	2	2	3	1	1	1	2
CO2	2	1	-	-	1	1	1	2	2	3	-	2	-	2
CO3	2	1	-	-	1	1	2	3	3	3	-	1	1	2
CO4	2	1	-	-	-	1	2	2	2	3	1	1	-	-
CO5	2	-	-	-	-	1	1	2	3	3	-	1	1	2
Avg	2	1	-	-	1	1	1.6	2.2	2.4	3	1	1.2	1	2

22CY1151- Chemistry for Circuit Engineering

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	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	3	1	2	1	1	-	1	-	2	2	-	1
CO5	2	3	3	2	2	1	1	-	1	-	1	2	-	-
Avg	2	2.6	2.6	1.4	1.4	1	1	-	1	-	1.2	2	-	1

22CS1151- Problem Solving using C Programming

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	3	-	2	-	-	-	-	-	-	2	2	2
CO2	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO3	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO4	2	3	3	-	2	-	-	-	2	-	-	2	2	2
CO5	2	3	3	-	2	-	-	-	2	-	-	2	2	2
Avg	2	3	3	-	2	-	-	-	2	-	-	2	2	2

22EI1201- Fundamentals of Electrical, Electronics and Instrumentation Engineering

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	3	3
CO2	3	2	2	-	-	-	-	-	-	-	-	1	3	3
CO3	3	3	2	2	-	-	-	-	-	-	-	1	2	3
CO4	3	2	2	-	-	-	-	-	-	-	-	2	2	3
CO5	3	3	3	3	-	-	-	-	-	-	-	2	2	3
Avg	3	2.6	2.2	1	-	-	-	-	-	-	-	1.4	2.2	3

SEMESTER III

22MA3102- Complex Analysis and Transforms

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	2	-	-	-	-	-	-	2	2	2
CO2	3	3	3	3	3	-	-	-	-	-	-	2	2	1
CO3	3	3	3	3	2	-	-	-	-	-	-	2	2	1
CO4	3	3	3	3	3	-	-	-	-	-	-	2	2	1
CO5	3	3	3	3	3	-	-	-	-	-	-	2	2	1
Avg	3	3	3	3	2.6	-	-	-	-	-	-	2	2	1.2

22EI3201-Electronic Instrumentation

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	-	-	-	-	-	-	3	3
CO2	3	3	2	-	-	2	-	-	-	-	-	-	3	2
CO3	3	3	1	-	-	-	-	-	-	-	-	-	3	3
CO4	3	2	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	-	-	-	-	0.8	3	2.8

22EI3203-Sensors and Transducers

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	2	1	-	-	-	-	2	3	2
CO2	3	3	2	-	-	2	1	-	-	-	-	2	3	2
CO3	3	2	2	2	-	-	1	-	-	-	-	1	2	3
CO4	3	2	2	-	-	-	1	-	-	-	-	2	3	3
CO5	3	2.4	3	3	1	-	1	-	-	-	-	2	3	3
Avg	2	1.2	2.2	1	0.4	0.4	1	-	-	-	-	1.4	2.8	2.6

22EE3202-Electric Circuit Analysis

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	2	-	-	-	-	-	-	-	3	3	3
CO2	3	3	2	2	-	-	-	-	-	-	-	2	2	3
CO3	3	2	3	3	-	-	-	-	-	-	-	2	3	2
CO4	2	2	3	2	-	-	-	-	-	-	-	1	2	3
CO5	3	2	2	3	-	-	-	-	-	-	-	2	3	3
Avg	2.8	2.6	2.6	2.2	-	-	-	-	-	-	-	2.2	2.6	2.8

19EI3251-Digital Electronics

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	2	1	-	-	-	-	-	-	1	2	3
CO2	3	3	2	2	-	-	-	-	-	-	-	2	2	3
CO3	3	2	3	3	2	-	-	-	-	-	-	1	2	3
CO4	2	2	3	2	-	-	-	-	-	-	-	1	2	3
CO5	3	2	1	3	2	-	-	-	-	-	-	2	3	3
Avg	2.8	2.6	2.4	2.2	0.6	-	-	-	-	-	-	1.4	2.2	3

22EE3001-Electric Circuits Laboratory

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	3	-	-	2	3
CO2	2	3	2	3	-	-	-	-	3	2	2	-	2	3
CO3	3	2	3	2	-	-	-	-	3	3	1	-	3	3
CO4	3	3	1	1	-	-	-	-	3	3	-	-	3	2
CO5	3	3	2	1	-	-	-	-	3	3	-	-	3	3
Avg	2.8	2.6	1.8	1.8	-	-	-	-	3	2.8	0.5	-	2.6	2.8

22EI3002-Sensors and Transducers Laboratory

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	3	1	-	2	3
CO2	3	3	2	3	-	-	-	-	3	2	2	-	2	3
CO3	3	2	3	2	-	-	-	-	3	3	1	-	3	3
CO4	3	3	1	1	-	-	-	-	3	3	-	-	3	3
CO5	3	3	2	2	-	-	-	-	3	3	1	-	3	3
Avg	3	2.6	1.8	2	-	-	-	-	3	2.8	1	-	2.6	3

REGULATIONS 2019 -Amendment

SEMESTER V

21EI5201 -Industrial Instrumentation – II

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	2	1	-	-	-	-	-	-	-	3	3
CO2	3	2	2	2	1	-	-	-	-	-	-	1	3	3
CO3	3	2	2	2	1	-	-	-	-	-	-	1	3	3
CO4	3	1	1	2	1	-	-	-	-	1	-	1	3	3
CO5	3	1	3	2	1	-	-	-	-	1	-		3	3
Avg	3	1.6	2	2	1	-	-	-	-	0.4	-	0.6	3	3

21EI5202 – Control Systems

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	3
CO2	3	-	2	-	-	2	-	-	-	-	-	-	3	3
CO3	-	1	2	2	2	2	-	-	-	-	-	-	2	3
CO4	3	-	2	-	-	-	-	-	-	-	-	2	3	3
CO5	1	3	3	3	-	-	-	-	-	-	-	2	3	3
Avg	2	1.2	2.2	1	0.4	0.4	-	-	-	-	-	0.8	2.8	3

21EI5203 - Microprocessors and Microcontrollers

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	-	-	-	-	1	3	2
CO2	3	-	2	-	-	2	1	-	-	-	-	1	3	2
CO3	-	1	2	2	-	-	1	-	-	-	-	1	2	3
CO4	3	-	2	-	-	-	1	-	-	-	-	2	2	3
CO5	1	3	3	3	1	-	1	-	-	-	-	2	1	3
Avg	2	1.2	2.2	1	0.4	0.4	1	-	-	-	-	1.4	2.2	2.6

21EI5204 - Analytical Instrumentation

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	3
CO2	3	-	2	-	-	2	-	-	-	-	-	-	3	3
CO3	-	1	2	2	-	-	-	-	-	-	-	-	2	3
CO4	3	-	2	-	-	-	-	-	-	-	-	2	2	3
CO5	1	3	3	3	-	-	-	-	-	-	-	2	3	3
Avg	2	1.2	2.2	1	-	0.4	-	-	-	-	-	0.8	2.6	3

21EI5251 - Programmable Logic Controllers and SCADA

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	1	3	1	-	-	-	-	-	2	3	2
CO2	3	2	3	2	2	1	-	-	-	-	-	3	3	3
CO3	3	1	2	3	2	1	-	-	-	-	-	2	2	2
CO4	3	2	3	3	3	-	-	-	-	-	-	2	3	3
CO5	3	1	3	2	3	1	-	-	-	-	-	2	2	3
Avg	3	2.2	2.8	2.2	2.4	0.8	-	-	-	-	-	2.2	2.4	2.1

21EI5001 - Industrial Instrumentation Laboratory

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	-	3	-	-	2	2	3
CO2	2	-	-	1	-	-	3	-	3	-	-	2	2	3
CO3	3	2	3	2	-	-	3	-	3	-	-	3	1	2
CO4	3	-	-	1	2	-	3	-	3	-	-	-	2	2
CO5	3	-	-	-	-	-	3	-	3	-	-	2	3	3
Avg	2.8	0.8	0.6	0.8	0.4	-	3	-	3	-	-	1.8	2.2	2.8

21EI5002-Microprocessors and Microcontrollers Laboratory

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	1	3	-	-	-	3	-	3	-	-	-	3	3
CO2	2	3	3	3	-	-	3	-	3	-	-	-	3	3
CO3	1	3	3	-	-	-	3	-	3	-	-	1	1	3
CO4	2	1	3	2	-	-	3	-	3	-	-	1	3	2
CO5	1	-	3	-	3	-	3	-	3	-	-	3	3	2
Avg	1.8	1.6	3	1	0.6	-	3	-	3	-	-	1	2.6	2.6

21EI5301 - Power Plant Instrumentation

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	-	1	-	1	-	1	1	1	1	-	-	2	2
CO2	-	2	2	2	1	2	1	-	-	-	-	-	2	2
CO3	2	2	2	-	1	1	1	-	1	-	-	-	2	2
CO4	2	2	2	-	1	1	1	-	-	-	1	1	2	2
CO5	-	1	2	1	1	1	1	-	-	-	1	-	2	2
Avg.	1.2	1.4	1.8	0.6	1	1	1	0.2	0.4	0.2	0.4	0.2	2	2

21EI5302 - Communication Theory

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	1	3	1	1	-	1	2	2
CO2	3	2	2	2	1	1	1	3	1	1	-	-	2	2
CO3	3	3	3	3	1	1	1	3	1	3	-	1	2	2
CO4	3	3	3	3	-	-	1	3	1	3	1	-	2	2
CO5	3	2	2	2	1	-	1	3	1	1	-	-	2	2
Avg.	3	2.4	2.4	2.4	0.8	0.8	1	3	1	1.8	0.4	0.6	2	2

21IT5331 - Fundamentals of Java Programming

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	1	1	1	1	-	1	1	1	-	1	1	-	1	2
CO2	3	2	2	2	-	1	1	-	1	-	-	-	1	2
CO3	3	3	3	3	1	1	1	-	-	-	1	-	1	2
CO4	2	2	1	2	1	1	1	-	-	-	-	-	1	2
CO5	3	3	3	2	-	-	1	1	1	1	1	1	1	2
Avg.	2.4	2.2	2	2	0.4	0.8	1	0.4	0.4	0.4	0.6	0.2	1	2

21EI5303 - Industrial Chemical Process

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	1	-	-	-	-	1	-	-	-	-	1	2	3
CO2	3	-	2	-	-	1	-	-	1	-	-	-	2	3
CO3	3	-	2	-	2	1	-	-	-	-	2	1	2	3
CO4	3	-	2	-	-	-	-	-	-	-	-	1	2	2
CO5	3	-	2	-	1	-	-	-	1	-	-	-	2	2
Avg	3	0.2	1.6	-	0.6	0.4	0.2	-	0.4	-	0.4	0.6	2	2.2

21EI5304 - Operating Systems

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	-	-	-	-	1	3	-	3	3	3
CO2	3	2	3	2	3	-	1	-	-	3	-	1	3	3
CO3	3	3	2	2	3	-	-	-	1	3	-	3	3	3
CO4	3	3	3	2	3	-	-	-	1	3	-	3	3	3
CO5	3	3	2	2		-	1	-	-	3	-	1	3	3
Avg	3	2.6	2.6	2	1.8	-	0.4	-	0.6	3	-	2.2	3	3

REGULATIONS 2019

SEMESTER VII

19EI7201 - Computer Control of Process

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	2
CO2	3	2	2	-	-	2	-	-	-	-	-	-	3	2
CO3	2	1	2	2	2	2	-	-	-	-	-	-	2	3
CO4	3	2	2	-	-	-	-	2	1	-	-	2	2	3
CO5	2	3	3	3	-	-	-	-	-	-	-	2	1	3
Avg	2.6	2.2	2.2	1	0.4	0.8	-	0.4	0.2	-	-	0.8	1.2	2.4

19EI7202- Industrial Electronics

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	1
CO2	1	3	2	-	2	-	-	-	-	-	-	-	2	1
CO3	2	1	3	-	2	-	-	-	-	-	-	-	3	1
CO4	2	3	1	-	1	-	-	-	-	-	-	-	2	2
CO5	2	2	2	-	2	-	-	-	-	-	-	-	1	2
Avg	2	1.8	2.2	-	1.4	-	-	-	-	-	-	-	2	1.4

19EI7251- Bio-Medical Instrumentation

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	2	3
CO2	3	3	1	-	-	-	-	-	-	-	-	2	2	3
CO3	2	2	3		1	-	-	-	-	-	-	1	2	2
CO4	2	2	3	2	-	-	-	-	-	-	-	1	2	3
CO5	3	1	-	-	2	-	-	-	-	-	-	2	3	2
Avg	2.6	2	1.6	0.4	0.6	-	-	-	-	-	-	1.4	2.2	2.4

19EI7001- Computer Control of Process Laboratory

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	2	3
CO2	2	1	2	-	-	-	-	-	3	-	-	2	1	3
CO3	3	1	3	2	-	-	-	-	3	-	-	-	1	3
CO4	3	1	-	-	2	-	2	-	3	-	-	-	1	2
CO5	3	2	-	2	1	-	-	-	3	-	-	2	3	3
Avg	2.8	1.2	1	0.8	0.6	-	0.4	-	3	-	-	1.2	1.4	2.8

19EI7002- Instrumentation System Design Laboratory

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	2	3
CO2	2	2	2	-	-	-	-	-	3	-	-	2	1	3
CO3	3	2	3	2	-	-	-	-	3	-	-	-	1	3
CO4	3	1	-	-	2	-	2	-	2	-	-	-	1	2
CO5	3	1	-	2	-	-	-	-	2	-	-	2	3	3
Avg	2.8	1.6	1	0.8	0.4	-	0.4	-	2.6	-	-	1.2	1.4	2.8

19EI7901- Project Work – Phase I

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	3	3	3	3	3	3
CO2	3	2	2	-	-	-	-	2	3	3	3	3	3	3
CO3	3	2	1	-	-	-	-	2	3	3	3	3	2	3
CO4	3	2	1	-	-		-	1	2	3	3	2	2	3
CO5	3	2	1	-	-	-	-	1	3	3	3	3	3	3
Avg	2.6	2	0.8	-	-	-	-	1.4	2.8	3	3	2.8	2.6	3

19EI7301- Non-Linear Control System

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	3
CO2	3	2	3	-	-	-	-	-	-	-	-	-	3	3
CO3	3	2	2	-	-	-	1	1	-	2	-	2	3	3
CO4	3	1	3	-	-	-	1	1	-	1	-	1	3	3
CO5	3	2	2	3	-	-	-	-	-	-	-	-	3	3
Avg	3	2.1	2	1	-	-	0.4	0.4	-	0.6	-	0.6	3	3

19EI7302- Industrial IoT

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	-	-	-	-	3	3
CO2	3	3	-	1	-	-	-	-	-	-	-	-	3	3
CO3	3	3	3	1	-	-	-	1	-	-	2	3	3	3
CO4	3	2	3	1	-	-	1	1	1	-	-	3	3	3
CO5	3	2	1	-	-	2	1	-	-	-	2	-	3	3
Avg	3	2.6	1.4	1	-	0.4	0.4	0.6	0.4	-	2	1.2	3	3

19EI7303- Robotics and Automation

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	-	-	2	1	-	-	3	3	3	3
CO2	3	2	2	3	-	-		1	-	-	-	2	3	3
CO3	3	2	-	3	-	-	2	1	-	-	2	2	2	3
CO4	3	3	1	3	-	-	1	1	1	-	2	3	2	3
CO5	3	3	-	3	-	-		1	-	-	2	3	3	3
Avg	3	3	0.8	3	-	-	1.2	1	0.2	-	1.8	2.6	2.6	3

19EI7304- Microcontroller Based System Design

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	2	-	-	-	3		-	-	-	2	3	3
CO3	3	3	2	-	-	1	2	1	-	1	-	2	2	3
CO4	3	3	-	-	-	1	-	-	-	1	1	2	3	3
CO5	3	3	1	3	3	-	-	-	-	-	1	3	3	3
Avg	3	3	1.4	0.6	0.6	0.4	1.2	0.4	-	0.4	0.4	2.2	2.8	3

19EI7305- Neural Networks and Fuzzy Systems

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	-	-	-	-	3	3
CO2	3	3	-	1	-	-	-	-	-	-	-	-	3	3
CO3	3	3	3	1	-	-	-	1	-	-	2	3	3	3
CO4	3	2	3	1	-	-	1	1	1	-	-	3	3	3
CO5	3	2	1	-	-	2	1	-	-	-	2	-	3	3
Avg	3	2.6	1.4	1	-	0.4	0.4	0.6	0.4	-	2	1.2	3	3

19EI7401- Introduction to Programmable Logic Controllers

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	1	3	1	-	-	-	-	-	2	3	2
CO2	3	2	3	2	2	1	-	-	-	-	-	3	3	3
CO3	3	1	2	3	2	1	-	-	-	-	-	2	2	2
CO4	3	2	3	3	3	-	-	-	-	-	-	2	3	3
CO5	3	1	3	2	3	1	-	-	-	-	-	2	2	3
Avg	3	2.2	2.8	2.2	2.4	0.8	-	-	-	-	-	2.2	2.4	2.1

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