Vidya Jyothi Institute of Technology

(An Autonomous Institution)

Accredited by NAAC & NBA, Approved By A.I.C.T.E., New Delhi, Permanently Affiliated to JNTUH, Hyderabad

Aziz Nagar, C.B.Post, Hyderabad -500075

Board of Studies Meeting

of

Department of Electrical and Electronics Engineering

held on 29.06.2020

Vidya Jyothi Institute of Technology

An Autonomous Institution

(Accredited by NAAC & NBA, Approved by AICTE New Delhi & Permanently Affiliated to JNTUH)

Aziz Nagar Gate, C.B. Post, Hyderabad-500 0

Department of Electrical and Electronics Engineering

BOS MEETING ON 29- 06-2020 at 11:00 AM

AGENDA

1. To discuss and decide the course structure and syllabi of III Year and IV Year B.Tech Electrical and Electronics Engineering for the students admitted under R18 Regulations (including FASTTRACK batch). **Annexure - I**
2. To discuss and decide the course structure and syllabi of II, III and IV Year B.Tech Electrical and Electronics Engineering for the students admitted under R19 Regulations. (including FAST TRACK batch). **Annexure - II**
3. To discuss and decide the syllabi of the subjects offered by EEE Department for other departments admitted under R18 and R19 Regulations: **Annexure - III**
   1. Electrical Technology (for II B. Tech ECE II semester (R19))
   2. Control Systems (for III B. Tech ECE I Semester(R18 and R19))
   3. Basic Electrical Engineering (for II B. Tech Mechanical II Semester(R19))
   4. Basic Electrical Engineering Laboratory(for II B.Tech Mechanical II Semester(R19))
   5. Principles of Electrical Engineering(for II B. Tech Civil Engineering II Semester(R 19))
4. To approve on the adoption of the syllabi of Basic Electrical Engineering (Theory and Laboratory) of I B Tech R19 Regulations of Artificial Intelligence to I B. Tech "Data Science and AI" Branch from A.Y 2020-21. **Annexure - IV**
5. To discuss and decide substitute subjects for rejoined students of R18 regulation (VJIT Autonomous). **Annexure - V**
6. To Approve Panel of Examiners.
7. Any other matter with the permission of the Chair.

1. 2. 3. 4.

5. 6. 7. 8.

9. 10. 11.

Vidya Jyothi Institute of Technology

An Autonomous Institution

(Accredited by NAAC & NBA, Approved by AICTE New Delhi & Permanently Affiliated to JNTUH)

Aziz Nagar Gate, C.B. Post, Hyderabad-500 0

Department of Electrical and Electronics Engineering

Minutes of the Board of studies of Department of Electrical and Electronics Engineering meeting held on 29-06-2020 at 11:00 AM.

The following members were present in the meeting.

S. No	Name of the Member	Designation	Signature
1	Dr. A. Srujana, Professor and HOD/EEE,VJIT	Chairperson	
2	Dr. K. H. Phani Sree, Associate Professor/ EEE, JNTUH,	JNTUH Nominee	
3	Mr. P. Chow Reddy, Managing Director, Interleaved Multidisciplinary Research Centre	External Member	
4	Dr. T. Anil Kumar, Professor &HOD/EEE, Anurag University	External Member	
5	Dr. G. Suresh Babu, Professor& HOD /EEE, CBIT	External Member	
6	Dr. P. Ram Kishore Kumar Reddy, Professor & HOD/EEE, MGIT	External Member	
7	Dr. S. Siva Prasad, Professor/EEE,VJIT	Internal Member	
8	Dr. D. B. G. Reddy, Professor/EEE,VJIT	Internal Member	
9	Dr. C. N. Ravi, Professor/EEE, VJIT	Internal Member	
10	Dr. G. Madhusudhana Rao, Professor/EEE, VJIT	Internal Member	
11	Mr. B. Rajesh, Assistant Professor/EEE,VJIT	Internal Member	

Department of Electrical and Electronics Engineering

Resolutions

Item No.1: To discuss and decide the course structure and syllabi of III Year and IV Year B. Tech. Electrical and Electronics engineering for the students admitted under R18 Regulation

The Chairperson presented the course structure and syllabi ofIII Year and IV Year B. Tech.EEE subjects as per Annexure-I.

After discussing various aspects of the Course Structure and syllabi the committee passed the following resolution.

Resolution(1): The members after thorough discussion approved the course structure and syllabi of III Year and IV Year B. Tech. in Electrical and Electronics Engineering for R18 Regulation as per Annexure-I

Noted and Approved.

Item No.2: To discuss and decide the course structure and syllabi of Fast track Curriculum scheme offered to III Year and IV Year B. Tech. Electrical and Electronics engineering for the students admitted under R18 Regulation

The Chairperson presented the course structure and syllabiof III Year and IV Year B. Tech.EEE Fast Track Curriculum Scheme (FTCS) subjects as per Annexure-I.

After discussing various aspects of the Course Structure and syllabi the committee passed the following resolution.

Resolution(2): The members after thorough discussion approved the course structure and syllabi of Fast Track Curriculum Scheme(FTCS) offered to III Year and IV Year B. Tech. in Electrical and Electronics Engineering for R18 Regulation as per Annexure-I

Noted and Approved.

Item No. 3: To discuss and decide the course structure and syllabi of II, III and IV Year B. Tech. Electrical and Electronics Engineering, for the students admitted under R19 Regulation.

The Chairperson presented the course structure and syllabi of II Year, III Year and IV Year B. Tech. EEE subjects as per Annexure-II.

After discussing various aspects of the Course Structure and syllabi the committee passed the following resolution.

Resolution (3): The members after thorough discussion approved the course structure and syllabi of II Year, III Year and IV Year B. Tech. in Electrical and Electronics Engineering for R 19 Regulation as per Annexure-II.

Noted and Approved.

1. 2. 3. 4.

5. 6. 7. 8.

9. 10. 11.

Department of Electrical and Electronics Engineering

Item No. 4: To discuss and decide the course structure and syllabi of Fast track Curriculum Scheme offered to II, III and IV Year B. Tech. Electrical and Electronics Engineering, for the students admitted under R19.

The Chairperson presented the course structure and syllabi of II Year, III Year and IV Year B. Tech. EEE subjects Fast track Curriculum Scheme (FTCS) as per Annexure-II.

After discussing various aspects of the Course Structure and syllabi the committee passed the following resolution.

Resolution (4): The members after thorough discussion approved the course structure and syllabi of Fast Track Curriculum Scheme(FTCS) offered to II Year, III Year and IV Year B. Tech. in Electrical and Electronics Engineering for R 19 Regulation as per Annexure-II.

Noted and Approved.

Item No. 5: To discuss and decide the syllabi of the subjects offered by EEE Department to other departments admitted under R18 and R19 Regulations:

(i) The Chairperson presented the syllabi ofsubjectsoffered to B. Tech. ECE, Mechanical and Civil EngineeringBranchesviz:

1. Electrical Technology (for II B.Tech. ECE II semester(R19))
2. Control Systems (for III B. Tech. ECE I Semester(R18 and R19))
3. Basic Electrical Engineering (for II B. Tech. Mechanical II Semester(R19))
4. Basic Electrical Engineering Laboratory(for II B. Tech. Mechanical II Semester(R19))
5. Principles of Electrical Engineering(for II B. Tech. Civil Engineering II Semester(R19))

(ii) Further,the Chairperson presented subjects along with syllabi offered as Open Electives for other Branches of Engineering in the college viz:

1. Non Conventional Energy Sources (OE-1 for R18 & R19)
2. Fundamentals of Electrical Power Generation and Protection(OE-1 for R18 & R19)
3. Energy Audit and Conservation (OE-2 for R18 & R19)
4. Principles of Electric Power Utilization(OE-2 for R18 & R19)
5. Electric Vehicles and Hybrid Vehicles(OE-3 for R18 & R19)
6. Energy Storage Systems(OE-3 for R18 & R19)

After discussion and deliberation the committee approved the subjects along with the syllabi and passed the following resolution.

Resolution (5): The members after thorough discussion approved the syllabi of subjectsoffered to B. Tech. ECE, Mechanical and Civil Engineering Branchesand Open Elective subjects offered to other Branches mentioned in Item 5as per Annexure -III.

Noted and Approved.

1. Apara
2. K. H Phani Bhushan
3. Accepted
4.
5.
6.
7. Accepted
8.
9. C.V. Rao
10.
11. Brijesh

Item No. 6: To approve on the adoption of the syllabi of Basic Electrical Engineering (Theory and Laboratory) of I B. Tech R 19 Regulations of Artificial Intelligence to I B. Tech. Data Science and AI Branch from A.Y 2020-21.

The Chairperson presented syllabi of Basic Electrical Engineering (Theory and Laboratory) of I B.Tech R19 Regulations of Artificial Intelligence and discussed that it can be adopted to I B. Tech. Data Science and AI Branch.

After discussing various aspects of the syllabi the committee passed the following resolution

Resolution (6): The members after thorough discussion approved the syllabi of Basic Electrical Engineering subject and Basic Electrical Engineering Laboratory for I B.Tech for Data Science and AI Engineering Branch as per Annexure -IV.

Noted and Approved.

Item No. 7: To discuss and decide substitute subjects for rejoined students of R18regulation (VJIT Autonomous).

The Chairperson presented the substitute subjects for rejoining students of R18 ((VJIT Autonomous) as per Annexure - V
After discussing various aspects of the subjects the committee passed the following resolution

Resolution (7): The members after thorough discussion approved the substitute subjects for rejoined students of R 18 (VJIT Autonomous) as per Annexure -V. The BoS Chairperson is authorized to choose and approve the substitute subjects for rejoined students.

Noted and Approved.

1. 2. 3. 4.
5. 6. 7. 8.
9. 10. 11.

Item No. 8: To approve the Panel of examiners

The Chairperson explained on the requirement and emphasized on the panel of examiners, whose services will be utilized, as and when required for preparation of the question paper for End Semester examination and also for evaluation of the Answer scripts of the End Semester Examinations. The panel of the examiners will be prepared in consultation with the senior faculty of the department. They will be paid remuneration as per the recommendations of College Finance Committee.

Resolution (8): The committee of BoS, after discussion, authorized the Chairperson of BoS to prepare the Panel of examiners, as and when required in consultation with the senior faculty members for both B. Tech. (EEE) courses under R18 and R19 regulations. The same may be submitted to the Examination branch (Autonomous) for further processing.

Noted and Approved.

The Board of studies Meeting concluded with Vote of Thanks.

1. 2. 3. 4.
5. 6. 7. 8.
9. 10. 11.

Annexure - I

R18 III B. Tech. EEE Course Structure

I Semester

S. No	Course Category	Course Title	L	T	P	Credits
1	H&S – 2	Managerial Economics and Financial Analysis	3	-	-	3
2	ES – 3	Switching Theory and Logic Design	3	-	-	3
3	PC – 8	Electrical Machines III	3	-	-	3
4	PC – 9	Power Electronics	3	-	-	3
5	PE – 1	Electrical Energy Conservation and Auditing / Electrical Estimation and Costing	3	-	-	3
6	OE – 1	Non Conventional Energy Sources / Fundamentals of Electrical Power Generation and Protection	3	-	-	3
7	PC Lab – 5	Electrical Machines -II Lab	0	-	2	1
8	PC Lab – 6	Advanced Communication Skills Lab	0	-	2	1
9	MC – 3	Quantitative Methods & Logical Reasoning	2	-	-	1
		Total number of Credits				**21**

II Semester

S. No	Course Category	Course Title	L	T	P	Credits
1	PC – 10	Electrical Measurements & Instrumentation	3	-	-	3
2	PC – 11	Computer Methods in Power Systems	3	-	-	3
3	PC – 12	Power Semiconductor Drives	3	-	-	3
4	PC – 13	Switch Gear and Protection	3	-	-	3
5	PE – 2	Integrated Circuit Analysis / Artificial Intelligence Techniques in Electrical Engineering	3	-	-	3
6	OE – 2	Energy Auditing and Conservation / Principles of Electric Power Utilization	3	1	-	3
7	PC Lab – 7	Control Systems and Simulation Lab	0	-	2	1
8	PC Lab – 8	Power Electronics and Simulation Lab	0	-	2	1
9	MC – 4	Personality Development & Behavioural Skills	2	-	-	1
		Total number of Credits				**21**

1. 2. 3. 4.

5. 6. 7. 8.

9. 10. 11.

Vidya Jyothi Institute of Technology

An Autonomous Institution

(Accredited by NAAC & NBA, Approved by AICTE New Delhi & Permanently Affiliated to JNTUH)

Aziz Nagar Gate, C.B. Post, Hyderabad-500 0

Department of Electrical and Electronics Engineering

R 18IV B.Tech. EEE Course Structure

I Semester

S. No	Course Category	Course Title	L	T	P	Credits
1	PC -14	Microprocessors and Interfacing Devices	3	-	-	3
2	PC -15	Power Systems Operation and Control	3	-	-	3
3	PE - 3	Electric Vehicles/ Smart Grids	3	-	-	3
4	PE – 4	Electrical Distribution Systems/ Industrial Electrical Systems	3	-	-	3
5	OE-3	Electric Vehicles and Hybrid Vehicles/ Energy Storage Systems	3	1	-	3
6	PC Lab – 9	Microprocessorsand Interfacing Lab	0	-	2	1
7	PC Lab – 10	Electrical Measurements Lab	0	-	2	1
8	-	Mini Project		-	-	3
					Total number of Credits	**20**

II Semester

S. No	Course Category	Course Title	L	T	P	Credits
1	PC -16	Utilization of Electrical Energy	3	1	-	3
2	PC -17	Renewable Energy and Energy Storage Technologies	3	1	-	3
3	-	Technical Seminar	2	1	-	2
4	-	Comprehensive Viva Voce	-	-	-	2
5	-	Major Project	-	-	-	10
					Total number of Credits	**20**

1. 2. 3. 4.

5. 6. 7. 8.

9. 10. 11.

Vidya Jyothi Institute of Technology

An Autonomous Institution

(Accredited by NAAC & NBA, Approved by AICTE New Delhi & Permanently Affiliated to JNTUH)

Aziz Nagar Gate, C.B. Post, Hyderabad-500 0

Department of Electrical and Electronics Engineering

R18 B. Tech. EEE Course Structure (for FAST TRACK)

III Year I Semester

S. No.	Course Category	Course Title	L	T	P	Credits
1	H&S – 2	Managerial Economics and Financial Analysis	3	-	-	3
2	ES – 3	Switching Theory and Logic Design	3	-	-	3
3	PC – 8	Electrical Machines III	3	-	-	3
4	PC – 9	Power Electronics	3	-	-	3
5	PE – 1	Electrical Energy Conservation and Auditing / Electrical Estimation and Costing	3	-	-	3
6	OE – 1	Non Conventional Energy Sources / Fundamentals of Electrical Power Generation and Protection	3	-	-	3
7	PC Lab – 5	Electrical Machines -II Lab	0	-	2	1
8	PC Lab – 6	Advanced Communication Skills Lab	0	-	2	1
9	MC – 3	Quantitative Methods & Logical Reasoning	2	-	-	1
					Total number of Credits	21

III Year II Semester

S. No.	Course Category	Course Title	L	T	P	Credits
1	PC – 10	Electrical Measurements & Instrumentation	3	-	-	3
2	PC – 11	Computer Methods in Power Systems	3	-	-	3
3	PC – 12	Power Semiconductor Drives	3	-	-	3
4	PC – 13	Switch Gear and Protection	3	-	-	3
5	PE – 2	Integrated Circuit Analysis / Artificial Intelligence Techniques in Electrical Engineering	3	-	-	3
6	OE – 2	Energy Auditing and Conservation / Principles of Electric Power Utilization	3	1	-	3
7	PC Lab – 7	Control Systems and Simulation Lab	0	-	2	1
8	PC Lab – 8	Power Electronics and Simulation Lab	0	-	2	1
9	MC – 4	Personality Development & Behavioural Skills	2	-	-	1
10	PC -16	Utilization of Electrical Energy	3	1	-	3
					Total number of Credits	24

1. 2. 3. 4.

5. 6. 7. 8.

9. 10. 11.

Vidya Jyothi Institute of Technology

An Autonomous Institution

(Accredited by NAAC & NBA, Approved by AICTE New Delhi & Permanently Affiliated to JNTUH)

Aziz Nagar Gate, C.B. Post, Hyderabad-500 0

Department of Electrical and Electronics Engineering

R18 B. Tech. EEE Course Structure (for FAST TRACK)

IV Year I Semester

S. No.	Course Category	Course Title	L	T	P	Credits
1	PC -14	Microprocessors and Interfacing Devices	3	-	-	3
2	PC -15	Power Systems Operation and Control	3	-	-	3
3	PE - 3	Electric Vehicles/ Smart Grids	3	-	-	3
4	PE – 4	Electrical Distribution Systems/ Industrial Electrical Systems	3	-	-	3
5	OE-3	Electric Vehicles and Hybrid Vehicles/ Energy Storage Systems	3	1	-	3
6	PC Lab – 9	Microprocessorsand Interfacing Lab	0	-	2	1
7	PC Lab – 10	Electrical Measurements Lab	0	-	2	1
8	-	Mini Project		-	-	3
9	PC -17	Renewable Energy and Energy Storage Technologies	3	1	-	3
					Total number of Credits	23

IV Year II Semester

S. No.	Course Category	Course Title	L	T	P	Credits
1	-	Technical Seminar	2	1	-	2
2	-	Comprehensive Viva Voce	-	-	-	2
3	-	Major Project	-	-	-	10
					Total number of Credits	14

1. 2. 3. 4.

5. 6. 7. 8.

9. 10. 11.

B. Tech. EEE III Year I Semester

L	T	P	C
3	0	0	3

ELECTRICAL MACHINES-III

Prerequisite: Basic Electrical Engineering, Electrical Machines-I, Electrical Machines-II

Course Objectives:

- To explain the operation, construction and types of Synchronous Machines.
- To introduce the concept of regulation and its calculations.
- To explain the parallel operation of alternators and analyze short circuit current wave.
- To introduce the principle and operation of special motors

Course Outcomes: At the end of this course, students will demonstrate the ability to

CO1: Describe the concepts of Synchronous generator, Synchronous motor and Special Machines.
CO2: Deduce the regulation of Synchronous Machines.
CO3: Determine the characteristics of Synchronous Machines.
CO4: Discuss the concepts of Synchronous Machines and special machines for specific applications.

UNIT – I SYNCHRONOUS MACHINE & CHARACTERISTICS

Constructional Features of round rotor and salient pole machines - Armature windings - Integral slot and fractional slot windings; Distributed and concentrated windings –Harmonics in generated EMF – suppression of harmonics –Excitation of Synchronous generators in thermal plants and Hydro plants-armature reaction - leakage reactance - synchronous reactance and impedance - experimental determination – phasor diagram - load characteristics.

UNIT – II REGULATION OF SYNCHRONOUS GENERATOR

Regulation by synchronous impedance method, M.M.F. method, Z.P.F. method and A.S.A. methods – salient pole alternators – two reaction analysis – experimental determination of Xd and Xq (Slip test) Phasor diagrams – Regulation of salient pole alternators.

UNIT – III PARALLEL OPERATION OF SYNCHRONOUS GENERATOR

Synchronizing alternators with infinite bus bars – synchronizing power torque – parallel operation and load sharing - Effect of change of excitation and mechanical power input. Analysis of short circuit current wave form – determination of sub-transient, transient and steady state reactances.

UNIT – IVSYNCHRONOUS MOTORS

Synchronous Motors: Theory of operation – phasor diagram – Variation of current and power factor with excitation – synchronous condenser – Mathematical analysis for power developed - hunting and its suppression – Methods of starting – V and inverted V curves.

UNIT – V SPECIAL MACHINES

Principles of operation of Reluctance Motors, Stepper Motors, Permanent magnet Brushless DC Motors, Principle and operation of Servomotor.

TEXT BOOKS:

1. Electrical Machines – by P.S. Bimbra, Khanna Publishers.
2. Electric Machines, I. J. Nagrath& D. P. Kothari, Tata Mc Graw Hill Publishers.
3. Performance and Design of AC Machines, MG. Say, BPB Publishers.

REFERENCE BOOKS:

1. Electro-machanics - III (Synchronous and single phase machines), S. Kamakashiah, Right Publishers.
2. Principles of Electrical Machines, V. K. Mehta, Rohit Mehta, S. Chand Publishing.
3. Theory of Alternating Current Machinery, Langsdorf, Tata McGraw-Hill Companies.
4. Electric machinery, A.E. Fitzerald, C. Kingsley and S. Umans, Mc Graw Hill Companies.
5. Electric Machines, Mulukutla S. Sarma, Mukesh K. Pathak, Cengage Learning.
6. Fundamentals of Electric Machines, B. R. Gupta, VandanaSinghal, New Age International Publishers.
7. Electrical Machines, M. V. Deshpande, PHI Learning Private Limited.
8. Electrical Machines, R. K. Srivastava, Cengage Learning.
9. Brushless Permanent magnet and Reluctace Motor Drives, J.E. Miller, Calrendon Press Oxford, 1989.
10. Stepping Motors- A Guide to Motor Theory and practice,by P.P. Aearnley, Peter perengrinus, London,1982

1. 2. 3. 4.
5. 6. 7. 8.
9. 10. 11.

B. Tech. EEE III Year I Semester

L	T	P	C
3	0	0	3

POWER ELECTRONICS

Prerequisite: Analog Electronics, Digital Electronics

Course Objectives:

- To Design/develop suitable power converter for efficient control or conversion of power in drive applications
- To Design / develop suitable power converter for efficient transmission and utilization of power in power system applications.

Course Outcomes: At the end of this course students will demonstrate the ability to

CO1: Explain the characteristics of various Power semiconductor devices.
CO2: Differentiate the operation of controlled rectifier circuits, DC choppers, Inverters, Cycloconverters and AC voltage controllers
CO3: Apply various control techniques to control output voltage and currents of the converters.
CO4: Evaluate the performance of the converters.
CO5: Design Power electronic converters for various applications.

UNIT – I POWER SEMI CONDUCTOR DEVICES & COMMUNICATION CIRCUITS

Thyristors – Silicon Controlled Rectifiers (SCR's) – BJT – Power MOSFET – Power IGBT and their characteristics and other thyristors – Basic theory of operation of SCR – Static characteristics – Turn on and turn off methods- Dynamic characteristics of SCR - Turn on and Turn off times -Salient points. Two transistor analogy – SCR - UJT firing circuit —– Series and parallel connections of SCR's – Snubber circuit details – Specifications and Ratings of SCR's, BJT, IGBT - Numerical problems – Line Commutation and Forced Commutation circuits.

UNIT – II AC-DC CONVERTERS (1-PHASE CONTROLLED RECTIFIERS)

Phase control technique – Single phase Line commutated converters – Midpoint and Bridge connections – Half controlled converters with Resistive, RL loads and RLE load– Derivation of average load voltage and current -Active and Reactive power inputs to the converters without and with Freewheeling Diode –Numerical problems. Fully controlled converters, Midpoint and Bridge connections with Resistive, RL loads and RLE load– Derivation of average load voltage and current – Line commutated inverters -Active and Reactive power inputs to the converters without and with Freewheeling Diode, Effect of source inductance – Derivation of load voltage and current – Numerical problems.

UNIT – III AC-DC CONVERTERS (3-PHASE CONTROLLED RECTIFIERS)

Three phase converters – Three pulse and six pulse converters – Midpoint and bridge connections average load voltage With R and RL loads – Effect of Source inductance–Dual converters (both single phase and three phase) - Waveforms –Numerical Problems.

AC-AC CONVERTERS (AC VOLTAGE CONTROLLERS) & FREQUENCY CHANGERS (CYCLO-CONVERTERS): AC voltage controllers – Single phase two SCR's in anti parallel – With R and RL loads – modes of operation of Triac – Triac with R and RL loads – Derivation of RMS load voltage, current and power factor wave forms – Firing circuits -Numerical problems -Cyclo converters – Single phase mid point cyclo converters with Resistive and inductive load (Principle of operation only) – Bridge configuration of single phase cyclo converter (Principle of operation only) – Waveforms.

UNIT – IVDC-DC CONVERTERS (CHOPPERS)

Choppers – Time ratio control and Current limit control strategies – Step down choppers Derivation of load voltage and currents with R, RL and RLE loads- Step up Chopper – load voltage expression, Jones chopper, AC Chopper, Problems.Switched Mode Regulator - SMPS (Basic Principle of Operation)

UNIT – V DC-AC CONVERTERS (INVERTERS)

Inverters – Single phase inverter – Basic series inverter, parallel inverter - operation and waveforms - Three phase inverters (180, 120 degrees conduction modes of operation) - Voltage control techniques for inverters, Pulse width modulation techniques - Numerical problems

TEXT BOOKS:

1. Power Electronics, Dr. P. S. Bimbhra, Khanna Publishers
2. Power Electronics Devices, Circuits and Industrial applications, V. R. Moorthi, Oxford University Press.

REFERENCE BOOKS:

1. Power Electronics; Circuits, Devices and Applications, M. H. Rashid, Prentice Hall of India.
2. Power Electronics, M. D. Singh & K. B. Kanchandhani, Tata Mc Graw - Hill Publishing Company.
3. Power Electronics, Vedam Subramanyam, New Age International (P) Limited, Publishers.
4. Elements of Power Electronics, Philip T. Krein, Oxford University Press.
5. Power Electronics, M. S. Jamil Asghar, PHI Private Limited.
6. Power Electronics, P. C. Sen, Tata Mc Graw-Hill Publishing.
7. Power Electronics, K. Hari Babu, Scitech Publications India Pvt. Ltd.
8. Principles of Power Electronics, John G. Kassakian, martin F. Schlect, Geroge C. Verghese, Pearson Education.
9. Thyristorised Power Controllers, G. K. Dubey, S. R. Doradra, A. joshi and R. M. K. Sinha, New Age International (P) Limited Publishers.

1. 2. 3. 4.

5. 6. 7. 8.

9. C.V. Rao 10. 11.

B. Tech. EEE III Year I Semester

L	T	P	C
3	0	0	3

Electrical Energy Conservation and Auditing
(Professional Elective 1)

Prerequisite: Basic Electrical Engineering, Electrical Machines-I, Electrical Machines-II

Course Outcomes:

At the end of this course, students will demonstrate the ability to

- CO1. Understand the current energy scenario and importance of energy conservation.
- CO2. Apply the concepts of energy management.
- CO3. Evaluate energy efficiency in different electrical systems.
- CO4. Analyse the energy audit of different energy systems.

UNIT I: Energy Scenario

Commercial and Non-commercial energy, primary energy resources, commercial energy production, final energy consumption, energy needs of growing economy, long term energy scenario, energy pricing, energy sector reforms, energy and environment, energy security, energy conservation and its importance, restructuring of the energy supply sector, energy strategy for the future, air pollution, climate change. Energy Conservation Act-2001 and its features

UNIT II: Basics of Energy and its various forms

Electricity tariff, load management and maximum demand control, power factor improvement, selection & location of capacitors, Thermal Basics-fuels, thermal energy contents of fuel, temperature & pressure, heat capacity, sensible and latent heat, evaporation, condensation, steam, moist air and humidity & heat transfer, units and conversion.

UNIT III:

Energy Management & Audit

Definition, energy audit, need, types of energy audit. Energy management (audit) approach understanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel & energy substitution, energy audit instruments. Material and Energy balance: Facility as an energy system, methods for preparing process flow, material and energy balance diagrams.

Energy Efficiency in Electrical Systems

Electrical system: Electricity billing, electrical load management and maximum demand control, power factor improvement and its benefit, selection and location of capacitors, performance assessment of PF capacitors, distribution and transformer losses. Electric motors: Types, losses in induction motors, motor efficiency, factors affecting motor performance, rewinding and motor replacement issues, energy saving opportunities with energy efficient motors.

UNIT IV: Energy Efficiency in Industrial Systems

Compressed Air System: Types of air compressors, compressor efficiency, efficient compressor operation, Compressed air system components, capacity assessment, leakage test, factors affecting the performance and savings opportunities in HVAC, Fans and blowers: Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities. Pumps and Pumping System: Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities. Cooling Tower: Types and performance evaluation, efficient system operation, flow control strategies and energy saving opportunities, assessment of cooling towers.

UNIT V: Energy Efficient Technologies in Electrical Systems

Maximum demand controllers, automatic power factor controllers, energy efficient motors, soft starters with energy saver, variable speed drives, energy efficient transformers, electronic ballast, occupancy sensors, energy efficient lighting controls, energy saving potential of each technology.

Text/Reference Books

1. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-1, General Aspects (available online)
2. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-3, Electrical Utilities (available online)
3. S. C. Tripathy, "Utilization of Electrical Energy and Conservation", McGraw Hill, 1991.
4. Success stories of Energy Conservation by BEE, New Delhi (www.bee-india.org)

1. 2. 3. 4.

5. 6. 7. 8.

9. 10. 11.

B. Tech. EEE III Year I Semester

L	T	P	C
3	0	0	3

ELECTRICAL ESTIMATION AND COSTING

(Professional Elective-1)

Pre requisites: Electric Circuit Theory, Network Theory, Power Systems –II

Course Objectives: The objectives of this course are

- To emphasize the estimating and costing aspects of all electrical equipment, installation and designs to analyze the cost viability.
- Exposure to design and estimation of wiring, design of overhead and underground distribution lines, substations and illuminations design.
- To successfully estimate costing of the products / projects that are part of our everyday usage.

Course Outcomes: After the course, the student can

CO1: Generalize estimation and costing aspects of all electrical equipment

CO2: Determine the concepts of installation and designs to analyse the cost viability

CO3: Evaluate design aspects of wiring system, overhead and underground distribution lines, substations and illuminations.

CO4: Estimate the cost of various electrical designs and equipment.

UNIT-I DESIGN OF SIMPLE ELECTRIC CIRCUITS

Electrical diagrams- classification of diagrams according to purpose - methods of representation for wiring diagram. System of connection of appliances and accessories - schematic wiring and single line diagram. Design and drawing of panel boards. Design conditions – standard sizes of boards – materials used.

UNIT-II DESIGN CONSIDERATIONS OF ELECTRICAL INSTALLATIONS

Electric Supply System - Three phase four wire distribution system - Protection of Electric Installation against over load - short circuit and Earth fault – Earthing - General requirements of electrical installations - testing of installations - Indian Electricity rules - Neutral and Earth wire.

UNIT- III

Types of loads - Systems of wiring - Service connections - Service Mains- Sub-Circuits -Location of Outlets - Location of Control Switches - Location of Main Board and Distribution board - Guide lines for Installation of Fittings - Load Assessment - Permissible voltage drops and sizes of wires - Estimation and Costing of Electric installations.

UNIT – IVELECTRICAL INSTALLATION FOR DIFFERENT TYPES OF BUILDINGS AND SMALL INDUSTRIES

Electrical installations for residential buildings - estimating and costing of material - Electrical installations for commercial buildings - high rise buildings. Electrical installations for small industries.

UNIT – V OVERHEAD AND UNDERGROUND TRANSMISSION AND DISTRIBUTION LINES

Introduction - Supports for transmission lines - Distribution lines - Materials used - Underground cables - Mechanical Design of overhead lines - Design of underground cables.

TEXT BOOKS:

1. Electrical Design Estimating and Costing, K. B. Raina, S. K. Bhattacharya, New Age International Publisher,5th edition
2. Design of Electrical Installations, Er. V. K. Jain, Er. Amitabh Bajaj, University Science Press.
3. Electricity Pricing Engineering Principles and Methodologies, Lawrence J. Vogt, P. E., CRC Press.
4. Electrical Installation Estimating and Costing by J.B.Gupta, 8th edition, S.K.Katria and Sons, New Delhi.

REFERENCE BOOKS:

1. Code of practice for Electrical wiring installations,(System voltage not exceeding 650 volts), Indian Standard Institution, IS: 732-1983.
2. Guide for Electrical layout in residential buildings, Indian Standard Institution, IS: 4648-1968.
3. Electrical Installation buildings Indian Standard Institution, IS: 2032.
4. Code of Practice for selection, Installation of Maintenance of fuse (voltage not exceeding 650V), Indian Standard Institution, IS: 3106- 1966.
5. Code of Practice for earthling, Indian Standard Institution, IS:3043- 1966.
6. Code of Practice for Installation and Maintenance of induction motors, Indian Standard Institution, IS: 900-1965.
7. Code of Practice for electrical wiring, Installations (system voltage not exceeding 650 Volts), Indian Standard Institution, IS: 2274-1963.
8. Electrical Installation, estimating and costing, Gupta J. B., Katson, Ludhiana.

1. 2. 3. 4.

5. 6. 7. 8.

9. 10. 11.

B. Tech. EEE III Year I Semester

L	T	P	C
0	0	2	1

ELECTRICAL MACHINES –II LAB

Prerequisite: Electrical Machines – I & Electrical Machines - II

Course Objectives:

- To understand the operation of synchronous machines
- To understand the equivalent circuit of a single phase induction motor
- To understand the circle diagram of an induction motor by conducting a blocked rotor test.

Course Outcomes: After the completion of this laboratory course, the student will be able

CO1: Test the performance of different AC machines using different testing methods

CO2: Calculate regulation of synchronous generator by different methods

CO3: Conclude the control the active and reactive power flows in synchronous machines

CO4: Distinguish the methods to control the speed and power factor

Any Ten of the following experiments are required to be conducted.

1. Sumpner's test on a pair of single phase transformer.
2. Separation of core losses of a single phase transformer.
3. Scott connection of transformer and Parallel operation of single phase transformer.
4. No-load & Blocked rotor tests on three phase induction motor.
5. Regulation of a three – phase alternate by synchronous impedance m.m.f methods.
6. V and inverted V curves of a three – phase synchronous motor.
7. Equivalent circuit of a single phase induction motor.
8. Determination of Xd and Xq of a salient pole synchronous machine.

In addition to the above eight experiments alteast any two of the following experiments are required to be conducted from the following list.

9. Regulation of three phase alternator by Z.P.F. and A.S.A methods
10. Determination of sequence impedances of a three-phase alternator.
11. Determination of sequence impedances of a three-phase transformer.
12. Speed control of three phase slip ring Induction Motor.

Reference books:

1. Electric machinery- P.S. Bimbra, Khanna Publishers, 7thedition, 2010.
2. Theory and Performance of Electrical Machines- JB. Gupta, S.K. Kataria and ISons, 2009.
3. Electro mechanics (transformers and induction motors) – S.Kamakshiah , Hitech publishers 2009.

1. 2. 3. 4.

5. 6. 7. 8.

9. C.V. 10. 11.

B. Tech. EEE III Year II Semester

L	T	P	C
3	0	0	3

ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

Prerequisite: Basic Electrical Engineering, Analog Electronics, Electrical Circuit Analysis & Electro Magnetic fields.

Course objectives:

- To introduce the basic principles of all measuring instruments
- To deal with the measurement of voltage, current, Power factor, power, energy and magnetic measurements.
- To understand the basic concepts of smart and digital metering.

Course Outcomes: After completion of this course, the student able to

CO1: Discuss different types of measuring instruments, their construction, operation and characteristics.
CO2: Identify the instruments suitable for typical measurements
CO3: Apply the knowledge about transducers and instrument transformers to use them effectively.
CO4: Correlate the concept of energy metering for industrial applications

UNIT-I INTRODUCTION TO MEASURING INSTRUMENTS

Classification-deflection, control and damping torques- Ammeters and Voltmeters- PMMC, moving iron type instruments- expression for the deflecting torque and control torque- Errors and compensations, extension of range using shunts and series resistance. Electrostatic Voltmeters- electrometer type and attracted disc type.

UNIT-II POTENTIOMETERS& INSTRUMENT TRANSFORMERS

Principle and operation of D.C. Crompton's potentiometer – standardization – Measurement of unknown resistance, current, voltage. A.C. Potentiometers: polar and coordinate types, standardization- applications. CT and PT- Ratio and Phase angle errors (of CT only).

UNIT-III MEASUREMENT OF POWER & ENERGY

Single phase dynamometer wattmeter, LPF and UPF, Double element and three element dynamometer wattmeter, expression for deflecting and control torques – Extension of range of wattmeter using instrument transformers – Measurement of reactive power.

Single phase Induction type energy meter–driving and braking torques-errors and compensations – testing by phantom loading using RSS meter. Three phase energy meter- Maximum demand meters.

UNIT – IVD.C & A.C BRIDGES

Method of measuring low, medium, high resistances – sensitivity of wheat- stone Bridge – carey foster's Bridge, Kelvin's double bridge for measuring low resistance, measurement of high resistance – loss of charge method

Measurement of Inductance – Q Factor – Maxwell's Bridge, Hay's bridge, Anderson's bridge, Owen's bridge. Measurement of capacitance and loss angle – Desauty Bridge. Wien's Bridge – Schering Bridge.

UNIT – V TRANSDUCERS & OSCILLOSCOPES

Definition of transducers, classification of transducers, Advantages of Electrical transducers, characteristics and choice of transducers; Principle operation of LVDT and capacitor transducers, LVDT Applications, Strain guage and its principle of operation, guage factor, Thermistors, Thermocouples, Piezo electric transducers, photovoltaic, photo conductive cells, photo diodes.

CRO: Cathode ray oscilloscope – cathode ray tube – time base generator- horizontal and vertical amplifiers- Lissajous Patterns

TEXT BOOKS:

1. Electrical and electronic measurements and instrumentation, R.K.Rajput, S.Chand& company Ltd.
2. Electrical measuring instruments and measurements, S.C. Bhargava, BS Publications.

REFERENCE BOOKS:

1. Electrical & electronic measurement & Instruments, A.K.Swehney, Dhanpat Rai & Co. Publications.
2. Electrical and electronic measurements, G.K.Banerjee, PHI Learning Pvt.Ltd.

1. 2. 3. 4.
5. 6. 7. 8.
9. 10. 11.

B. Tech. EEE III Year II Semester

L	T	P	C
3	0	0	3

COMPUTER METHODS IN POWER SYSTEMS

Prerequisites: Power Systems-I, Power Systems –II, Electrical Circuit Theory and Mathematics

Course Objectives: Upon completion of the coursestudents will be able to

- formulate Y-bus and Z-bus matrices
- apply computer methods for analysis of any general power transmission system
- conduct investigationsof short circuits of any general power transmission system
- analyze stability of power system

Course Outcome:

CO1: DeduceY-bus and Z-bus matrices of the power system.
CO2: Evaluate load flow solutions using computer methods
CO3: Compare various types of short circuits in power system
CO4: Apply knowledge of mathematics to analyze steady state and transient stability

UNIT I: POWER SYSTEM NETWORK MATRICES

Graph Theory: Definitions, Bus Incidence Matrix, Y-bus formation by Singular Transformation Methods and Direct Inspection methods, Numerical Problems.

FORMATION OF Z-BUS: Partial network, Algorithm for the Modification of Z-bus Matrix for addition element for the following cases: Addition of element from a new bus to reference, Addition of element from a new bus to an old bus, Addition of element between an old bus to reference and Addition of element between two old busses (Numerical Problems). Modification of Z-bus for the changes in network (Problems).

UNIT II: POWER FLOW STUDIES

Necessity of Power Flow Studies – Data for Power Flow Studies – Derivation of Static load flow equations, classification of Buses and their relevance to Power Flow.**LOAD FLOW SOLUTION USING GAUSS SEIDEL METHOD:** Acceleration Factor, Load flow solution without and with P-V buses, Algorithm and Flowchart. Numerical Load flow Solution for Simple Power Systems (Max. 3-Buses): Determination of Bus Voltages, Injected Active and Reactive Powers (Sample One Iteration only) and finding Line Flows/Losses for the given Bus Voltages.

NEWTON RAPHSON METHOD IN RECTANGULAR AND POLAR CO-ORDINATES FORM: Load Flow Solution without and with PV Busses- Derivation of Jacobian Elements, Algorithm and Flowchart (Max. 3-Buses)

DECOUPLED AND FAST DECOUPLED METHODS: Comparison of Different Methods – DC load Flow.

UNIT III SHORT CIRCUIT ANALYSIS

PER-UNIT SYSTEM OF REPRESENTATION: Per-Unit equivalent reactance network of a three phase Power System, Numerical Problems.Needs and assumptions for short circuit analysis

SYMMETRICAL FAULT ANALYSIS: Short Circuit Current and MVA Calculations, Fault levels, Application of Series Reactors, Numerical Problems.

SYMMETRICAL COMPONENT THEORY: Symmetrical Component Transformation, Positive, Negative and Zero sequence components: Voltages, Currents and Impedances.Sequence Networks: Positive, Negative and Zero sequence Networks, Numerical Problems.

UNSYMMETRICAL FAULT ANALYSIS: LG, LL, LLG faults without and with fault impedance, Numerical Problems.

UNIT IV STEADY STATE STABILITY ANALYSIS

Elementary concepts of Steady State, Dynamic and Transient Stabilities. Description of Steady State Stability Power Limit, Transfer Reactance, Synchronizing Power Coefficient, Power Angle Curve and Determination of Steady State stability and methods to improve steady state stability.

UNIT V TRANSIENT STABILITY ANALYSIS

Derivation of Swing Equation. Determination of Transient Stability by Equal Area Criterion, Application of Equal Area Criterion, Case study – sudden loss of parallel lines, Critical Clearing Angle Calculation- Solution of Swing Equation: Point-by-Point Method. Methods to improve Stability - Application of Auto Reclosing and Fast Operating Circuit Breakers.

TEXT BOOKS:

1. Power System Analysis, Dr.N.V.Ramana, Pearson Education India, 2011.
2. Computer methods in power system analysis, Stagg and EL-Abiad, Mc-Graw hill, 1987
3. Modern Power System Analysis – by I.J.Nagrath&D.P.Kothari, Tata McGraw-Hill Publishing Company, 4th edition.

REFERENCE BOOKS:

1. Power System Analysis, A.Nagoorkani, RBA Publications, 3rd edition
2. Power System Analysis and Stability, S.S. Vadhera, Khanna Publications
3. Power SytemAnalysis,HadiSaadat, Tata McGraw Hill,2002.
4. Power System Analysis by J.J. Grainger and W.D. Stevenson, McGraw Hill,2016
5. Computer techniques and models in power systems, By K.Uma Rao, I.K.International, 2010
6. Computer Techniques in Power System Analysis by M.A.Pai, TMH Publications,1979
7. Power System Analysis, Grainger and Stevenson, Tata McGraw Hill.

1. 2. 3. 4.
5. 6. 7. 8.
9. 10. 11.

B. Tech. EEE III Year II Semester

L	T	P	C
3	0	0	3

POWER SEMICONDUCTOR DRIVES

Prerequisite: Power Electronics, Electrical Machines – I, Electrical Machines – II

Course Objectives:

- To introduce the drive system and operating modes of drive and its characteristics
- To understand Speed – Torque characteristics of different motor drives by various power converter topologies
- To understand the motoring and braking operations of drive
- To differentiate DC and AC drives

Course Outcomes: After completion of this course the student is able to

CO1: Identify the drawbacks of speed control of motor by conventional methods.
CO2: Differentiate Phase controlled and chopper controlled DC drives speed-torque characteristics merits and demerits
CO3: Contrast AC motor drive speed-torque characteristics using different control strategies its merits and demerits
CO4: Distinguish various control methods to DC and AC motors.

UNIT – I CONTROL OF DC MOTORS THROUGH PHASE CONTROLLED RECTIFIERS

Introduction to Thyristor controlled Drives, Single Phase semi and fully controlled converters connected to DC separately excited and DC series motors -continuous current operation - output voltage and current waveforms- Speed and Torque expressions - Speed - Torque Characteristics- Problems on Converter fed DC motors. Three phase semi and fully controlled converters Connected to DC separately excited and DC series motors - output voltage and current waveforms - Speed and Torque expressions - Speed - Torque characteristics - Problems.

UNIT – II FOUR QUADRANT OPERATIONS OF DC DRIVES THROUGH DUAL CONVERTERS

Introduction to Four quadrant operation - Motoring operations, Electric Braking - Plugging, Dynamic and Regenerative Braking operations, Four quadrant operation of D C motors by dual converters -Closed loop operation of DC motor (Block Diagram Only).

UNIT III CONTROL OF DC MOTORS BY CHOPPERS (1, 2, 4 QUADRANT OPERATIONS)

Single quadrant, Two -quadrant and four quadrant chopper fed separately excited and series exacted motors - Continuous current operation - Output voltage and current wave forms - Speed torque expressions - speed torque characteristics - Problems on Chopper fed DC Motors - Closed Loop operation (Block Diagram Only).

UNIT –IV CONTROL OF INDUCTION MOTORS

Variable voltage& Frequency Characteristics:
Control of Induction Motor by AC Voltage Controllers - Waveforms - speed torque characteristics.
Variable frequency control of induction motor by Voltage source and current source Inverter and cyclo-converters- PWM control - Comparison of VSI and CSI operations - Speed torque Characteristics - numerical problems on induction motor drives - Closed loop operation of induction motor delves (Block Diagram Only).
Static rotor resistance control-
Slip power recovery - Static Scherbius drive – Static Kramer Drive - their performance and speed torque characteristics - advantages applications - problems.

UNIT – V CONTROL OF SYNCHRONOUS MOTORS

Separate control &self control of synchronous motors - Operation of self controlled synchronous motors by VSI and CSI cycloconverters. Load commutated CSI fed Synchronous Motor - Operation - Waveforms - speed torque characteristics - Applications -Advantages and Numerical Problems Closed Loop control operation of synchronous motor drives (Block Diagram Only), variable frequency control, Cyclo converter, PWM, VFI, CSI. Principle of operation of BLDC motor drive

TEXT BOOKS:

1. Power Semiconductor Drives, PV Rao, BS Publications.
2. Fundamentals of Electric Drives, G K Dubey Narosa Publications

REFERENCE BOOKS:

1. Power Semiconductor Drives, J.Gnanavadivel, Anuradha Publications.
2. Power Semiconductor Drives, S. B. Dewan, G R. Slemon , A. Straughen. Wiley Pvt Ltd.
3. Electric Drives N K. De, P. K. Sen, PHI Learning Private Ltd.
4. Thyristor Control of Electric drives, Vedam Subramanyam Tata McGraw Hill Pubications
5. Electrical machines and Drive Systems, John Hindmarsh, Alasdair Renfrew, Newnes.
6. Electric Motors and Drives, Fundamentals, Types and Applications Austin Hughes, Newnes.
7. Power Electronics and Variable Frequency Drives Technology and Applications, Bimal K. Bose, Wiley India Pvt, Ltd.
8. A First course on Electrical Drives, S K Pillai, New Age International (P) Ltd.
9. Modern Power Electronics and AC Drives, B.K.Bose, PHI.
10. Power Electronic Circuits, Devices and applications, M,H.Rashid, PHI

1. 2. 3. 4.
5. 6. 7. 8.
9. 10. 11.

B. Tech. EEE III Year II Semester

L	T	P	C
3	0	0	3

SWITCH GEAR AND PROTECTION

Pre-requisites: Power Systems-I, Power Systems-II

Course Objectives:

- To introduce all kinds of circuit breakers and relays for protection of Generators, Transformers and feeder bus bars from Over voltages and other hazards.
- To describe neutral grounding for overall protection.
- To understand the phenomenon of Over Voltages and it's classification.

Course Outcomes: At the end of the course the student will be able to:

CO1: Express quenching mechanisms used in air, oil and vacuum circuit breakers.
CO2: Compare and contrast electromagnetic, static and numerical relays
CO3: Apply technology to protect power system components.
CO4: Select relay settings of over current and distance relays.

UNIT–I CIRCUIT BREAKERS

Circuit Breaker (CB)– Elementary principles of arc interruption, Recovery– Restriking Voltage and Recovery voltages–Restriking phenomenon–Average and Max. RRRV–Numerical problems-Current chopping and Resistance switching–CB ratings and specifications: Types and Numerical problems-Auto reclosing. Description and operation of following types Circuit Breaker: Minimum Oil Circuit Breaker, Air Blast Circuit Breaker–Vacuum and SF6 circuit breakers

UNIT–II ELECTROMAGNETIC, STATIC RELAYS & NUMERICAL RELAYS

Principle of operation and construction of attracted armature– Balanced beam– induction disc and induction cup relays– Relays classification– Instantaneous– DMT and IDMT types– Applications of relays: Over current/under voltage relays– Directional relays– Differential relays and percentage differential relays

Distance relays: Impedance– Reactance– Mho and offset Mho relays– Characteristics of distance relays

Comparison of numerical relays & static relays with electromagnetic relays.

UNIT–III GENERATOR & TRANSFORMER PROTECTION

Protection of generators against stator faults– Rotor faults and abnormal conditions– restricted earth fault and inter turn fault protection– Numerical examples on percentage windings unprotected.Protection of transformers: Percentage differential protection– Numerical problems on Design of CT's ratio– Buchholz relay protection.

UNIT–IV FEEDER AND BUS BAR PROTECTION& GROUNDING PROTECTION OF LINES

Over current– earth fault, Carrier current and three zone distance relay using impedance relays–Translay relay–Protection of bus bars– Differential protection.

NEUTRAL GROUNDING

Grounded & ungrounded neutral systems.-Effects of ungrounded neutral system performance. Methods of neutral grounding: Solid resistance, reactance-Arcing grounds& grounding practice

UNIT–V PROTECTION AGAINST OVER VOLTAGE AND GROUNDING

Generation of over voltages in power systems– Protection against lightning over voltages– Valve type and zinc–Oxide lighting arresters– Insulation coordination– BIL– impulse ratio–. Earthing Practices in Substations.

TEXT BOOKS:

1. Switchgear & protection, Sunil Rao, Khanna publishers.
2. Protection & switchgear, BhaveshBhalja, R.P Maheshwari, Nilesh G.Chothani, and Oxford University press.
3. Power System Protection and Switchear Gear By Badriram ,D.NViswakarma TMH Publications.

REFERENCE BOOKS:

1. Electrical power systems, C.L Wadhwa, New age international (P) limited, Publishers.
2. Electrical Power System Protection by C. CHRISTOPOULOS and A. Wright, Springer publications.
3. Electrical power systems, P.S.R Murthy, BS Publications.
4. Power System Protection& switchgear by BhuvaneshOza, TMH.
5. A textbook on power system engineering, M.L.Soni, P.V.Gupta, U.S.Bhatnagar, A.Chakrabarthy, Dhanapat Rai & Co pvt.ltd.
6. A textbook on power system engineering, R.K Rajput, Laxmi Publications (P) ltd.
7. Principle of power system, V.K Mehta&Rohit Mehta, S.Chand company pvt ltd.
8. Digital and numerical relays by t.smadhavaraotatamagra hills

1. 2. 3. 4.
5. 6. 7. 8.
9. 10. 11.

B. Tech. EEE III Year II Semester

L	T	P	C
3	0	0	3

ARTIFICIAL INTELLIGENCE TECHNIQUES IN ELECTRICAL ENGINEERING

(Professional Elective-2)

Prerequisites: Mathematics, Control Systems

Course Objectives:

- To locate soft commanding methodologies, such as artificial neural networks, Fuzzy logic and genetic Algorithms.
- To observe the concepts of feed forward neural networks and about feedback neural networks.
- To practice the concept of fuzziness involved in various systems and comprehensive knowledge of fuzzy logic control and to design the fuzzy control
- To analyze genetic algorithm, genetic operations and genetic mutations.

Course Outcomes: Upon the completion of this course, the student will be able to

CO1: Generalize feed forward neural networks, feedback neural networks and learning techniques.
CO2: Identify fuzziness involved in various systems and fuzzy set theory.
CO3: Discover fuzzy logic control for applications in electrical engineering
CO4: Interpret genetic algorithm for applications in electrical engineering.

UNIT-I ARTIFICIAL NEURAL NETWORKS

Introduction, Models of Neuron Network-Architectures –Knowledge representation, Artificial Intelligence andNeural networks–Learning process-Error correction learning, Hebbian learning –Competitive learning-Boltzmanlearning, supervised learning-Unsupervised learning–Reinforcement learning-Learning tasks.

UNIT-II ANN PARADIGMS

Multi-layer perceptron using Back propagation Algorithm (BPA), Self –Organizing Map (SOM), Radial BasisFunction Network-Functional Link Network (FLN), Hopfield Network.

UNIT-III FUZZY LOGIC

Introduction –Fuzzy versus crisp, Fuzzy sets-Membership function –Basic Fuzzy set operations, Properties of Fuzzysets –Fuzzy Cartesian Product, Operations on Fuzzy relations - Fuzzy logic–Fuzzy Quantifiers, Fuzzy Inference-Fuzzy Rule based system, Defuzzification methods.

UNIT-IV GENETIC ALGORITHMS

Introduction-Encoding –Fitness Function-Reproduction operators, Genetic Modeling -Genetic operators-Cross over-Single site cross over, Two point cross over –Multi point cross over Uniform cross over, Matrix cross over-Crossover Rate-Inversion & Deletion, Mutation operator –Mutation –Mutation Rate-Bit-wise operators, Generationalcycle-convergence of Genetic Algorithm.

UNIT-V APPLICATIONS OF AI TECHNIQUES

Load forecasting, Load flow studies, Economic load dispatch, Load frequency control, Single area system and twoarea system, Reactive power control , Speed control of DC and AC Motors.

TEXT BOOKS

1. Simon O Haykin, Neural Networks: A comprehensive Foundation: International Edition 2ed,
2. Timothy J Ross, Fuzzy Logic with Engineering Applications, 3ed, Wiley Publishers.
3. S.Rajasekaran and G.A.V.Pai Neural Networks, Fuzzy Logic & Genetic Algorithms, PHI, New Delhi, 2003.
4. Rober J. Schalkoff, Artificial Neural Networks, Tata McGraw Hill Edition, 2011.

REFERENCES

1. P.D.Wasserman; Neural Computing Theory & Practice, Van Nostrand Reinhold, New York, 1989.
2. Bart Kosko; Neural Network & Fuzzy System, Prentice Hall,1992
3. D.E.Goldberg, Genetic Algorithms, Addison-Wesl.

1. 2. 3. 4.
5. 6. 7. 8.
9. 10. 11.

B. Tech. EEE III Year II Semester

L	T	P	C
0	0	2	1

CONTROL SYSTEMS AND SIMULATION LAB

Course Objectives:

- To understand the different ways of system representations such as Transfer function representation and state space representations and to assess the system dynamic response
- To assess the system performance using time domain analysis and methods for improving it
- To assess the system performance using frequency domain analysis and techniques for improving the performance
- To design various controllers and compensators to improve system performance

Course Outcomes: After completion of this lab the student is able to

CO1: Develop the system performance by selecting a suitable controller and/or a compensator for a specific application
CO2: Discover various time domain and frequency domain techniques to assess the system performance
CO3: Test various control strategies to different applications(example: Power systems, electrical drives etc)
CO4: Compute system controllability and observability using state space representation and applications of state space representation to various systems

Any Ten of the following experiments are to be conducted

1. Time response of Second order system.
2. Characteristics of Synchros.
3. Programmable logic controller – Study and verification of truth tables of logic gates, simple Boolean expressions and application of speed control of motor
4. Effect of feedback on DC servo motor
5. Transfer function of DC motor
6. Transfer function of DC Shunt generator
7. Characteristics of magnetic amplifiers
8. Characteristics of AC servo motor
9. Simulation of Op-Amp based Integrator and Differentiator circuits.
10. Linear system analysis (Time domain analysis, Error analysis).
11. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using simulation software
12. State space model for classical transfer function– Verification using simulation software.

REFERENCE BOOKS

1. MATLAB and Tool books user's manual and- Math Works, USA.
2. PSPICE A/D Users Manual-Microsim,USA
3. PSPICE reference Guide –Microsim, USA.
4. Simulation of Electrical and Electronics Circuits Using P-Spice- By MH. Rashid, M/s PHI publications.
5. SCILAB (A Free Software To MATLAB), SChand Publications

B. Tech. EEE III Year II Semester

L	T	P	C
0	0	2	1

POWER ELECTRONICS AND SIMULATION LAB

Course Objectives:

- Apply the concepts of power electronic converters for efficient conversion/control of power from source to load.
- Design the power converter with suitable switches meeting a specific load requirement.

Course Outcomes: After completion of this course, the student is able to

CO1: Summarize the operating principles of various power electronic converters.
CO2: Simulate power converter networks.
CO3: Choose the appropriate converters for various applications

Any ten of the following experiments are required to be conducted.

1. Study of the characteristics of SCR, MOSFET &IGBT.
2. Gate Firing Circuits for SCRs (R- Triggering, RC Triggering & UJT Triggering).
3. Single Phase AC voltage Controller with R & RL Loads.
4. Single Phase fully Controlled Bridge Converter with R& RL Loads.
5. DC Jones Chopper with R& RL Loads.
6. Single Phase Parallel Inverter with R& RL Loads.
7. Single Phase Cyclo-Converter with R& RL Loads.
8. Single Phase Series Inverter with R& RL Loads.
9. Single Phase Half controlled converter with R Load.
10. Simulation of single-phase full converter using RLE loads and single-phase AC voltage controller using RLE loads.
11. Simulation of resonant pulse commutation circuit and Buck Chopper.
12. Simulation of single phase Inverter with PWM control.

REFERENCE BOOKS:

1. Simulation of Electrical and Electronics Circuits Using PSPICE- by M.H. Rashid, M/s PHI publications.
2. PSPICE A/D Users Manual-Microsim, USA
3. PSPICE reference Guide –Mircosim, USA
4. MATLAB and Tool books user's manual and- MATH Works, USA
5. SCILAB (A Free Software To MATLAB), SChand Publications.

1. 2. 3. 4.
5. 6. 7. 8.
9. C.N. Rao 10. 11.

B.Tech. EEE IV Year I Semester

L	T	P	C
3	0	0	3

POWER SYSTEM OPERATION AND CONTROL

Pre-requisite: Power Systems-I

Course Objectives: Upon completion of the coursestudents will be able to

- apply mathematicalmethods for economic operation of power systems
- apply mathematicalmethods foroptimal scheduling of hydrothermal system
- obtain transfer function model of power system
- analyze load frequency control reactive power control of power system

Course Outcome:

- **CO1:** Evaluate economic operation ofhydrothermal power plants
- **CO2:** Model of power system components
- **CO3:** Analyze single and two area load frequency control
- **CO4:** Interpret reactive power compensation in power system

UNIT - I ECONOMIC OPERATION OF POWER SYSTEMS

Optimal operation of Generators in Thermal Power Stations, - heat rate Curve - Cost Curve - Incremental fuel and Production costs, input-output characteristics, Optimum generation allocation with line losses neglected. Optimum generation allocation including the effect of transmission line losses - Loss Coefficients, General transmission line loss formula.

UNIT - II HYDROTHERMAL SCHEDULING

Optimal scheduling of Hydrothermal System: Hydroelectric power plant models, Scheduling problems- Short term Hydrothermal scheduling problem.

UNIT -III MODELING

Modeling of Turbine: First order Turbine model, Block Diagram representation of Steam Turbines and Approximate Linear Models.
Modeling of Governor: Mathematical Modeling of Speed Governing System - Derivation of small signal transfer function.
Modeling of Excitation System: Fundamental Characteristics of an Excitation system, Transfer function, Block Diagram Representation of IEEE Type-1 Model

UNIT - IV LOAD FREQUENCY CONTROL

Single Area Load Frequency Control: Necessity of keeping frequency constant. Definitions of Control area – Single area control – Block diagram representation of an isolated power system – Steady state analysis – Dynamic response – Uncontrolled case.
Load frequency control of 2-area system – uncontrolled case and controlled case, tie-line bias control
Load Frequency Controllers: Proportional plus Integral control of single area and its block diagram representation, steady state response – Load Frequency Control and Economic dispatch control.

UNIT – V REACTIVE POWER CONTROL

Overview of Reactive Power control – Reactive Power compensation in transmission systems– advantages and disadvantages of different types of compensating equipment for transmission systems. load compensation – Specifications of load compensator, Uncompensated and compensated transmission lines: shunt and Series Compensation.

TEXT BOOKS:

1. Power system operation and control, Dr.K. Uma Rao, wileyindiaPvt.Ltd
2. Power systems Analysis, Operation and control, AbjithChakrabarti, Sunitha Halder, PHI Publications

REFERENCE BOOKS:

1. Power System Analysis and Design by J.Duncan Glover and M.S.Sarma., THOMPSON, 3rd Edition.
2. Power system operation and control in power systems, GR.Chadrasekar Reddy, A.srinivasulu
3. Operation and control in power systems, PSR Murthy, BS publications
4. Power systems stability and control, PrabhaKundur, the McGraw-hill companies.
5. Power system analysis, C.L. Wadhwa, Newage International.
6. Modern Power system Analysis, I.J.Nagarath& D.P. Kothari Tata McGraw-hill Publishing Company Ltd.
7. Power system Analysis, Grainger and Stevenson, Tata McGraw Hill.

1. 2. 3. 4.
5. 6. 7. 8.
9. 10. 11.

B.Tech EEE IV Year I Semester

L	T	P	C
3	0	0	3

ELECTRIC VEHICLES
(Professional Elective – 3)

Course Objective:

- To understand working of different configurations of electric vehicles, and its components
- To understand hybrid vehicle configuration and performance analysis.

Course Outcomes:

After this course, the student will

CO1: Observe theworking of different configurations of electric vehicles, hybrid vehicles and its components.
CO2: Write the basic concepts of batteries and Motors in the design of Electric and Hybrid Vehicles.
CO3: Differentiate the modes of operation of Hybrid Vehicles.
CO4: Evaluate the performance of hybrid vehicles.
CO5: Design the basic parameters of Electric and Hybrid Electric Vehicles.

UNIT I ELECTRIC VEHICLES

Introduction to Electric Vehicles – History of Electric and Hybrid Vehicles- Components - vehicle mechanics - Roadway fundamentals - vehicle kinetics - Dynamics of vehicle motion - Propulsion System Design.

UNIT II BATTERIES

Basics - Types - Parameters - Capacity - Discharge rate - State of charge - state of Discharge - Depth of Discharge - Technical characteristics - Battery pack Design - Properties of Batteries.
Fuel Cells - Types - Fuel Cell Electric Vehicle.

UNIT III DC & AC ELECTRICAL MACHINES

(Speed control Techniques)
Motor and Engine rating – Requirements – Speed control techniques of DC machines in Electric Vehicles – Speed control techniques of Three phase A/c machines -Induction machines- Permanent Magnet Machines, Switched Reluctance Machines.

UNIT IV ELECTRIC VEHICLE DRIVE TRAIN

Transmission configuration - Components - gears, differential, clutch, brakes regenerative braking- motor sizing- Gear Ratio – Torque speed characteristics - EV Motor Sizing Initial Acceleration - Rated Vehicle Velocity - Maximum Velocity - Maximum Gradability.

UNIT V HYBRID ELECTRIC VEHICLES

Types of Hybrid Vehicles - series and parallel Hybrid Electric Vehicles, series- parallel configuration - Internal Combustion Engines - Reciprocating Engines - Practical and Air-Standard Cycles - Air-Standard Otto Cycle - Air-Standard Diesel Cycle - Example IC Engines in HEVs - Design - Drive train - sizing of components.

TEXT BOOKS:

1. Iqbal Hussain, "Electric & Hybrid Vehicles - Design Fundamentals", Second Edition, CRC Press, 2011.
2. James Larminie, "Electric Vehicle Technology Explained", John Wiley & Sons, 2003.

REFERENCE BOOKS:

1. MehrdadEhsani, YiminGao, Ali Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals", CRC Press, 2010.
2. Sandeep Dhameja, "Electric Vehicle Battery Systems", Newnes, 2001

1. 2. 3. 4.
5. 6. 7. 8.
9. 10. 11.

B.Tech. EEE IV Year I Semester

L	T	P	C
3	0	0	3

SMART GRIDS
(Professional Elective-3)

Prerequisite: Power Systems - II

Course Outcomes:

CO1:Report the features of Smart Grid.
CO2: Judge the role of automation in Transmission and Distribution
CO3: Apply Evolutionary Algorithms for the Smart Grid and Distribution Generation.
CO4: Represent operation and importance of PMUs, PDCs, WAMS, Voltage and Frequency control in Micro Grids.

UNIT I:

Introduction to Smart Grid

Introduction to Smart Grid - Working definitions of Smart Grid and Associated Concepts – Smart Grid Functions – Traditional Power Grid and Smart Grid – New Technologies for Smart Grid – Advantages – Indian Smart Grid – Key Challenges for Smart Grid.

UNIT II:

Smart Grid Architecture

Components and Architecture of Smart Grid Design – Review of the proposed architectures for Smart Grid. The fundamental components of Smart Grid designs – Transmission Automation – Distribution Automation – Renewable Integration

UNIT III:

Tools and Techniques for Smart Grid: Computational Techniques – Static and Dynamic Optimization Techniques – Computational Intelligence Techniques – Evolutionary Algorithms – Artificial Intelligence techniques.

Distribution Generation Technologies: Introduction to Renewable Energy Technologies –Micro grids – Storage Technologies –Electric Vehicles and plug – in hybrids – Environmental impact and Climate Change – Economic Issues.

UNIT IV:

Communication Technologies and Smart Grid: Introduction to Communication Technology – Synchro-Phasor Measurement Units (PMUs) – Wide Area Measurement Systems (WAMS)- Introduction to Internet of things (IOT)- Applications of IOT in Smart Grid.

UNIT V:

Control of Smart Power Grid System: Load Frequency Control (LFC) in Micro Grid System – Voltage Control in Micro Grid System – Reactive Power Control in Smart Grid. Case Studies and Test beds for the Smart Grids.

Text Books:

1. Stuart Borlase, Smart Grids, Infrastructure, Technology and Solutions, CRC Press, 1e, 2013
2. Gil Masters, Renewable and Efficient Electric Power System, Wiley–IEEE Press, 2e, 2013.

Reference Books:

1. A.G. Phadke and J.S. Thorp, "Synchronized Phasor Measurements and their Applications", Springer Edition, 2e, 2017.
2. T. Ackermann, Wind Power in Power Systems, Hoboken, NJ, USA, John Wiley, 2e, 2012.

1. 2. 3. 4.
5. 6. 7. 8.
9. 10. 11.

Vidya Jyothi Institute of Technology

An Autonomous Institution

(Accredited by NAAC & NBA, Approved by AICTE New Delhi & Permanently Affiliated to JNTUH)

Aziz Nagar Gate, C.B. Post, Hyderabad-500 0

Department of Electrical and Electronics Engineering

B.Tech. EEE IV Year I Semester

L	T	P	C
3	0	0	3

ELECTRICAL DISTRIBUTION SYSTEMS
(Professional Elective-4)

Pre-requisites: Power Systems – I and Power Systems - II

Course Objectives: Objectives of this course are

- to distinguish between transmission and distribution systems
- to understand design considerations of feeders
- to compute voltage drop and power loss in feeders
- to understand protection of distribution systems
- to examine the power factor improvement and voltage control.

Course Outcomes: After this course, the student will be able to

CO1: distinguish between transmission, and distribution line and design the feeders
CO2: compute power loss and voltage drop of the feeders
CO3: design protection of distribution systems
CO4: understand the importance of voltage control and power factor improvement

UNIT - I

INTRODUCTION & GENERAL CONCEPTS

Introduction to distribution systems: Load modelling and characteristics. Coincidence factor, contribution factor loss factor – Relationship between the load factor and loss factor.

CLASSIFICATION OF LOADS

Residential, commercial, Agricultural and Industrial loads and their characteristics.

UNIT - II

DISTRIBUTION FEEDERS & SUBSTATIONS

DESIGN CONSIDERATIONS OF DISTRIBUTION FEEDERS

Radial and loop types of primary feeders, voltage levels, feeder loading; basic design practice of the secondary distribution system.

SUBSTATIONS

Rating of distribution substation, service area within primary feeders. Benefits derived through optimal location of substations.

UNIT – III DISTRIBUTION SYSTEM ANALYSIS

Voltage drop and Power-Loss Calculations -Derivation for voltage drop and power loss in lines, manual methods of solution for radial networks, three phase balanced primary lines.

UNIT – IV PROTECTIVE DEVICES & CO ORDINATION

Objectives of distribution system protection, types of common faults and procedure for fault calculations.
Protective Devices - Principle of operation of Fuses, Circuit Reclosure, and line sectionalizes, and circuit breakers.
Coordination of Protective Devices -General coordination procedure.

UNIT – V VOLTAGE CONTROL & POWER FACTOR IMPROVEMENT

Equipment for voltage control, effect of series capacitors, line drop Compensation, effect of AVB/AVR. Power-factor control using different types of power capacitors, shunt and series capacitors, effect of shunt capacitors (Fixed and Switched), capacitor allocation - Economic justification - Procedure to determine the best capacitor location.

TEXT BOOKS:

1. Electric Power Distribution System Engineering, TuranGonen, CRC Press, 3rd edition
2. Electrical Distribution Systems, Dr. S. Siva Naga Raju, Dr.K.Shankar,Danapathi Rai Publications
3. Electric Power Distribution, Tata McGraw Hill Publishing Company, A.S. Pabla, 5th edition, 1997.

REFERENCE BOOKS:

1. Electrical Power Distribution Systems,V.Kamaraju, Tata Mc GrawHillPublishing company, 2nd edition, 2010.
2. Electric Power Generation, Transmission and Distribution, S.N. Singh, PHI Publishers, 2nd edition
3. Electrical Power Distribution hand book, G. Ram Murthy, University Press, 2nd edition.

1. 2. 3. 4.
5. 6. 7. 8.
9. 10. 11.

B.Tech. EEE IV Year I Semester

L	T	P	C
3	0	0	3

INDUSTRIAL ELECTRICAL SYSTEMS
(Professional Elective-4)

Course Outcomes: At the end of this course, students will demonstrate the ability to

CO 1: Review the electrical wiring systems for residential, commercial and industrialconsumers, representing the systems with standard symbols and drawings, SLD.

CO 2: Show various components of industrial electrical systems.

CO 3: Select the proper size of various electrical system components.

UNIT 1: Electrical System Components

LT system wiring components, selection of cables, wires, switches, distribution box, metering system, Tariff structure, protection components- Fuse, MCB, MCCB, ELCB, inverse current characteristics, symbols, single line diagram (SLD) of a wiring system, Contactor, Isolator, Relays, MPCB, Electric shock and Electrical safety practices

UNIT II: Residential and Commercial Electrical Systems Types of residential and commercial wiring systems, general rules and guidelines for installation, load calculation and sizing of wire, rating of main switch, distribution board and protection devices, earthing system calculations, requirements of commercial installation, deciding lighting scheme and number of lamps, earthing of commercial installation, selection and sizing of components.

UNIT III: Illumination and Industrial Electrical System Automation

Illumination Systems

Understanding various terms regarding light, lumen, intensity, candle power, lamp efficiency,
specific consumption, glare, space to height ratio, waste light factor, depreciation factor, various illumination schemes, Incandescent lamps and modern luminaries like CFL, LED and
their operation, energy saving in illumination systems, design of a lighting scheme for a residential and commercial premises, flood lighting.

Industrial Electrical System Automation

Study of basic PLC, Role of in automation, advantages of process automation, PLC based control system design, Panel Metering and Introduction to SCADA system for distribution automation.

UNIT IV: Industrial Electrical Systems I

HT connection, industrial substation, Transformer selection, Industrial loads, motors, starting
of motors, SLD, Cable and Switchgear selection, Lightning Protection, Earthing design, Power factor correction – kVAR calculations, type of compensation, Introduction to PCC, MCC panels. Specifications of LT Breakers, MCB and other LT panel components.

UNIT V: Industrial Electrical Systems II

DG Systems, UPS System, Electrical Systems for the elevators, Battery banks, Sizing the DG, UPS and Battery Banks, Selection of UPS and Battery Banks.

Text Books

1. S. L. Uppal and G. C. Garg, "Electrical Wiring, Estimating & Costing", Khannapublishers, 2008.
2. K. B. Raina, "Electrical Design, Estimating & Costing", New age International, 2007.
3. S. Singh and R. D. Singh, "Electrical estimating and costing", Dhanpat Rai and Co.,1997.

Reference Books

1. Web site for IS Standards.
2. H. Joshi, "Residential Commercial and Industrial Systems", McGraw Hill Education,2008.

1. 2. 3. 4.
5. 6. 7. 8.
9. 10. 11.

B.Tech. EEE IV Year I Semester

L	T	P	C
0	0	2	1

ELECTRICAL MEASUREMENTS LAB

Course Objectives:

- To know the procedures for measuring Resistance, Inductance and Capacitance of different ranges using bridges
- To perform experiments to measure three phase power, frequency, core losses.
- To design experiments for calibration of energy meter, power factor meter
- To know the industrial practices of measuring dielectric strength of transformer oil & Testing.

Course Outcomes: Upon completion of this Laboratory course student should be able to

CO1: Design the scale of PMMC voltmeter, LPF wattmeter, LVDT and resistance strain gauge

CO2: Calculate resistance, inductance and capacitance

CO3: Compute 3-Φ reactive power,

CO4: Testsingle phase energy meter and dielectric strength of oil of transformers.

Any ten of the following experiments are required to be conducted

1. Calibration and Testing of single phase energy Meter.
2. Calibration of dynamometer type power factor meter.
3. Crompton D.C. Potentiometer - Calibration of PMMC ammeter and PMMC voltmeter.
4. Kelvin's double Bridge - Measurement of resistance - Determination of Tolerance.
5. Dielectric oil testing using H.T. testing Kit.
6. Schering Bridge & Anderson Bridge.
7. Measurement of 3 Phase reactive power with single-phase wattmeter.
8. Measurement of parameters of a choke coil using 3 voltmeter and 3 ammeter methods.
9. LVDT and capacitance pickup - characteristics and Calibration.
10. Resistance strain gauge - strain measurements and Calibration.
11. Transformer turns ratio measurement using A.C. Bridge.
12. Measurement of ratio error and phase angle of given C.T. by comparison.

REFERENCE BOOKS:

1. A Course in Electrical and Electronics Measurements and Instrumentation, A.K.Sawhney, Dhanpat Rai & Co.
2. Electrical and electronics measurements and instrumentation, R.K.Rajput, S.Chand& Company Ltd.

1. 2. 3 4.

5. 6. 7. 8.

9. 10. 11.

B.Tech. EEE IV Year II Semester

L	T	P	C
3	1	0	3

UTILIZATION OF ELECTRICAL ENERGY
(Professional Core – 16)

Prerequisites: Electrical Machines-I and Electrical Machines-II

Course Objectives: Objectives of this course are

- To understand the fundamentals of illumination and good lighting practices
- To understand the methods of electric heating and welding.
- To understand the concepts of electric drives and their application to electrical traction systems.

Course Outcomes: At the end of the course the student will be able to:

CO1: Describe basic principles of illumination, electric heating and welding,Electric drives and Traction.
CO2: Determine the lighting requirements for flood lighting, household and industrial needs.
CO3: Calculate heat developed in induction furnace.
CO4: Evaluate speed time curves for traction
CO5: Analyze specific energy consumption of traction systems.

UNIT I ILLUMINATION

Introduction, terms used in illumination, laws of illumination, polar curves, photometry, integrating sphere, sources of light.

VARIOUS ILLUMINATION METHODS

Discharge lamps, MV and SV lamps - comparison between tungsten filament lamps and fluorescent tubes, Energy Efficient Lamps - principle of operation, Basic principles of light control, Types and design of lighting and flood lighting.

UNIT-II ELECTRIC HEATING &WELDING

ELECTRIC HEATING

Advantages and methods of electric heating, resistance heating induction heating and dielectric heating.

ELECTRIC WELDING

Resistance and arc welding, electric welding equipment, comparison between A.C. and D.C. Welding

UNIT III ELECTRIC DRIVES

Type of electric drives, choice of motor, starting and running characteristics, speed control, temperature rise, particular applications of electric drives, types of industrial loads, continuous, intermittent and variable loads, load equalization.

UNIT IV ELECTRIC TRACTION-I

System of electric traction and track electrification. Review of existing electric traction systems in India, Magnetic Levitation - Bullet Trains. Special features of traction motor, advantages of electric braking. Mechanics of train movement, Speed-time curves for different services – trapezoidal and quadrilateral speed time curves.

UNIT V ELECTRIC TRACTION-II

Calculations of tractive effort, power, specific energy consumption for given run, effect of varying acceleration and braking retardation, adhesive weight and braking retardation, adhesive weight and coefficient of adhesion.

TEXT BOOKS:

1. Utilisation of Electric Energy – by E. Openshaw Taylor, Orient Longman.
2. Art & Science of Utilization of electrical Energy – by Partab, Dhanpat Rai & Sons.

REFERENCE BOOKS:

1. Utilization of Electrical Power including Electric drives and Electric traction – by N.V.Suryanarayana, New Age International (P) Limited, Publishers, 1996.
2. Generation, Distribution and Utilization of electrical Energy – by C.L. Wadhwa, New Age International (P) Limited, Revised edition, 1997.
3. Utilization of Electric Energy, VVL Rao, University Press.
4. Utilisation of Electric Power, Er. R.K. Rajput, Laxmi Publications

1. 2. 3. 4.
5. 6. 7. 8.
9. 10. 11.

B. Tech. EEE IV Year I Semester

L	T	P	C
3	1	0	3

RENEWABLE ENERGY AND ENERGY STORAGE TECHNOLOGIES

(Professional Core- 17)

Course Objectives:

- understand the conversion of wind, solar energy into electrical power
- associate energy storage schemes to store generated electrical power
- construct energy storage management

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO1. Discuss the energy scenario and the consequent growth of the power generation from renewable energy sources.
CO2. Explain the basic physics of wind and solar power generation.
CO3. Express the power electronic interfaces for wind and solar generation.
CO4. Generalize the issues related to the grid-integration of solar and wind energy systems.

UNIT I: Physics of Wind Power:

History of wind power, Indian and Global statistics, Wind physics, Betz limit, Tip speed ratio, stall and pitch control, Wind speed statistics-probability distributions, Wind speed and power-cumulative distribution functions.

UNIT II: Wind generator topologies:

Review of modern wind turbine technologies, Fixed and Variable speed wind turbines, Induction Generators, Doubly-Fed Induction Generators and their characteristics, Permanent- Magnet Synchronous Generators, Power electronics converters. Generator-Converter configurations, Converter Control.

UNIT III:

The Solar Resource:

Introduction, solar radiation spectra, solar geometry, Earth Sun angles, observer Sun angles, solar day length, Estimation of solar energy availability.

Solar thermal power generation:

Technologies - Parabolic trough, central receivers, parabolic dish, Fresnel, solar pond, elementary analysis

UNIT IV: Solar photovoltaic:

Technologies - Amorphous, monocrystalline, polycrystalline; V-I characteristics of a PV cell, PV module, array, Power Electronic Converters for Solar Systems, Maximum Power Point Tracking (MPPT) algorithms. Converter Control.

UNIT V: Energy Storage Technologies:

Role of Electrical Energy storage system -Electro chemical storage systems, secondary batteries, Management and control hierarchy of storage systems - Internal configuration of battery storage systems,design of electric energy storage system for solar and wind plants (blockdiagram).

Text Books:

1. Chetan Singh Solanki, "Renewable Energy Technologies: A Practical Guide for Beginners", PHI,2008
2. T. Ackermann, "Wind Power in Power Systems", John Wiley and Sons Ltd., 2005.
3. 2. G. M. Masters, "Renewable and Efficient Electric Power Systems", John Wiley and Sons, 2004.

Reference Books:

1. S. P. Sukhatme, "Solar Energy: Principles of Thermal Collection and Storage", McGraw Hill, 1984.
2. H. Siegfried and R. Waddington, "Grid integration of wind energy conversion systems" John Wileyand Sons Ltd., 2006.
3. G. N. Tiwari and M. K. Ghosal, "Renewable Energy Applications", Narosa Publications, 2004.
4. J. A. Duffie and W. A. Beckman, "Solar Engineering of Thermal Processes", John Wiley & Sons, 1991.

1. 2. 3. 4.
5. 6. 7. 8.
9. 10. 11.