ESTD:2008

NADIMPALLI SATYANARAYANA RAJU INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

(Approved by AICTE, New Delhi & Permanently Affiliated to JNTUGV, Vizianagaram)

Recognized under Section 2(f) & 12(B) of the UGC Act, 1956| Accredited by NAAC with 'A' Grade

Department of Electrical & Electronics Engineering

Few specific feedback received reflecting the needs of stakeholders at Local, Regional, National, International level

(The feedbacks are received through centralised online system using google form with timestamp and reflected in the Feedback Form by the Program Coordinator of Electrical & Electronics Engineering for documentation attested by the HoD). The received feedback (s) are further discussed in the internal pre-BoS meeting and escalated to the BoS for necessary approval.

1.1 Curriculum Design and Development

Geographical Location	Few samples feedback received	Integration into the curriculum		Semester	POs/PSOs
		Course Code	Course		
Regional	Communication	20HSX01	Communicative English	I	10
		-	Summer Internship	V & VII	5, 8, 9, 10, PSO 1
	Communication Coding & Modeling	-	Technical paper Writing	V	10
		20EES01	MATLAB	III	05
		20ESX02	Programming of Problem-solving using C	I	1, 4
	To incorporate courses/topics related to sustainable resources/BMS/EVT/SG	20EEH01	Smart Grid	IV	01, 02, 03, PSO1
		20EEH04	Electric Vehicle Technologies	V	01, 02, 03, PSO1
		20EEH07	Challenges and Impact of Electric Vehicle on Smart Grids	VI	01, 02, 03, PSO1

Commented [ds1]: Feedback received from the stakeholders as the upcoming technology in the motor field is related to Electric Vehicles. In that context, it is included in the curriculum and shown as proof. All other similar evidences are shown in trailing part of the proof.

27/11/23

Head of the Department
Dept. of Electrical & Electronics Engg.
N.S.Raju Institute of Technology
Sontyam, Visakhapatnam-531173

		20EEH10	Design and Testing of Battery Management System for Electric Vehicle	VII	01, 02, 03, PSO1
Local	Topics to strengthen the base of the Program Communication	-	Basics of Power Systems	III	01
		-	Basics of Induction Motors	IV	01
		20HSX01	Communicative English	I	10
		-	Summer Internship	V & VII	05, 8, 9, 10, PSO 1
		-	Technical paper Writing	V	10
	Coding & Modeling	20EES01	MATLAB	III	05
		20ESX02	Programming of Problem-solving using C	I	1, 4
National	Coding & Modeling	20EES01	MATLAB	III	05
		20ESX02	Programming of Problem-solving using C	I	1, 4
	Automation	20EES02	Programmable Logic Controllers (PLC)	IV	3, 4
		20EE407	Industrial Automation Lab	IV	4
	Communication	20HSX01	Communicative English	I	10
		-	Summer Internship	V & VII	5, 8, 9, 10, PSO 1
		-	Technical paper Writing	V	10
	Coding & Modeling	20EES01	MATLAB	III	05
		20ESX02	Programming of Problem-solving using C	I	1, 4
International	Coding & Modeling	20EES01	MATLAB	III	05
		20ESX02	Programming of Problem-solving using C	I	1, 4
	Automation	20EES02	Programmable Logic Controllers (PLC)	IV	3, 4
		20EE407	Industrial Automation Lab	IV	4

27/11/23.

Head of the Department
Dept of Electrical & Electronics Engg.,
N.S Raj Institute of Technology Autonomous
Sontyam, Visakhapatnam - 531 173

	Communication	20HSX01	Communicative English	I	10
		-	Summer Internship	V & VII	5, 8, 9, 10, PSO 1
		-	Technical paper Writing	V	10
	To incorporate courses/topics related to sustainable resources/BMS/EVT/SG	20EEH01	Smart Grid	IV	01, 02, 03, PSO1
		20EEH04	Electric Vehicle Technologies	V	01, 02, 03, PSO1
		20EEH07	Challenges and Impact of Electric Vehicle on Smart Grids	VI	01, 02, 03, PSO1
		20EEH10	Design and Testing of Battery Management System for Electric Vehicle	VII	01, 02, 03, PSO1
	Contemporary courses	-	Advanced Embedded System using IOT	V	04
		-	Industrial IOT	VI	04

20/11/23.

Head of the Department

The curriculum provides academic flexibility to choose any of the inter-disciplinary courses from MOOCs as approved by the respective Board of Studies and Academic Council. The students can take up this course on self-study mode. The course shall be of 45 – 60 hours duration and the assessment shall be as per the academic regulation 2020. OE

B. Tech. (Honors)

Category I								
1	20EEH01	Smart Grid	-	4	0	0	4.0	HO
2	20EEH02	Advanced Smart Power Grids	-	4	0	0	4.0	HO
3	20EEH03	Electric Power Quality	-	4	0	0	4.0	HO
Category II								
4	20EEH04	Electric Vehicle Technologies	-	4	0	0	4.0	HO
5	20EEH05	Energy Audit Conversation and Management	-	4	0	0	4.0	HO
6	20EEH06	Electrical Load Estimation	-	4	0	0	4.0	HO
Category III								
7	20EEH07	Challenges and Impact of Electric Vehicle on Smart Grids	-	4	0	0	4.0	HO
8	20EEH08	Optimization Techniques	-	4	0	0	4.0	HO
9	20EEH09	Illumination Engineering	-	4	0	0	4.0	HO
Category IV								
10	20EEH10	Design and Testing of Battery Management System for Electric Vehicle	-	4	0	0	4.0	HO
11	20EEH11	Advanced Power System Protection	-	4	0	0	4.0	HO
12	20EEH12	Power System Stability	-	4	0	0	4.0	HO

B. Tech. (Minor with Specialization)

Category I								
1	20CEM01	Air Pollution	-	3	0	0	3.0	MI
2	20CSM01	E-Commerce	-	3	0	0	3.0	MI
3	20MEM01	Biomaterials	-	3	0	0	3.0	MI
4	20EEM01	Basic Control Systems	-	3	0	0	3.0	MI
5	20ECM01	Semi-Conductor Devices and Circuits	-	3	0	0	3.0	MI
6	20AIM01	Fundamentals of Neural Networks	-	3	0	0	3.0	MI
7	20DSO03	Introduction to R Programming	-	3	0	0	3.0	MI
8	20SHM01	Psychology	-	3	0	0	3.0	MI
9	20SHM02	Statistical Methods	-	3	0	0	3.0	MI
10	20MBM01	General Management	-	3	0	0	3.0	MI
11	20MBM02	Human Resource Planning	-	3	0	0	3.0	MI
Category II								
12	20CEM02	Climate Change Mitigation and Adaptation	-	3	0	0	3.0	MI
13	20CSM02	Knowledge Discovery and Databases	-	3	0	0	3.0	MI
14	20MEM02	Micro Electromechanical Systems	-	3	0	0	3.0	MI
15	20EEM02	Basics of Electrical Machines and Drives	-	3	0	0	3.0	MI
16	20ECM02	Digital Electronics	-	3	0	0	3.0	MI
17	20AIM02	Machine Learning with Python	-	3	0	0	3.0	MI
18	20DSM02	Data Management and Analysis	-	3	0	0	3.0	MI
19	20SHM03	English for Media	-	3	0	0	3.0	MI
20	20SHM04	Statistical Inference	-	3	0	0	3.0	MI
21	20MBM03	Organization Behaviour	-	3	0	0	3.0	MI
22	20MBM04	Compensation Management & Employee Welfare Laws	-	3	0	0	3.0	MI
Category III								
23	20CEM03	Sustainability and Pollution Prevention Practices	-	3	0	0	3.0	MI
24	20CSM03	Database Security	-	3	0	0	3.0	MI
25	20MEM03	Surface Engineering	-	3	0	0	3.0	MI
26	20EEM03	Electrical Engineering Material Science	-	3	0	0	3.0	MI
27	20ECM03	Analog Electronic Circuits	-	3	0	0	3.0	MI
28	20AIM03	Interpretable Machine Learning	-	3	0	0	3.0	MI
29	20DSM03	Data Governance	-	3	0	0	3.0	MI
30	20SHM05	Journalism	-	3	0	0	3.0	MI
31	20SHM06	Statistical Quality Control	-	3	0	0	3.0	MI
32	20MBM05	Entrepreneurship & Business Venture Planning	-	3	0	0	3.0	MI
33	20MBM06	Performance Management & Talent Management	-	3	0	0	3.0	MI

HO 20EEH04 Electric Vehicle Technologies

4 0 0 4.0

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

Code	Course Outcomes	Mapping with PO's	DoK
20EEH04.1	Outline various electric and hybrid vehicle architectures		L2
20EEH04.2	Understand about drives and control.		L2
20EEH04.3	Select battery, battery indication system for EV applications		L3
20EEH04.4	Analyse battery charger for an EV		L4
20EEH04.5	Demonstrate different configurations of electric vehicles and its components		L2

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos

L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create, DoK:Depth of Knowledge

Unit I: Introduction to Electric and Hybrid Electric Vehicles **12 Hours**

Sustainable transportation, Brief history of electric vehicles (EV's), Hybrid electric vehicles, Fuel cell vehicles, Architectures of EV, Series HEV, Parallel HEVs, Diesel HEVs, PHEV & FCEV, Hybridization ratio, Interdisciplinary Nature of HEVs, Challenges and key technology of HEVs.

Unit II: Electric Machines and Drives in HEVs **12 Hours**

Introduction to induction motor drives and control Principle of operation and analysis of BLDC motor Drive, PMSM drive and SRM drive.

Unit III: Power Factor and energy instruments **12 Hours**

Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles: - Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Hybridization of different energy storage devices. Sizing the drive system, Design of Hybrid Electric Vehicle and Plug-in Electric Vehicle

Unit IV: Energy Management System **12 Hours**

Energy Management Strategies, Automotive networking and communication, EV charging standards, V2G, G2V, V2B, V2H. Business: E-mobility business, electrification challenges, Business- E-mobility business, electrification challenges

Unit V: Mobility and Connectors **12 Hours**

Connected Mobility and Autonomous Mobility- case study E-mobility Indian Roadmap Perspective. Policy: EVs in infrastructure system, integration of EVs in smart grid, social dimensions of EVs. Connectors- Types of EV charging connector, North American EV Plug Standards, DC Fast Charge EV Plug Standards in North America, CCS (Combined Charging System), CHAdeMO, Tesla, European EV Plug Standards

Text Books

1. Emadi, A. (Ed.), Miller, J., Ehsani, M., "Vehicular Electric Power Systems" Boca Raton, CRC Press, 2003.
2. Husain, I. "Electric and Hybrid Vehicles" Boca Raton, CRC Press, 2010.
3. Emadi, A. (Ed.), Miller, J., Ehsani, M., "Vehicular Electric Power Systems" Boca Raton, CRC Press, 2003

Reference Books

1. Larminie, James, and John Lowry, "Electric Vehicle Technology Explained" John Wiley and Sons, 2012.
2. Tariq Muneer and Irene Illescas García, "The automobile, In Electric Vehicles: Prospects and Challenges", Elsevier, 2017.
3. Sheldon S. Williamson, "Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles", Springer, 2013

Web References

1. https://nptel.ac.in/courses/108/106/108106170/
2. https://www.youtube.com/watch?v=3E1SXG7VkQk&list=PLHRG-unM84XgZd9HKQAmKdE12-1eRSe

CONTROL COPY ATTESTED

Chairman
Board of Studies (EEE)

Head of the Department
Dept of Electrical & Electronics Engg.
N.S Raju Institute of Engg. & Technology
Sontyam, Visakhapatnam - 531 173

Electrical and Electronics Engineering

Credit requirement for the award of the degree under academic Regulation 2020 – 2021 for the candidates admitted from the academic year 2021 onwards

	Four Years	Three Years
B. Tech. (Regular Degree)	160	121
B. Tech. (Honors Degree)	180	141
B. Tech. (With Minor specialization other than Chosen Branch of Engg. & Tech.)	180	141

Semester I

No.	Code	Course	POs	Contact Hours L	T1*	P	C	
01	20HSX01	Communicative English	10	3	0	0	3.0	HS
02	20BSX11	Linear Algebra and Differential Equations	1, 12[1]	3	1	0	3.0	BS
03	20BSX33	Applied Physics	1	3	1	0	3.0	BS
04	20ESX03	Basic Electrical Engineering	1	3	0	0	3.0	ES
05	20ESX02	Programming for Problem Solving Using 'C'	1	3	0	0	3.0	ES
06	20HSX02	Communicative English Lab	10	0	0	3	1.5	HS
07	20BSX34	Applied Physics Lab	1, 4	0	0	3	1.5	BS
08	20ESX07	Programming for Problem Solving Using 'C' Lab	1, 4	0	0	3	1.5	ES
			Sub-total	15	02	09	19.5	

Semester II

01	20BSX12	Partial Differential Equations and Vector Calculus	1	3	1	0	3.0	BS
02	20BSX23	Applied Chemistry	1	3	1	0	3.0	BS
03	20CS403	Python Programming	1	3	1	0	3.0	ES
04	20ESX04	Engineering Mechanics	1	3	1	0	3.0	ES
05	20ESX01	Engineering Drawing	1, 5, 10	1	0	4	3.0	ES
06	20BSX24	Applied Chemistry Lab	1, 4	0	0	3	1.5	BS
07	20CS407	Python Programming Lab	1	0	0	3	1.5	ES
08	20ESX06	Engineering Workshop	4	0	0	3	1.5	ES
09	20MCX01	Environmental Science	1	2	0	0	-	MC
			Sub-total	15	04	13	19.5	

Semester III

01	20BSX13	Numerical Methods and Transforms	1	3	1	0	3.0	BS
02	20EC302	Electronic Devices and Circuits	1, 3, 10	3	0	0	3.0	PC
03	20EE303	Electrical Circuit Analysis	1, 3, 10, PSO	3	1	0	3.0	PC
04	20EE304	DC Machines and Transformers	2,3, PSO 1	3	0	0	3.0	PC
05	20EE305	Power Generation and Transmission	2, 7, 10, PSO	3	0	0	3.0	PC
06	20EC306	Electronic Devices and Circuits Lab	4, PSO 1	0	0	3	1.5	PC
07	20EE307	DC Machines and Transformers Lab	4, PSO 1	0	0	3	1.5	PC
08	20EE308	Electrical Circuit Analysis Lab	4, PSO 1	0	0	3	1.5	PC
09	20EES01	MATLAB	5	1	0	2	2.0	SC
10	20MCX02	Constitution of India	-	2	0	0	-	MC
			Sub-total	18	02	11	21.5	

27/11/23

Head of the Department
Dept of Electrical & Electronics Engg.,
N.S.Raju Institute of Technology Autonomous
Sontyam, Visakhapatnam - 531 173

*Suggested hours for tutorial

[1]By default all courses are mapped to PO 12 as they are weakly contributing

No.	Code	Course	POs	Contact Hours L	T	P	C	
Semester IV								
01	20HSX03	Managerial Economics and Financial Analysis	11	3	0	0	3.0	HS
02	20BSX15	Probability and Statistics	1	3	1	0	3.0	BS
03	20EE403	Control Systems	3, PSO 1	3	0	0	3.0	PC
04	20EE404	Induction Motors and Synchronous Machines	2, 3, PSO 1	3	1	0	3.0	PC
05	20EE405	Electro Magnetic Field Theory	3, PSO 1	3	0	0	3.0	ES
06	20EE406	Induction Motors and Synchronous Machines Lab	4	0	0	3	1.5	PC
07	20EE407	Industrial Automation for Electrical & Electronics Engg.	4	0	0	3	1.5	PC
08	20EE408	Control Systems Lab	4, PSO 1	0	0	3	1.5	PC
09	20EES02	Programmable Logic Circuits	3, 4	1	0	2	2.0	SC
			Sub-total	16	02	11	21.5	
Semester V								
01	20EE501	Power Distribution and Distributed Generation	2, 3, 7, PSO 1	3	0	0	3.0	PC
02	20EE502	Power Electronics	2, 3, PSO 1	3	1	0	3.0	PC
03	20EC305	Digital System Design	1, 3	3	0	0	3.0	PC
04	-	Professional Elective I	-	3	0	0	3.0	PE
05	-	Open Elective I	-	3	0	0	3.0	OE
06	20EC308	Digital System Design Lab	4	0	0	3	1.5	PC
07	20EE507	Power Electronics Lab	4, PSO 1	0	0	3	1.5	PC
08	20EES03	MOOCs	12	0	0	0	2.0	SC
09	20MCX03	Intellectual Property Rights and Patents	-	2	0	0	-	MC
10	-	Summer Internship #1[2]	5, 8, 9, 10, PSO 1	0	0	0	1.5	IN
11	-	Technical Paper Writing	-	0	0	2	-	AC
			Sub-total	17	01	08	21.5	
Semester VI								
01	20EC603	Micro Processors and Micro Controllers	3	3	0	0	3.0	PC
02	20EE602	Electrical Measurements and Instrumentation	2, PSO 1	3	0	0	3.0	PC
03	20EE603	Power System Analysis	2, 3, 6, PSO 1	3	1	0	3.0	PC
04	-	Professional Elective II	-	3	0	0	3.0	PE
05	-	Open Elective II	-	3	0	0	3.0	OE
06	20EC606	Micro Processors and Micro Controllers Lab	4, 9	0	0	3	1.5	PC
07	20EE607	Electrical Measurements and Instrumentation Lab	4, PSO1	0	0	3	1.5	PC
08	20EE608	Power Systems and Simulation Lab	4, PSO1	0	0	3	1.5	PC
09	20EES04	P-SPICE	5	1	0	2	2.0	SC
10	20MCX04	Indian Traditional Knowledge	-	2	0	0	-	MC
			Sub-total	18	01	11	21.5	
Semester VII								
01	-	Professional Elective III	-	3	0	0	3.0	PE
02	-	Professional Elective IV	-	3	0	0	3.0	PE
03	-	Professional Elective V	-	3	0	0	3.0	PE
04	-	Open Elective III	-	3	0	0	3.0	OE
05	-	Open Elective IV	-	3	0	0	3.0	OE
06	20HSX04	Professional Ethics	8	3	0	0	3.0	HS
07	20EES05	E-CAD	5	1	0	2	2.0	SC
08	-	Summer Internship #2[2]	5, 8, 9, 10, PSO 1	0	0	0	3.0	
			Sub-total	19	0	02	23.0	
Semester VIII								
01	-	Full Semester Internship[3]	5-10, PSO 1, PSO	0	0	0	06	IN
02	-	Capstone Project[3]	5-10, PSO 1, PSO	0	0	0	06	IN
			Sub-total	0	0	0	12.0	
			Total Credits	-	-	-	160	

[2] The work pertaining to Summer Internship #1 and #2 shall be completed at the end of Semesters IV and VI respectively. The assessment shall be carried out during Semesters V and VII

[3] The students opting for FSI in VII Semester should take up the courses of VII Semester in VIII Semester

Head of the Department
Electrical & Electronics Engg.,
N S Raju Institute of Technology Autonomous
Sontyam, Visakhapatnam - 531 173

List of Electives

Professional Elective #1								
1	20EE001	Advanced Power Electronics	-	3	0	0	3.0	PE
2	20EE002	Digital Control Systems	-	3	0	0	3.0	PE
3	20EE003	Utilization of Electrical Energy	-	3	0	0	3.0	PE
4	20EE004	Machine Modelling and Analysis	-	3	0	0	3.0	PE
5	20EE005	Sensors and Transducers	-	3	0	0	3.0	PE
Professional Elective #2								
6	20EE006	Solid State Electric Drives	-	3	0	0	3.0	PE
7	20EE007	Advanced Control Systems	-	3	0	0	3.0	PE
8	20EE008	Reactive Power Compensation and Management	-	3	0	0	3.0	PE
9	20EE009	Basic Industrial Automation	-	3	0	0	3.0	PE
10	20EE010	Process Instrumentation	-	3	0	0	3.0	PE
Professional Elective #3								
11	20EE011	Switchgear Protection	-	3	0	0	3.0	PE
12	20EE012	Digital Signal Processing	-	3	0	0	3.0	PE
13	20EE013	HVDC and FACTS	-	3	0	0	3.0	PE
14	20EE014	Programmable Control Devices and Applications	-	3	0	0	3.0	PE
15	20EE015	Virtual Instrumentation	-	3	0	0	3.0	PE
Professional Elective #4								
16	20EE016	Analysis of Power Converters	-	3	0	0	3.0	PE
17	20EE017	Multivariable Control System	-	3	0	0	3.0	PE
18	20EE018	Power System Operation and Control	-	3	0	0	3.0	PE
19	20EE019	Automotive Electrical Engineering	-	3	0	0	3.0	PE
20	20EE020	Wireless Sensors and Instrument Networks	-	3	0	0	3.0	PE
Professional Elective #5								
The curriculum provides academic flexibility to choose any of the domain specific courses from MOOCs as approved by the respective Board of Studies and Academic Council. The students can take up this course on self- study mode. The course shall be of 45 – 60 hours duration (4-credits) and the assessment shall be as per the academic regulation 2020.								PE
Open Elective #1								
21	20CEO01	Urban Environmental Service	-	3	0	0	3.0	OE
22	20CSO01	Data Structures and Algorithms	-	3	0	0	3.0	OE
23	20AIO01	Machine Learning for Engineers	-	3	0	0	3.0	OE
24	20DSO01	Introduction to Database Management Systems	-	3	0	0	3.0	OE
25	20ECO01	Architectures and Algorithms of IoT	-	3	0	0	3.0	OE
26	20EEO01	Introduction to Renewable Energy Sources	-	3	0	0	3.0	OE
27	20MEO01	Nano Technology	-	3	0	0	3.0	OE
28	20SHO01	Women and Society	-	3	0	0	3.0	OE
Open Elective #2								
29	20CEO02	Ecology, Environment and Resources	-	3	0	0	3.0	OE
30	20CSO02	Designing the Internet of Things	-	3	0	0	3.0	OE
31	20AIO02	Fundamentals of Deep Learning	-	3	0	0	3.0	OE
32	20DSO02	Introduction to Data Science	-	3	0	0	3.0	OE
33	20ECO02	IoT for Smart Grids	-	3	0	0	3.0	OE
34	20EEO02	Electrical Safety and Management	-	3	0	0	3.0	OE
35	20MEO02	Fundamentals of Automobile Engineering	-	3	0	0	3.0	OE
Open Elective #3								
36	20CEO03	Disaster, Risk Mitigation and Management	-	3	0	0	3.0	OE
37	20CS404	Operating Systems	-	3	0	0	3.0	OE
38	20AIO03	Fundamentals of AI	-	3	0	0	3.0	OE
39	20DSO03	Introduction to Big Data	-	3	0	0	3.0	OE
40	20ECO03	Privacy and Security in IoT	-	3	0	0	3.0	OE
41	20EEO03	Low-cost Automation	-	3	0	0	3.0	OE
42	20MEO03	Industrial Automation	-	3	0	0	3.0	OE
43	20SHO02	Design Thinking	-	3	0	0	3.0	OE
Open Elective #4								

Head of the Department
Dept of Electrical & Electronics Engg.
N S Raju Institute of Technology Autonomous
Sontyam, Visakhapatnam - 531 173

List of Honors offered by Electrical and Electronics Engineering Program

1. Smart Electrical Vehicles
2. Advanced Power Systems
3. Advanced Power Quality

List of Minor with Specialization offered by Electrical and Electronics Engineering Program

1.Basics of Electrical Drives and Control

List of Minor's offered by the Freshman engineering and Management studies such as

1. Liberal Arts
2. Statistics
3. General Management
4. Human Resource Management these will be implemented for the 2021 admitted students

20/11/23.

Head of the Department
Dept of Electrical & Electronics Engg.,
N.S.Raju Institute of Technology Autonomous
Sontyam, Visakhapatnam - 531 173