RAGHU ENGINEERING COLLEGE (Autonomous)

(Approved by AICTE, New Delhi & Permanently Affiliated to JNTUGV, Vizianagaram) NBA and NAAC 'A+' grade accredited Institute.
Dakamarri, Bheemili Mandal, Visakhapatnam – 531162,A.P. Phone: 08922-248001
www.raghuenggcollege.com

INSTITUTE VISION

"Envisioning to be a world class technical institution by synergizing quality education with ethical values"

INSTITUTE MISSION

- To encourage training and research in cutting-edge technologies.
- To develop and strengthen strategic links with the industry.
- To kindle the zeal among the students and promote their quest for academic excellence.
- To encourage extra-curricular activities along with good communication skills.

QUALITY POLICY

"RAGHU Engineering College underscores ethical values along with innovative teaching through an interactive, activity-based pedagogy; establishes the best of infrastructural facilities, inculcates engineering temper among the students through the use of the latest Information and Communication Technologies, and strives for an efficient, responsive and transparent administration in all areas"

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

VISION

"To produce Electrical and Electronics Engineers through quality education with exposure to state of art technology and innovation with ethical values"

MISSION

- M1 : Empowering students and professionals with state-of-art knowledge and Technological skills.
- M2 : To prepare students for higher studies and entrepreneurship.
- M3 : To impart essential skills of leadership, teamwork, communication and ethics among the students.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

- **PEO 1:**
  Domain Knowledge:
  Graduates will have knowledge in basic science, mathematical tools and fundamental engineering stream with contemporary problem solving, critical analysis in Electrical and Electronics Engineering and its allied areas.

- **PEO 2:**
  Communication Skills & Employability:
  Graduates will have careers in the diversified sectors of electrical power industry, software industries and also encouraged for higher education and research.

- **PEO 3:**
  Life Long Learning & Social Concern:
  Graduates will be able to communicate effectively, adopt lifelong learning act with integrity and have inter personal skills needed to engage in, lead and nurture diverse teams with commitment to their ethical and social responsibilities.

MAPPING OF MISSION STATEMENTS WITH PEOs

MS/PEO	PEO 1	PEO 2	PEO 3
M1	3	3	2
M2	2	2	3
M3	2	3	2

1-Slight, **2**- Moderate, **3**- Substantial

PROGRAMME OUTCOMES

Graduates of Electrical and Electronics Engineering Will:

PO 1	**Engineering knowledge :** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO 6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO 1: On successful completion of the B. Tech. (EEE) Program, the graduates will be able to apply technical knowledge and usage of modern hardware & software tools related to Electrical and Electronics Engineering for solving real world problems.

PSO 2: On successful completion of the B. Tech. (EEE) Program, the graduates will be able to analyse, comprehend, design & develop Electrical subsystems/systems for a variety of engineering applications and thus demonstrating professional ethics and concern for societal wellbeing.

MAPPING OF PEOS WITH POS AND PSOS:

PEO/POs	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
PEO 1	3	3	3	3									3	3
PEO 2						3	3	3	3	3	3		2	2
PEO 3									3	3		3	2	2

1-Slight, **2-** Moderate**, 3-** Substantial

2302104 - POWER SYSTEMS – I

(Only for EEE)

Programme & Branch	B.Tech & EEE	Sem	Category	L	T	P	Credit
Prerequisites	Electrical Circuit Analysis – I Electrical Circuit Analysis – II	**4**	**PC**	**3**	**0**	**0**	**3**

Course Objectives:

1. To study the principle of operation of different components of a hydro, thermal and nuclear power stations
2. To study construction and operation of different components of an Air and Gas Insulated substations
3. To study regarding the DC and AC distribution systems
4. To study different types of load curves and tariffs applicable to consumers.
5. To study the concept of illumination and its applications

Preamble:	The aim of this course is to allow the students to understand the concepts of the generation, distribution and utilization of electrical power system

Course Contents:

Unit-1	Conventional Power Stations	Contact Hours: 9

Hydroelectric Power Stations:

Selection of site, general layout of a hydroelectric power plant with brief description of major components and principle of operation

Thermal Power Stations:

Selection of site, general layout of a thermal power plant. Brief description of components: boilers, super heaters, economizers and electrostatic precipitators, steam turbines: impulse and reaction turbines, condensers, feed water circuit, cooling towers and chimney.

Nuclear Power Stations:

Location of nuclear power plant, working principle, nuclear fission, nuclear fuels, nuclear chain reaction, nuclear reactor components: moderators, control rods, reflectors and coolants, types of nuclear reactors and brief description of PWR, BWR and FBR. Radiation: radiation hazards and shielding, nuclear waste disposal.

Unit-2	Substations	Contact Hours: 9

Air Insulated Substations – indoor & outdoor substations, substations layouts of 33/11 kV showing the location of all the substation equipment. Bus bar arrangements in the sub-stations: simple arrangements like single bus bar, sectionalized single bus bar, double bus bar with one and two circuit breakers, main and transfer bus bar system with relevant diagrams.

Gas Insulated Substations (GIS) – advantages of gas insulated substations, constructional aspects of GIS, comparison of air insulated substations and gas insulated substations.

Unit-3	Distribution Systems	Contact Hours: 9

Classification of Distribution Systems - Comparison of DC vs AC and Under-Ground vs Over Head Distribution Systems- Requirements and Design Features of Distribution Systems. Design Considerations of Distribution Feeders: Radial and Ring Types of Primary Feeders, Voltage Levels, Feeder Loading, Basic Design Practice of the Secondary Distribution System. Voltage Drop Calculations (Numerical Problems) In A.C. Distributors for The Following Cases: Power Factors Referred to Receiving End Voltage and With Respect to Respective Load Voltages

Unit-4	Economic Aspects & Tariff	Contact Hours: 9
Economic Aspects – load curve, load duration and integrated load duration curves, discussion on economic aspects: connected load, maximum demand, demand factor, load factor, diversity factor, plant capacity factor and plant use factor, base and peak load plants. **Tariff Methods**– Costs of generation and their division into fixed, semi-fixed and running costs, desirable characteristics of a tariff method, tariff methods: simple rate, flat rate, block- rate, two-part, three–part, and power factor tariff methods.		
Unit-5	**Illumination**	**Contact Hours: 9**
Introduction, terms used in illumination–Laws of illumination–Polar curves–Integrating sphere–Lumens, Lux meter–Discharge lamps. Comparison between tungsten filament lamps and fluorescent tubes–Basic principles of light control – Types and design of lighting and flood lighting – LED lighting, principle of operation, street lighting and domestic lighting – Conservation of energy.		
		Total Hours: 45

Text Books:	
1	Electrical Power Systems – Wadhwa C.L , Eighth Edition, 2022, New Age International (P) Ltd.
2	I.J. Nagarath & D.P. Kothari, Power System Engineering, McGraw-Hill Education, 3rd Edition, 2019.
3	C.L.Wadhwa, Generation, Distribution and Utilization of Electrical Energy, New Age International Publishers, 6th Edition, 2018.
Reference Books:	
1	Turan Gonen, Electric Power Distribution System Engineering, McGraw-Hill, 3rd edition 2014.
2	Turan Gonen, Electric Power Transmission System Engineering, Willey & Sons, 3rd edition 2014.
Web References :	
1	https://nptel.ac.in/courses/108102047

Course Outcomes:

Upon completion of the course, students shall have ability to		**BT Mapped** (Highest Level)
CO 1	Understand the different types of power plants, operation of hydroelectric, thermal and nuclear	L2
CO 2	Describe the different components of air and gas insulated substations	L2
CO 3	Discuss the various types of distribution systems and analyze for both DC and AC systems	L3
CO 4	Analyze different economic factors of power generation and tariffs	L3
CO 5	Discuss regarding the illumination and the laws governing the illumination	L2

Mapping of Cos with POs and PSOs

COs/ POs	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
CO 1	3	3	3										3	2
CO 2	3	2		2									3	2
CO 3	3	3			2	2							3	2
CO 4	2	2	1	1									2	1
CO 5	3	2	2		2								3	2
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy														

Assessment Pattern - Theory							
TEST	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total%
Mid-1	12	8	80				100
Mid-2	12	8	80				100
SEE	12	8	80				100
* ± 3% May be varied							