

1.1.3 Total number of courses having focus on employability/ entrepreneurship/ skill development offered by the University during the year (2021-22)

1.2.1 Number of new courses introduced of the total number of courses across all programs offered during the year (2021-22)

| Name of the Course | Course Code | Year of introduction | Activities/Content with direct bearing on Employability/ Entrepreneurship/ Skill development | Link to the relevant document |
|---|--------------|----------------------|--|-------------------------------|
| Computer Aided Power System Analysis | PSRE-101/21 | 2021 | Mid-semester tests, Assignments, End-semester examination | |
| Distributed Generation | PSRE-102/21 | 2021 | Mid-semester tests, Assignments, End-semester examination | |
| FACTS and custom Power Devices | PSRE-103A/21 | 2021 | Mid-semester tests, Assignments, End-semester examination | |
| Advanced Power System Protection | PSRE-103B/21 | 2021 | Mid-semester tests, Assignments, End-semester examination | |
| Mathematical Methods for Power Engineering | PSRE-103C/21 | 2021 | Mid-semester tests, Assignments, End-semester examination | |
| Analysis of Power Converter | PSRE-103D/21 | 2021 | Mid-semester tests, Assignments, End-semester examination | |
| Solar PV Energy System | PSRE-104A/21 | 2021 | Mid-semester tests, Assignments, End-semester examination | |
| Waste to Energy Conversion Technologies | PSRE-104B/21 | 2021 | Mid-semester tests, Assignments, End-semester examination | |
| Small Hydro and Non-Conventional Technologies | PSRE-104C/21 | 2021 | Mid-semester tests, Assignments, End-semester examination | |
| Solar Energy Conversion Technologies | PSRE-104D/21 | 2021 | Mid-semester tests, Assignments, End-semester examination | |
| Computer Aided Power System Analysis Lab | PSRE-105/21 | 2021 | Lab work and experiments, End-semester examination | |
| Power Simulation Lab-I | PSRE-106/21 | 2021 | Lab work and experiments, End-semester examination | |
| English for Research Paper Writing | MTA-101/21 | 2021 | Mid-semester tests, Assignments, End-semester examination | |
| Disaster Management | MTA-102/21 | 2021 | Mid-semester tests, Assignments, End-semester examination | |
| Sanskrit for Technical Knowledge | MTA-103//21 | 2021 | Mid-semester tests, Assignments, End-semester examination | |
| Value Education | MTA-104/21 | 2021 | Mid-semester tests, Assignments, End-semester examination | |
| Research Methodology and IPR | MTRM-101/21 | 2021 | Mid-semester tests, Assignments, End-semester examination | |
| Mini Project with Seminar | MTPR-101/21 | 2021 | Mid-semester tests, Assignments, End-semester examination | |
| Energy Forecasting and Modeling | PSRE-201/21 | 2021 | Mid-semester tests, Assignments, End-semester examination | |
| Power System Generation Control | PSRE-202/21 | 2021 | Mid-semester tests, Assignments, End-semester examination | |
| Power Quality and and Harmonic Analysis | PSRE-203A/21 | 2021 | Mid-semester tests, Assignments, End-semester examination | |
| Power System Dynamics | PSRE-203B/21 | 2021 | Mid-semester tests, Assignments, End-semester examination | |
| Reliability Analysis and Protection | PSRE-203C/21 | 2021 | Mid-semester tests, Assignments, End-semester examination | |
| Energy Economics and Policies | PSRE-203D/21 | 2021 | Mid-semester tests, Assignments, End-semester examination | |
| Electric and Hybrid Vehicles | PSRE-204A/21 | 2021 | Mid-semester tests, Assignments, End-semester examination | |
| Smart Grids | PSRE-204B/21 | 2021 | Mid-semester tests, Assignments, End-semester examination | |
| Engineering Optimization | PSRE-204C/21 | 2021 | Mid-semester tests, Assignments, End-semester examination | |
| Artificial Intelligence Techniques | PSRE-204D/21 | 2021 | Mid-semester tests, Assignments, End-semester examination | |
| Constitution of India | MTA-105/21 | 2021 | Mid-semester tests, Assignments, End-semester examination | |
| Pedagogy Studies | MTA-106/21 | 2021 | Mid-semester tests, Assignments, End-semester examination | |
| Stress Management of Yoga | MTA-107/21 | 2021 | Mid-semester tests, Assignments, End-semester examination | |
| Personality Development through Life Enlightenment Skills | MTA-108/21 | 2021 | Mid-semester tests, Assignments, End-semester examination | |
| Industrial Load Modelling and Control | PSRE-301A/21 | 2021 | Mid-semester tests, Assignments, End-semester examination | |

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|---|--------------|------|---|
| Power System Deregulation | PSRE-301B/21 | 2021 | Mid-semester tests, Assignments, End-semester examination |
| Solar PV Energy System | PSRE-301C/21 | 2021 | Mid-semester tests, Assignments, End-semester examination |
| Energy Storage System | PSRE-301D/21 | 2021 | Mid-semester tests, Assignments, End-semester examination |
| Business Analysis | MTOE-301A/21 | 2021 | Mid-semester tests, Assignments, End-semester examination |
| Industrial Safety | MTOE-301B/21 | 2021 | Mid-semester tests, Assignments, End-semester examination |
| Operations Research | MTOE-301C/21 | 2021 | Mid-semester tests, Assignments, End-semester examination |
| Cost Management of Engineering Projects | MTOE-301D/21 | 2021 | Mid-semester tests, Assignments, End-semester examination |
| Composite Materials | MTOE-301E/21 | 2021 | Mid-semester tests, Assignments, End-semester examination |
| Phase-I Dissertation | PSRE- 302/21 | 2021 | Project assigned, writing and presentation of work |
| Phase-II Dissertation | PSRE-401/21 | 2021 | Project assigned, writing and presentation of work |
| Chemistry | BTCH101-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Chemistry (Lab) | BTCH102-18, | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Maths-2 | BTAMXX-18, | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Prog. For Problem Solving | BTPS101-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Prog. For Problem Solving (Lab) | BTPS102-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Workshop & Manufacturing Practice | BTMP101-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| English | BTHU101-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| English Lab | BTHU102-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Mentoring and professional Developemnt | BMPD201-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Physics {PHY (L) } | BTPHXX-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Physics Lab {PHY (P)} [PHYLAB-1] | BTPHXX-18 | 2018 | Lab work and experiments, End-semester examination |
| Maths-I {MATHS (L)} | BTAMXX-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Basic Electrical Engineering {BEE (L)} | BTEE101-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Basic Electrical Engineering Lab {BEE (P)} [BEELAB-1] | BTEE102-19 | 2018 | Lab work and experiments, End-semester examination |
| Engineering Graphics and Design (EGD) (DH-2) | BTME101-21 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Mentoring and Professional Development (BMPD) | BMPD101-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Electrical Circuit Analysis | BTEE- 301-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Analog Electronics | BTEE- 302-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Electrical Machines – I | BTEE- 303-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Electromagnetic Fields | BTEE- 304-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Engineering Mechanics | BTEE- 305-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Analog Electronics Laboratory | BTEE-311-18 | 2018 | Lab work and experiments, End-semester examination |
| Electrical Machines – I Laboratory | BTEE- 312-18 | 2018 | Lab work and experiments, End-semester examination |
| Mandatory Course (BTMC-101-18 or BTMC 102-18) | BTMC-XXX-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Mentoring and Professional Development of Students | BMPD-301-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Indian Constitution | BTMC-101-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Digital Electronics | BTEE- 401-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Electrical Machines – II | BTEE- 402-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Power Electronics | BTEE- 403-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |

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|--|---------------|------|---|
| Signals and Systems | BTEE- 404-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Mathematics-III (Probability & Statistics) | BTAM-302-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Measurements and Instrumentation Lab. | BTEE- 41-18 | 2018 | Lab work and experiments, End-semester examination |
| Digital Electronics Laboratory | BTEE- 412-18 | 2018 | Lab work and experiments, End-semester examination |
| Electrical Machines – II Laboratory | BTEE- 413-18 | 2018 | Lab work and experiments, End-semester examination |
| Power Electronics Laboratory | BTEE- 414-18 | 2018 | Lab work and experiments, End-semester examination |
| Mandatory Course (BTMC-101-18 or BTMC 102-18) | BTMC-XXX-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Mentoring and Professional Development of Students | BMPD-401-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Essence of Indian Traditional Knowledge | BTMC-102-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Power Systems – I | BTEE- 501-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Microprocessors | BTEE- 503-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Programme Elective-1 | BTEE- 601X-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Environmental Studies | EVS-101-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Power Systems-I Laboratory | BTEE- 511-18 | 2018 | Lab work and experiments, End-semester examination |
| Control Systems Laboratory | BTEE- 512-18 | 2018 | Lab work and experiments, End-semester examination |
| Microprocessors Laboratory | BTEE- 513-18 | 2018 | Lab work and experiments, End-semester examination |
| Mentoring and Professional Development of Students | BMPD-501-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Environmental Studies | EVS 101-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Control Systems | BTEE- 501-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Power System-II (Operation and Control) | BTEE- 601-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Power Generation and Economics | BTEE- 602-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Programme Elective-2 | BTEE- 603X-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Programme Elective-3 | BTEE- 604-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Open Elective-1 | OXX-XXX-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Humanities & Social Sciences including Mgt. | HSMC-XXX-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Electronic Design Laboratory | BTEE- 611-18 | 2018 | Lab work and experiments, End-semester examination |
| Power Systems-II Laboratory | BTEE-612-18 | 2018 | Lab work and experiments, End-semester examination |
| Project-1 | BTEE-621-18 | 2018 | Project assigned, writing and presentation of work |
| Mentoring and Professional Development of Students | BMPD-601-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Programme Elective-4 | BTEE- 701X-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Programme Elective-5 | BTEE- 702X-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Programme Elective-6 | BTOE- 703X-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Open Elective-2 | OXX-XXX-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Open Elective-3 | OXX-XXX-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Humanities & Social Sciences including Mgt. | HSMC-XXX-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| Project-2 | BTEE- 721-18 | 2018 | Project assigned, writing and presentation of work |
| Mentoring and Professional Development of Students | BMPD-701-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |
| One Semester Training | BTEE-721-18 | 2018 | Mid-semester tests, Assignments, End-semester examination |

Name of Department: Electrical Engineering

Draft of Mapping of M. Tech. Electrical Engineering (Power Systems and Renewable Energy)

MAPPING POS AND COS

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|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------------|-----|--|
| CO3: Understand the concepts of rigid bodies. | | | | | | | | | | | | | | | | | | Understand | Yes | Mid-Term Tests, Tutorial, End Semester Exams |
| CO4: Analyze the free-body diagrams of different systems. | | | | | | | | | | | | | | | | | | Analyze | Yes | Mid-Term Tests, Tutorial, End Semester Exams |
| CO5: Analyze torsional motion and bending moment. | | | | | | | | | | | | | | | | | | Analyze | Yes | Mid-Term Tests, Tutorial, End Semester Exams |

Paper: BTEE-311-18 Analog Electronics Laboratory

| | FO1 | FO2 | FO3 | FO4 | FO5 | FO6 | FO7 | FO8 | FO9 | FO10 | FO11 | FO12 | Skill | Focus | Assessment Tools to Measure Attainment of CO |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------------|-------|--|
| CO1: Understand the use and importance of waveform | V | V | V | V | V | V | V | V | V | V | V | V | Understand | Yes | Experiments, Viva-Voice, End Semester Exams |
| CO2: Ability to make circuits on bread board. | V | V | V | V | V | V | V | V | V | V | V | V | Analyze | Yes | Experiments, Viva-Voice, End Semester Exams |
| CO3: Analyze, take measurements to understand characteristics of diodes. | V | V | V | V | V | V | V | V | V | V | V | V | Apply | Yes | Experiments, Viva-Voice, End Semester Exams |
| CO4: Troubleshoot, design and create electronic circuit. | V | V | V | V | V | V | V | V | V | V | V | V | Knowledge | Yes | Experiments, Viva-Voice, End Semester Exams |
| CO5: Evaluate the performance characteristics of DC power | V | V | V | V | V | V | V | V | V | V | V | V | Understand | Yes | Experiments, Viva-Voice, End Semester Exams |

Paper: BTEE-312-18 Electrical Machines – Laboratory

| | FO1 | FO2 | FO3 | FO4 | FO5 | FO6 | FO7 | FO8 | FO9 | FO10 | FO11 | FO12 | Skill | Focus | Assessment Tools to Measure Attainment of CO |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------------|-------|--|
| CO1: Analyze three phase transformer/system components. | V | V | V | V | V | V | V | V | V | V | V | V | Analyze | Yes | Experiments, Viva-Voice, End Semester Exams |
| CO2: Evaluation of equivalent circuit parameters of transformer. | V | V | V | V | V | V | V | V | V | V | V | V | Understand | Yes | Experiments, Viva-Voice, End Semester Exams |
| CO3: Analyze per unit operation of transformer. | V | V | V | V | V | V | V | V | V | V | V | V | Analyze | Yes | Experiments, Viva-Voice, End Semester Exams |
| CO4: Analyze performance characteristics of DC generator. | V | V | V | V | V | V | V | V | V | V | V | V | Analyze | Yes | Experiments, Viva-Voice, End Semester Exams |

Paper: BTEE-401-18 Digital Electronics

| | FO1 | FO2 | FO3 | FO4 | FO5 | FO6 | FO7 | FO8 | FO9 | FO10 | FO11 | FO12 | Skill | Focus | Assessment Tools to Measure Attainment of CO |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------------|-------|--|
| CO1: Understand working of logic families and logic ICs. | V | V | V | V | V | V | V | V | V | V | V | V | Understand | Yes | Mid-Term Tests, Tutorial, End Semester Exams |
| CO2: Design and implement combinational and sequential logic circuits. | V | V | V | V | V | V | V | V | V | V | V | V | Analyze | Yes | Mid-Term Tests, Tutorial, End Semester Exams |
| CO3: Understand the process of Analog to digital conversion. | V | V | V | V | V | V | V | V | V | V | V | V | Understand | Yes | Mid-Term Tests, Tutorial, End Semester Exams |
| CO4: Be able to understand memories. | V | V | V | V | V | V | V | V | V | V | V | V | Understand | Yes | Mid-Term Tests, Tutorial, End Semester Exams |

Paper: BTEE-402-18 Electrical Machines – II

| | FO1 | FO2 | FO3 | FO4 | FO5 | FO6 | FO7 | FO8 | FO9 | FO10 | FO11 | FO12 | Skill | Focus | Assessment Tools to Measure Attainment of CO |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------------|-------|--|
| CO1: Understand the concepts of rotating magnetic field. | V | V | V | V | V | V | V | V | V | V | V | V | Understand | Yes | Mid-Term Tests, Tutorial, End Semester Exams |
| CO2: Understand the operation of AC machines. | V | V | V | V | V | V | V | V | V | V | V | V | Analyze | Yes | Mid-Term Tests, Tutorial, End Semester Exams |
| CO3: Analyze performance characteristics of AC machines. | V | V | V | V | V | V | V | V | V | V | V | V | Analyze | Yes | Mid-Term Tests, Tutorial, End Semester Exams |
| CO4: To understand the difference between the synchronous and induction motor. | V | V | V | V | V | V | V | V | V | V | V | V | Understand | Yes | Mid-Term Tests, Tutorial, End Semester Exams |

Paper: BTEE-403-18 Power Electronics

| | FO1 | FO2 | FO3 | FO4 | FO5 | FO6 | FO7 | FO8 | FO9 | FO10 | FO11 | FO12 | Skill | Focus | Assessment Tools to Measure Attainment of CO |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------------|-------|--|
| CO1: Understand the differences between signal line and power line. | V | V | V | V | V | V | V | V | V | V | V | V | Understand | Yes | Mid-Term Tests, Tutorial, End Semester Exams |
| CO2: Analyze controlled rectifier circuits. | V | V | V | V | V | V | V | V | V | V | V | V | Analyze | Yes | Mid-Term Tests, Tutorial, End Semester Exams |
| CO3: Analyze the operation of DC-DC choppers. | V | V | V | V | V | V | V | V | V | V | V | V | Analyze | Yes | Mid-Term Tests, Tutorial, End Semester Exams |
| CO4: Analyze the operation of voltage source inverters. | V | V | V | V | V | V | V | V | V | V | V | V | Analyze | Yes | Mid-Term Tests, Tutorial, End Semester Exams |

Paper: BTEE-404-18 Signals and Systems

| | FO1 | FO2 | FO3 | FO4 | FO5 | FO6 | FO7 | FO8 | FO9 | FO10 | FO11 | FO12 | Skill | Focus | Assessment Tools to Measure Attainment of CO |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------------|-------|--|
| CO1: Understand the concept of continuous time aperiodic signal. | V | V | V | V | V | V | V | V | V | V | V | V | Understand | Yes | Mid-Term Tests, Tutorial, End Semester Exams |
| CO2: Analyze systems in complex frequency domain. | V | V | V | V | V | V | V | V | V | V | V | V | Analyze | Yes | Mid-Term Tests, Tutorial, End Semester Exams |
| CO3: Understand sampling theorem and its implications. | V | V | V | V | V | V | V | V | V | V | V | V | Understand | Yes | Mid-Term Tests, Tutorial, End Semester Exams |
| CO4: Understand mathematical tools to be able to solve problems. | V | V | V | V | V | V | V | V | V | V | V | V | Understand | Yes | Mid-Term Tests, Tutorial, End Semester Exams |

Paper: BTMM302-18 Mathematics-III (Probability and Statistics)

| | FO1 | FO2 | FO3 | FO4 | FO5 | FO6 | FO7 | FO8 | FO9 | FO10 | FO11 | FO12 | Skill | Focus | Assessment Tools to Measure Attainment of CO |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|-----------|-------|--|
| CO1: Have basic knowledge about measure of central tendency. | V | V | V | V | V | V | V | V | V | V | V | V | Knowledge | Yes | Mid-Term Tests, Tutorial, End Semester Exams |
| CO2: Familiarize the student with expectations of probability. | V | V | V | V | V | V | V | V | V | V | V | V | Analyze | Yes | Mid-Term Tests, Tutorial, End Semester Exams |
| CO3: Familiarize probability techniques and random variables. | V | V | V | V | V | V | V | V | V | V | V | V | Analyze | Yes | Mid-Term Tests, Tutorial, End Semester Exams |
| CO4: Have basic idea about statistics including correlation. | V | V | V | V | V | V | V | V | V | V | V | V | Analyze | Yes | Mid-Term Tests, Tutorial, End Semester Exams |
| CO5: To fit the given data into curves by various method. | V | V | V | V | V | V | V | V | V | V | V | V | Apply | Yes | Mid-Term Tests, Tutorial, End Semester Exams |

Paper: BTEE-411-18 Measurements and Instrumentation Laboratory

| | FO1 | FO2 | FO3 | FO4 | FO5 | FO6 | FO7 | FO8 | FO9 | FO10 | FO11 | FO12 | Skill | Focus | Assessment Tools to Measure Attainment of CO |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------------|-------|--|
| CO1: Design and validate DC and AC bridge. | V | V | V | V | V | V | V | V | V | V | V | V | Apply | Yes | Experiments, Viva-Voice, End Semester Exams |
| CO2: Understand the dynamic response and the calibration of RTD. | V | V | V | V | V | V | V | V | V | V | V | V | Analyze | Yes | Experiments, Viva-Voice, End Semester Exams |
| CO3: Design and fabrication and calibration of all gas vacuum tube. | V | V | V | V | V | V | V | V | V | V | V | V | Understand | Yes | Experiments, Viva-Voice, End Semester Exams |
| CO4: Design about various measurement devices, like strain gauge, potentiometer, etc. | V | V | V | V | V | V | V | V | V | V | V | V | Analyze | Yes | Experiments, Viva-Voice, End Semester Exams |
| CO5: Understand statistical data acquisition. | V | V | V | V | V | V | V | V | V | V | V | V | Understand | Yes | Experiments, Viva-Voice, End Semester Exams |

Paper: BTEE-413-18 Digital Electronics Laboratory

| | FO1 | FO2 | FO3 | FO4 | FO5 | FO6 | FO7 | FO8 | FO9 | FO10 | FO11 | FO12 | Skill | Focus | Assessment Tools to Measure Attainment of CO |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------------|-------|--|
| CO1: To understand of basic electronic components. | V | V | V | V | V | V | V | V | V | V | V | V | Understand | Yes | Experiments, Viva-Voice, End Semester Exams |
| CO2: Understanding verify truth tables of TTL gates. | V | V | V | V | V | V | V | V | V | V | V | V | Analyze | Yes | Experiments, Viva-Voice, End Semester Exams |
| CO3: Design and fabrication and calibration of all gas vacuum tube. | V | V | V | V | V | V | V | V | V | V | V | V | Analyze | Yes | Experiments, Viva-Voice, End Semester Exams |
| CO4: Design the truth tables and basic circuits. | V | V | V | V | V | V | V | V | V | V | V | V | Analyze | Yes | Experiments, Viva-Voice, End Semester Exams |
| CO5: Testing of basic electronic circuits. | V | V | V | V | V | V | V | V | V | V | V | V | Apply | Yes | Experiments, Viva-Voice, End Semester Exams |

Paper: BTEE-413-18 Electrical Machines-II Laboratory

| | FO1 | FO2 | FO3 | FO4 | FO5 | FO6 | FO7 | FO8 | FO9 | FO10 | FO11 | FO12 | Skill | Focus | Assessment Tools to Measure Attainment of CO |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|---------|-------|--|
| CO1: Construct equivalent circuit of induction motor. | V | V | V | V | V | V | V | V | V | V | V | V | Analyze | Yes | Experiments, Viva-Voice, End Semester Exams |
| CO2: Comprehend the requirement of starting and speed control of induction motor. | V | V | V | V | V | V | V | V | V | V | V | V | Analyze | Yes | Experiments, Viva-Voice, End Semester Exams |
| CO3: Construct equivalent circuits of synchronous motor. | V | V | V | V | V | V | V | V | V | V | V | V | Analyze | Yes | Experiments, Viva-Voice, End Semester Exams |

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CO5:Construct characteristic curves for induction motor.
CO6:Understand the concept of parallel operation of transformer.

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|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 | PO15 |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |

Yes Experiments, Viva-Voce, End Semester Exams
Yes Experiments, Viva-Voce, End Semester Exams

Paper: BTEE-416-18 Power Electronics Laboratory

CO1:Understand the properties and characteristics of diode.
CO2:Understand the different types of waveform.
CO3:Analyze speed and direction control of single phase induction motor.
CO4:Understand the effect of free-wheeling diode in inverter.
CO5:Check the performance of a chopper, and motor.

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|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 | PO15 |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |

Yes Experiments, Viva-Voce, End Semester Exams
Yes Experiments, Viva-Voce, End Semester Exams
Yes Experiments, Viva-Voce, End Semester Exams
Yes Experiments, Viva-Voce, End Semester Exams

Paper: BTMC-103-18 Indian Constitution

CO1:Understand the different dimensions of Indian Constitution.
CO2:They will be aware about their duties towards state.
CO3:Students will be able to challenges of the democratic governance.

| | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 | PO15 |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |

Yes Mid-Term Tests, Tutorials, End Semester Exams
Yes Mid-Term Tests, Tutorials, End Semester Exams
Yes Mid-Term Tests, Tutorials, End Semester Exams

Paper: BTMC-102-18 Essence of Indian Traditional Knowledge

CO1:Ability to understand connect up and explain the concept of traditional knowledge.
CO2: Ability to understand connects up and explain the concept of traditional knowledge.

| | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 | PO15 |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |

Yes Mid-Term Tests, Tutorials, End Semester Exams
Yes Mid-Term Tests, Tutorials, End Semester Exams
Yes Mid-Term Tests, Tutorials, End Semester Exams

Paper: BTEE-501-18 Power Systems: (Apparatus and Modelling)

CO1:Understand the concepts of power systems.
CO2:Understand the various power system components.
CO3:Evaluate fault currents for different types of fault.
CO4:Understand the operation of over-voltage and under-voltage relays.
CO5:Understand basic protection schemes.
CO6:Understand concepts of HVDC power transmission.

| | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 | PO15 |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |

Yes Mid-Term Tests, Tutorials, End Semester Exams
Yes Mid-Term Tests, Tutorials, End Semester Exams
Yes Mid-Term Tests, Tutorials, End Semester Exams
Yes Mid-Term Tests, Tutorials, End Semester Exams

Paper: BTEE-502-18 Control Systems

CO1:Understand the modeling of time-domain model.
CO2:Understand the concept of stability and its assessment for time-domain transfer systems.
Design simple feedback controllers.

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|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 | PO15 |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |

Yes Mid-Term Tests, Tutorials, End Semester Exams
Yes Mid-Term Tests, Tutorials, End Semester Exams

Paper: BTEE-503-18 Microprocessors

CO1:Study of 8085 and 8086 Microprocessors.
CO2:Do assembly language programming.
CO3:Do interfacing design of peripheral like 8255, 8253, 8254.
CO4:Develop systems using different microprocessors.

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|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 | PO15 |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |

Yes Mid-Term Tests, Tutorials, End Semester Exams
Yes Mid-Term Tests, Tutorials, End Semester Exams
Yes Mid-Term Tests, Tutorials, End Semester Exams

Paper: BTEE-504A-18 Electrical Engineering Materials

CO1:To understand the basic concepts of materials.
CO2:To understand the selection of materials for electrical and electronic applications.
CO3:To understand the properties of materials.

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|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 | PO15 |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |

Yes Mid-Term Tests, Tutorials, End Semester Exams
Yes Mid-Term Tests, Tutorials, End Semester Exams
Yes Mid-Term Tests, Tutorials, End Semester Exams

Paper: BTEE-504B-18 Switchgear and Protection

CO1:Understand power system protection.
CO2:Understand the main components used in power system protection.
CO3:Understand the bus bars, overhead and underground cables and the guarding protection.

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|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 | PO15 |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |

Yes Mid-Term Tests, Tutorials, End Semester Exams
Yes Mid-Term Tests, Tutorials, End Semester Exams
Yes Mid-Term Tests, Tutorials, End Semester Exams

Paper: BTEE-504C-18 Electrical Machine Design

CO1:Understand the construction and performance of DC motor.
CO2:Understand the various factors which influence the performance of DC motor.
CO3:Understand the principles of electrical machine design.
CO4:Use software tools to do design calculations.

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|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 | PO15 |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |

Yes Mid-Term Tests, Tutorials, End Semester Exams
Yes Mid-Term Tests, Tutorials, End Semester Exams
Yes Mid-Term Tests, Tutorials, End Semester Exams

Paper: BTEE-504D-18 Renewable Energy Sources

CO1:To understand the need, importance and scope of renewable energy sources.
CO2:To understand the significance of solar energy.
CO3:To provide importance of Wind Energy.
CO4:To understand the role of ocean energy in the generation of electricity.
CO5:To get the utilization of Biogas plants and geothermal energy.
CO6:To understand the concept of energy conservation.

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|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 | PO15 |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |

Yes Mid-Term Tests, Tutorials, End Semester Exams
Yes Mid-Term Tests, Tutorials, End Semester Exams
Yes Mid-Term Tests, Tutorials, End Semester Exams
Yes Mid-Term Tests, Tutorials, End Semester Exams

Paper: ETS-105-18 Environmental Studies

CO1:Understand the need, importance and scope of environmental studies.
CO2:To understand the significance of solar energy.
CO3:To provide importance of Wind Energy.
CO4:To understand the role of ocean energy in the generation of electricity.
CO5:To get the utilization of Biogas plants and geothermal energy.
CO6:To understand the concept of energy conservation.

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|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 | PO15 |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |

Yes Mid-Term Tests, Tutorials, End Semester Exams

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(Signature)

CO1 Understand the characteristics of dc motors and

| | | | | | | | | | | | | | | | | | | | | |
|--|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Y | Y | Y | | | | | | | | | | | | | | | | |
| | | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |

CO2 Understand the principles of speed control of

| | | | | | | | | | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |

CO3 Apply the knowledge of power electronics to V

| | | | | | | | | | | | | | | | | | | | | |
|--|--|--|---|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| | | | Y | Y | Y | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |

CO4 Apply the knowledge of control system for the

| | | | | | | | | | | | | | | | | | | | | |
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CO5 Understand the working of AC and DC Drive

| | | | | | | | | | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |

Paper: BTEE-603D-18 Wind and Solar Energy Systems

Course Outcome

| | | | | | | | | | | | | | | | | | | | | |
|--|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO11 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | SK11 | SK12 | |
| CO1 Understand the basic physics of wind and solar | | | Y | Y | Y | | | | | | | | | | | | | | | |
| CO2 Understand the basic physics of wind and solar | | | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| CO3 Apply the knowledge of electrical machines to V | | | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| CO4 Understand the power electronic interfaces for | | | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| CO5 Understand the issues related to the grid inter | | | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |

Understand
Apply
Apply
Understand

Focus Assessment Tools to Measure Attainment of CO

| | |
|-----|---|
| | Mid-Term Tests, Tutorials, End Semester Exams |
| Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| Yes | Mid-Term Tests, Tutorials, End Semester Exams |

Paper: BTEE-604A-18 High Voltage Engineering

Course Outcome

| | | | | | | | | | | | | | | |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | SK11 | SK12 |
| CO1 Understand the basic physics related to various | | | Y | Y | Y | | | | | | | | | |
| CO2 Knowledge of generation and measurement of V | | | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| CO3 Knowledge of tests on H.V. equipment and on V | | | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| CO4 Knowledge of how over-voltages arise in a po | | | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |

Understand
Knowledge
Knowledge
Knowledge

Focus Assessment Tools to Measure Attainment of CO

| | |
|-----|---|
| | Mid-Term Tests, Tutorials, End Semester Exams |
| Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| Yes | Mid-Term Tests, Tutorials, End Semester Exams |

Paper: BTEE-603B-18 Power System Reliability

Course Outcome

| | | | | | | | | | | | | | | |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | SK11 | SK12 |
| CO1 Understand the basic quantitative reliability an | | | Y | Y | Y | | | | | | | | | |
| CO2 Understand the reliability modeling and analy | | | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| CO3 Knowledge of reliability assessment for client | | | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| CO4 Understand the risk analysis in power system | | | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |

Understand
Understand
Understand
Understand

Focus Assessment Tools to Measure Attainment of CO

| | |
|-----|---|
| | Mid-Term Tests, Tutorials, End Semester Exams |
| Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| Yes | Mid-Term Tests, Tutorials, End Semester Exams |

Paper: BTEE-604C-18 Line-Commutated and Active PWM Rectifiers

Course Outcome

| | | | | | | | | | | | | | | |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | SK11 | SK12 |
| CO1 Analyze controlled rectifier circuits. | | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| CO2 Understand the operation of line-commutated | | | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| CO3 Understand the operation of PWM rectifiers - | | | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |

Analyze
Understand
Understand

Focus Assessment Tools to Measure Attainment of CO

| | |
|-----|---|
| | Mid-Term Tests, Tutorials, End Semester Exams |
| Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| Yes | Mid-Term Tests, Tutorials, End Semester Exams |

Paper: BTEE-604D-18 Energy Efficient Systems

Course Outcome

| | | | | | | | | | | | | | | |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | SK11 | SK12 |
| CO1 Understand the basic electricity billing and ele | | | Y | Y | Y | | | | | | | | | |
| CO2 Understand the refrigeration and air conditi | | | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| CO3 Knowledge of light source, choice of lighting | | | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| CO4 Understand the diesel generating system and | | | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |

Understand
Understand
Understand
Understand

Focus Assessment Tools to Measure Attainment of CO

| | |
|-----|---|
| | Mid-Term Tests, Tutorials, End Semester Exams |
| Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| Yes | Mid-Term Tests, Tutorials, End Semester Exams |

Paper: HSMC-103-18 Education, Technology and Society

Course Outcome

| | | | | | | | | | | | | | | |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | SK11 | SK12 |
| CO1 Students will be able to integrate their technic | | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |

Knowledge

Focus Assessment Tools to Measure Attainment of CO

| | |
|-----|---|
| | Mid-Term Tests, Tutorials, End Semester Exams |
| Yes | Mid-Term Tests, Tutorials, End Semester Exams |

Paper: HSMC-104-18 History of Science and Technology in India

Course Outcome

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|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | SK11 | SK12 |
| CO1 Students will be able to integrate their technic | | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |

Knowledge

Focus Assessment Tools to Measure Attainment of CO

| | |
|-----|---|
| | Mid-Term Tests, Tutorials, End Semester Exams |
| Yes | Mid-Term Tests, Tutorials, End Semester Exams |

Paper: HSMC-113-18 Values and Ethics

Course Outcome

| | | | | | | | | | | | | | | |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | SK11 | SK12 |
| CO1 Students will be able to integrate their technic | | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |

Knowledge

Focus Assessment Tools to Measure Attainment of CO

| | |
|-----|---|
| | Mid-Term Tests, Tutorials, End Semester Exams |
| Yes | Mid-Term Tests, Tutorials, End Semester Exams |

Paper: HSMC-119-18 Introduction to Women's and Gender Studies

Course Outcome

| | | | | | | | | | | | | | | |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | SK11 | SK12 |
| CO1 Students will be able to integrate their technic | | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |

Knowledge

Focus Assessment Tools to Measure Attainment of CO

| | |
|-----|---|
| | Mid-Term Tests, Tutorials, End Semester Exams |
| Yes | Mid-Term Tests, Tutorials, End Semester Exams |

Paper: DEE-101-18 Control Systems

Course Outcome

| | | | | | | | | | | | | | | |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | SK11 | SK12 |
| CO1 Students will be able to integrate their technic | | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| CO2 Understanding the model of linear-time-invar | | | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| CO3 Understanding state space representations | | | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| CO4 Knowledge of the concept of stability | | | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| CO5 Assessment for linear-time invariant systems | | | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| CO6 Knowledge of non-linear systems | | | | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |

Understand
Understand
Understand
Analyze
Understand

Focus Assessment Tools to Measure Attainment of CO

| | |
|-----|---|
| | Mid-Term Tests, Tutorials, End Semester Exams |
| Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| Yes | Mid-Term Tests, Tutorials, End Semester Exams |

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Paper: OEE-102-18 Power Electronics

| Course Outcome | Focus: Assessment Tools to Measure Attainment of CO | | | | | | | | | | | | |
|--|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| | CO1 | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1: Knowledge of power semiconductor switches | V | V | | | | | | | | | | | |
| CO2: Understand the working of various types of converters | V | | V | V | | | | | | | | | |
| CO3: Apply the ac-dc and dc-dc converter in field | | | | | | | | | | | | | |

Paper: OEE-103-18 Electrical Energy Conservation & Auditing

| Course Outcome | Focus: Assessment Tools to Measure Attainment of CO | | | | | | | | | | | | |
|--|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|--|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | |
| CO1: Knowledge of the energy conservation/saving | V | V | | | | | | | | | | | |
| CO2: Knowledge of energy conservation opportunities | V | V | | | | | | | | | | | |
| CO3: Understand the Demerit/Rate skills required for energy conservation | | | V | V | | | | | | | | | |
| CO4: Understand the budget cost effective measure | | | V | V | | | | | | | | | |

Paper: OEE-104-18 Renewable Energy Sources

| Course Outcome | Focus: Assessment Tools to Measure Attainment of CO | | | | | | | | | | | | |
|--|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|--|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | |
| CO1: Knowledge of the basic properties of different renewable energy sources | V | V | | | | | | | | | | | |
| CO2: Knowledge of the main elements of technical design of renewable energy systems | V | V | | | | | | | | | | | |
| CO3: Understand the advantages and disadvantages of different renewable energy sources | | | V | V | | | | | | | | | |
| CO4: Understand the energy potential of renewable energy sources | | | V | V | | | | | | | | | |

Paper: OEE-201-18 Electric Machines

| Course Outcome | Focus: Assessment Tools to Measure Attainment of CO | | | | | | | | | | | | |
|--|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|--|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | |
| CO1: Summarize the basic of Single Phase Induction Motor | V | V | | | | | | | | | | | |
| CO2: Acquire Knowledge about Testing and application of Induction Motor | V | V | | | | | | | | | | | |
| CO3: Understand the concepts of Stepper Motors, DC Motors and Servo Motors | | | V | V | | | | | | | | | |
| CO4: Understand the basic concept of universal and repulsion motor | | | V | V | | | | | | | | | |
| CO5: Explain the basic concepts of universal and repulsion motor | | | V | V | | | | | | | | | |

Paper: OEE-202-18 Industrial Electrical Systems

| Course Outcome | Focus: Assessment Tools to Measure Attainment of CO | | | | | | | | | | | | |
|---|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|--|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | |
| CO1: Understand the electrical wiring systems for industrial applications | V | V | | | | | | | | | | | |
| CO2: Understand the basic principles of wind and solar energy systems | | | V | V | | | | | | | | | |
| CO3: Analyze and select the proper size of various electrical components | | | V | V | | | | | | | | | |

Paper: OEE-203-18 Wind and Solar Energy Systems

| Course Outcome | Focus: Assessment Tools to Measure Attainment of CO | | | | | | | | | | | | |
|--|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|--|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | |
| CO1: Understand the energy scenario and the concept of wind and solar energy | V | V | | | | | | | | | | | |
| CO2: Understand the basic principles of wind and solar energy systems | V | V | | | | | | | | | | | |
| CO3: Understand the proper electronic interfaces for wind and solar energy systems | | | V | V | | | | | | | | | |
| CO4: Understand the issues related to the solar panel | | | V | V | | | | | | | | | |

Paper: BTE-204-18 Power Systems

| Course Outcome | Focus: Assessment Tools to Measure Attainment of CO | | | | | | | | | | | | |
|---|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|--|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | |
| CO1: Awareness of supply system | V | V | | | | | | | | | | | |
| CO2: Understanding of the material used and concept of power factor | V | V | | | | | | | | | | | |
| CO3: Understand the cable used in power system | | | V | V | | | | | | | | | |
| CO4: Knowledge of neutral grounding | | | V | V | | | | | | | | | |

Paper: BTE-221-18 Project-2

| Course Outcome | Focus: Assessment Tools to Measure Attainment of CO | | | | | | | | | | | | |
|--|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|--|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | |
| CO1: Apply and verify basic scientific principles and concepts | V | V | | | | | | | | | | | |
| CO2: Application of interdisciplinary knowledge | V | V | | | | | | | | | | | |
| CO3: To identify possible product that can be made | | | V | V | | | | | | | | | |

Paper: BTE-201A-18 Electrical Energy Conservation and Auditing

| Course Outcome | Focus: Assessment Tools to Measure Attainment of CO | | | | | | | | | | | | |
|--|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|--|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | |
| CO1: Understand the current energy scenario and the concept of energy conservation | V | V | | | | | | | | | | | |
| CO2: Understand the methods of improving energy efficiency | V | V | | | | | | | | | | | |
| CO3: Understand the concepts of different energy audit methods | | | V | V | | | | | | | | | |

Paper: BTE-201B-18 Computer Aided Power System Analysis

| Course Outcome | Focus: Assessment Tools to Measure Attainment of CO | | | | | | | | | | | | |
|--|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|--|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | |
| CO1: To introduce computer applications in the area of power system analysis | V | V | | | | | | | | | | | |
| CO2: To understand the solution methods and techniques for power system analysis | V | V | | | | | | | | | | | |
| CO3: To solve numerically the complex, IEEE bus network | | | V | V | | | | | | | | | |

Paper: BTE-201C-18 Power Quality and FACTS

| Course Outcome | Focus: Assessment Tools to Measure Attainment of CO | | | | | | | | | | | | |
|--|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|--|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | |
| CO1: To introduce the fundamental concepts related to power quality | V | V | | | | | | | | | | | |
| CO2: To enhance the students to understand the various types of power quality issues | V | V | | | | | | | | | | | |
| CO3: To provide basic understanding of the emerging power quality issues | V | V | | | | | | | | | | | |
| CO4: To enable students to design power electronic devices for power quality improvement | V | V | | | | | | | | | | | |

Paper: BTEE-701D-18 Electrical and Hybrid Vehicles

| | | | | | | | | | | | | | | |
|--------------|-------------------|---|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 |
| CO1 | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | |
| CO2 | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | |
| CO3 | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Focus | Assessment | Tools to Measure Attainment of CO | | | | | | | | | | | | |
| | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| | | Mid-Term Tests, Tutorials, End Semester Exams | | | | | | | | | | | | |

Paper: BTEE-702A-18 Computational Electromagnetics

| | | | | | | | | | | | | | | |
|--------------|-------------------|---|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 |
| CO1 | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | |
| CO2 | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | |
| CO3 | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Focus | Assessment | Tools to Measure Attainment of CO | | | | | | | | | | | | |
| | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| | | Mid-Term Tests, Tutorials, End Semester Exams | | | | | | | | | | | | |

Paper: BTEE-702B-18 Microcontroller and PLC

| | | | | | | | | | | | | | | |
|--------------|-------------------|---|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 |
| CO1 | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | |
| CO2 | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | |
| CO3 | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Focus | Assessment | Tools to Measure Attainment of CO | | | | | | | | | | | | |
| | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| | | Mid-Term Tests, Tutorials, End Semester Exams | | | | | | | | | | | | |

Paper: BTEE-702C-18 Control Systems Design

| | | | | | | | | | | | | | | |
|--------------|-------------------|---|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 |
| CO1 | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | |
| CO2 | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | |
| CO3 | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Focus | Assessment | Tools to Measure Attainment of CO | | | | | | | | | | | | |
| | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| | | Mid-Term Tests, Tutorials, End Semester Exams | | | | | | | | | | | | |

Paper: BTEE-703A-18 Distributed Generation

| | | | | | | | | | | | | | | |
|--------------|-------------------|---|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 |
| CO1 | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | |
| CO2 | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | |
| CO3 | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Focus | Assessment | Tools to Measure Attainment of CO | | | | | | | | | | | | |
| | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| | | Mid-Term Tests, Tutorials, End Semester Exams | | | | | | | | | | | | |

Paper: BTEE-703A-18 Industrial Electrical Systems

| | | | | | | | | | | | | | | |
|--------------|-------------------|---|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 |
| CO1 | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | |
| CO2 | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | |
| CO3 | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Focus | Assessment | Tools to Measure Attainment of CO | | | | | | | | | | | | |
| | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| | | Mid-Term Tests, Tutorials, End Semester Exams | | | | | | | | | | | | |

Paper: BTEE-703B-18 Restructured Power Systems

| | | | | | | | | | | | | | | |
|--------------|-------------------|---|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 |
| CO1 | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | |
| CO2 | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | |
| CO3 | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Focus | Assessment | Tools to Measure Attainment of CO | | | | | | | | | | | | |
| | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| | | Mid-Term Tests, Tutorials, End Semester Exams | | | | | | | | | | | | |

CO1 To impart knowledge about the restructuring
CO2 To introduce the fundamental concepts relevant to transmission pricing, modes of dereliction
CO3 To introduce the fundamental concepts relevant to ancillary services and international experience of deregulation
CO4 To enable the students to understand the basic

Paper: BTEE-703C-18 Advanced Electric Drives

| | | | | | | | | | | | | | | |
|--------------|-------------------|---|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 |
| CO1 | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | |
| CO2 | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | |
| CO3 | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Focus | Assessment | Tools to Measure Attainment of CO | | | | | | | | | | | | |
| | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| | | Mid-Term Tests, Tutorials, End Semester Exams | | | | | | | | | | | | |

Paper: BTEE-703D-18 Energy Storage System

| | | | | | | | | | | | | | | |
|--------------|-------------------|---|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 |
| CO1 | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | |
| CO2 | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | |
| CO3 | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Focus | Assessment | Tools to Measure Attainment of CO | | | | | | | | | | | | |
| | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| | | Mid-Term Tests, Tutorials, End Semester Exams | | | | | | | | | | | | |

Paper: BTEE-721-18 One Semester Training

| | | | | | | | | | | | | | | |
|--------------|-------------------|---|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 |
| CO1 | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | |
| CO2 | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | |
| CO3 | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Focus | Assessment | Tools to Measure Attainment of CO | | | | | | | | | | | | |
| | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| | | Mid-Term Tests, Tutorials, End Semester Exams | | | | | | | | | | | | |

Paper: BTEE-801-18 Smart Grids

| | | | | | | | | | | | | | | |
|--------------|-------------------|---|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 |
| CO1 | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | |
| CO2 | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | |
| CO3 | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Focus | Assessment | Tools to Measure Attainment of CO | | | | | | | | | | | | |
| | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| | | Mid-Term Tests, Tutorials, End Semester Exams | | | | | | | | | | | | |

Paper: BTEE-802-18 Artificial Intelligence Techniques

| | | | | | | | | | | | | | | |
|--------------|-------------------|---|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 |
| CO1 | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | |
| CO2 | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | |
| CO3 | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Focus | Assessment | Tools to Measure Attainment of CO | | | | | | | | | | | | |
| | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| | | Mid-Term Tests, Tutorials, End Semester Exams | | | | | | | | | | | | |

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| CO/LO/PO | Knowledge | | | | | | | | | | | | Yes | Mid-Term Tests, Tutorials, End Semester Exams |
|----------|-----------|----|----|----|----|----|----|----|----|-----|-----|-----|-----|---|
| | K1 | K2 | K3 | K4 | K5 | K6 | K7 | K8 | K9 | K10 | K11 | K12 | Yes | |
| CO1/PO1 | V | V | | | | | | | | | | | Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| CO2/PO2 | V | V | | | | | | | | | | | Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| CO3/PO3 | V | V | V | V | V | V | V | V | V | V | V | V | Yes | Mid-Term Tests, Tutorials, End Semester Exams |

Paper: BTEE-803-18 Indian Electricity Standards and Practices

| Course Outcome | Focus Assessment Tools to Measure Attainment of CO | | | | | | | | | | | |
|--|--|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1/PO1 Know various definitions used in Indian electricity | V | V | | | | | | | | | | |
| CO2/PO2 Plan to get a new connection and enhancement | V | V | | | | | | | | | | |
| CO3/PO3 Adequacy and responsibility associated with power system | V | V | V | V | V | V | V | V | V | V | V | V |

Paper: BTEE-S11-18 Modelling and Simulation Lab

| Course Outcome | Focus Assessment Tools to Measure Attainment of CO | | | | | | | | | | | |
|--|--|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| CO1/PO1 Design of primary and secondary transmission line | V | V | | | | | | | | | | |
| CO2/PO2 Plan to get a new connection and enhancement | V | V | | | | | | | | | | |
| CO3/PO3 Adequacy and responsibility associated with power system | V | V | V | V | V | V | V | V | V | V | V | V |

S. Garg
(Signature of Head of Department)

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Kapurthala-144006

Name of Department: Electrical Engineering Program: M.Tech Electrical Engineering (Power System)

Paper: EEPs-101-18 POWER SYSTEM ANALYSIS-I

| Learning Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | SKILL | Focus of Assessment Tools to Measure Attainment of CO |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----------|---|
| CO1: To calculate voltage phasors at all buses, given the data | V | V | | | | | | | Ability | Mid-Term Tests, Tutorials, End Semester Exams |
| CO2: Able to calculate fault currents in each phase | | | | | | | | | Ability | Mid-Term Tests, Tutorials, End Semester Exams |
| CO3: Rank various contingencies according to their severity | V | | | | | | | | Knowledge | Mid-Term Tests, Tutorials, End Semester Exams |
| CO4: Estimate the bus voltage phasors given various quantities viz. power flow, voltages, taps, CB status etc | | | | | | | | | Analyze | Mid-Term Tests, Tutorials, End Semester Exams |
| CO5: Estimate clearance to voltage collapse and calculate PV curves using continuation power flow | | | | | | | | | Analyze | Mid-Term Tests, Tutorials, End Semester Exams |

Paper: EEPs-102-18 POWER SYSTEM DYNAMICS-I

| Learning Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | SKILL | Focus of Assessment Tools to Measure Attainment of CO |
|---|-----|-----|-----|-----|-----|-----|-----|-----|------------|---|
| CO1: Understand the modeling of synchronous machine in de | V | | | | | | | | Understand | Mid-Term Tests, Tutorials, End Semester Exams |
| CO2: Carry out simulation studies of power system dynamics | V | V | V | V | | | | | Identify | Mid-Term Tests, Tutorials, End Semester Exams |
| CO3: Carry out stability analysis with and without power system | V | V | V | V | | | | | Understand | Mid-Term Tests, Tutorials, End Semester Exams |
| CO4: Understand the load modeling in power system | | | | | | | | | Yes | |

Paper: EEPs-103A-18 RENEWABLE ENERGY SYSTEM

| Learning Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | SKILL | Focus of Assessment Tools to Measure Attainment of CO |
|--|-----|-----|-----|-----|-----|-----|-----|-----|------------|---|
| CO1: Knowledge about renewable energy | V | | | | | | | | Knowledge | Mid-Term Tests, Tutorials, End Semester Exams |
| CO2: Understand the working of distributed generation system | | | | | | | | | Understand | Mid-Term Tests, Tutorials, End Semester Exams |
| CO3: Know the impact of Distributed Generation on Power System | | | | | | | | | Yes | |

Paper: EEPs-103B-18 SMART GRIDS

| Learning Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | SKILL | Focus of Assessment Tools to Measure Attainment of CO |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----------|---|
| CO1: Appreciate the difference between smart grid & conventional | V | | | | | | | | Knowledge | Mid-Term Tests, Tutorials, End Semester Exams |
| CO2: Apply smart metering concepts to industrial and commercial | V | | | | | | | | Apply | Mid-Term Tests, Tutorials, End Semester Exams |
| CO3: Formulate solutions in the areas of smart substations, distribution | V | | | | | | | | Analyze | Mid-Term Tests, Tutorials, End Semester Exams |
| CO4: Come up with smart grid solutions using modern communication | V | | | | | | | | Analyze | Mid-Term Tests, Tutorials, End Semester Exams |

Paper: EEPs-103C-18 HIGH POWER CONVERTERS

| Learning Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | SKILL | Focus of Assessment Tools to Measure Attainment of CO |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----------|---|
| CO1: Learn the characteristics of PSUs such as SCR, GTO, IGBT | V | | | | | | | | Apply | Mid-Term Tests, Tutorials, End Semester Exams |
| CO2: Demonstrate the knowledge of the physics of wind power | V | | | | | | | | Knowledge | Mid-Term Tests, Tutorials, End Semester Exams |
| CO3: Acquire knowledge of power conditioners and their applications | V | | | | | | | | Knowledge | Mid-Term Tests, Tutorials, End Semester Exams |
| CO4: Ability to design power circuit and protection circuit of HV | | | | | | | | | Ability | Mid-Term Tests, Tutorials, End Semester Exams |

Paper: EEPs-103D-18 WIND AND SOLAR SYSTEMS

| Learning Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | SKILL | Focus of Assessment Tools to Measure Attainment of CO |
|--|-----|-----|-----|-----|-----|-----|-----|-----|----------------|---|
| CO1: Appreciate the importance of energy growth of the power | V | | | | | | | | Analyze | Mid-Term Tests, Tutorials, End Semester Exams |
| CO2: Demonstrate the knowledge of the physics of wind power | V | | | | | | | | Knowledge | Mid-Term Tests, Tutorials, End Semester Exams |
| CO3: Demonstrate the knowledge of physics of solar power | V | | | | | | | | Knowledge | Mid-Term Tests, Tutorials, End Semester Exams |
| CO4: Identify, formulate and solve the problems of energy crisis | V | | | | | | | | Identification | Mid-Term Tests, Tutorials, End Semester Exams |

Paper: EEPs-104A-18 ELECTRICAL POWER DISTRIBUTION SYSTEM

| Learning Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | SKILL | Focus of Assessment Tools to Measure Attainment of CO |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----------|---|
| CO1: Knowledge of power distribution system | V | | | | | | | | Knowledge | Mid-Term Tests, Tutorials, End Semester Exams |
| CO2: Study of Distribution automation and its application in power | V | | | | | | | | Analyze | Mid-Term Tests, Tutorials, End Semester Exams |
| CO3: To learn SCADA system | V | | | | | | | | Analyze | Mid-Term Tests, Tutorials, End Semester Exams |

Paper: EEPs-104 B-18 MATHEMATICAL METHODS FOR POWER ENGINEERING

| Learning Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | SKILL | Focus of Assessment Tools to Measure Attainment of CO |
|---|-----|-----|-----|-----|-----|-----|-----|-----|----------------|---|
| CO1: Knowledge about vector spaces, linear transformation, etc | V | | | | | | | | Knowledge | Mid-Term Tests, Tutorials, End Semester Exams |
| CO2: To learn about linear programming problems and understanding | V | | | | | | | | Investigation | Mid-Term Tests, Tutorials, End Semester Exams |
| CO3: Acquire knowledge about nonlinear programming and | V | | | | | | | | Knowledge | Mid-Term Tests, Tutorials, End Semester Exams |
| CO4: Understanding the concept of random variables, functions of | V | | | | | | | | Analyze | Mid-Term Tests, Tutorials, End Semester Exams |
| CO5: Understand stochastic processes and their classification | V | | | | | | | | Identification | Mid-Term Tests, Tutorials, End Semester Exams |

Paper: EEPs-104C-18 PULSE WIDTH MODULATION FOR PE CONVERTERS

| Learning Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | SKILL | Focus of Assessment Tools to Measure Attainment of CO |
|---|-----|-----|-----|-----|-----|-----|-----|-----|----------------|---|
| CO1: Appreciate importance of PWM techniques | V | | | | | | | | Knowledge | Mid-Term Tests, Tutorials, End Semester Exams |
| CO2: Implement PWM using different strategies | V | | | | | | | | Ability | Mid-Term Tests, Tutorials, End Semester Exams |
| CO3: Control C&I and VSI using PWM | V | | | | | | | | Yes | |
| CO4: Comparative performance of converter for different PWM | V | | | | | | | | Identification | Mid-Term Tests, Tutorials, End Semester Exams |

Paper: EEPs-104-D-18 ELECTRIC AND HYBRID VEHICLES

| Learning Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | SKILL | Focus of Assessment Tools to Measure Attainment of CO |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----------|---|
| CO1: Acquire Knowledge about fundamental concepts, principle | V | | | | | | | | Knowledge | Mid-Term Tests, Tutorials, End Semester Exams |
| CO2: To learn electric drive in vehicles / traction | V | | | | | | | | Ability | Mid-Term Tests, Tutorials, End Semester Exams |

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 I K Gujral Punjab Technical University
 Bathinda-144006

[Signature]

Paper: MTRM-101-18 RESEARCH METHODOLOGY AND IPR

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | Skill | Focus of Assessment Tools to Measure Attainment of CO |
|---|-----|-----|-----|-----|-----|-----|-----|-----|------------|---|
| CO1: Understand research problem formulation. Analyze research. | V | | | | | | | | Understand | Yes |
| CO2: Follow research ethics. | V | | | | | | | | Ability | Yes |
| CO3: Understand that today's world is controlled by Computer. | V | | | | | | | | Understand | Yes |
| CO4: Understanding that when IPR would take such important. | V | | | | | | | | Understand | Yes |

CO5: Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

Paper: EEP5-105-18 POWER SYSTEM STEADY STATE ANALYSIS LAB

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | Skill | Focus of Assessment Tools to Measure Attainment of CO |
|--|-----|-----|-----|-----|-----|-----|-----|-----|------------|---|
| CO1: Understand the power system operational problems. | V | | | | | | | | Understand | Yes |
| CO2: Apply the load flow methods. Load analysis techniques. | V | V | V | V | V | V | V | V | Apply | Yes |
| CO3: Applications of power electronic devices in power system. | V | V | V | V | V | V | V | V | Usage | Yes |

Paper: EEP5-106-18 POWER SYSTEM DYNAMICS LAB

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | Skill | Focus of Assessment Tools to Measure Attainment of CO |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----------|---|
| CO1: On stability analysis for small signal stability. | V | | | | | | | | Knowledge | Yes |
| CO2: Analyze the single machine system using model. | V | V | V | V | V | V | V | V | Analyze | Yes |
| CO3: Simulink models considering excitation system. | V | V | V | V | V | V | V | V | Design | Yes |

Paper: EEP5-106-18 RENEWABLE ENERGY LAB

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | Skill | Focus of Assessment Tools to Measure Attainment of CO |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----------|---|
| CO1: Various power curves considering different renewable energy. | V | | | | | | | | Knowledge | Yes |
| CO2: Analyze the effect of variations of parameters on solar panel. | V | V | V | V | V | V | V | V | Analyze | Yes |
| CO3: Analyze the wind power. | V | V | V | V | V | V | V | V | Analyze | Yes |

Paper: MTR-101A-18 ENGLISH FOR PAPER WRITING

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | Skill | Focus of Assessment Tools to Measure Attainment of CO |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----------|---|
| CO1: Improve writing and readability levels for English. | V | | | | | | | | Learn | Yes |
| CO2: How to write and what write according to section. | V | V | V | V | V | V | V | V | Knowledge | Yes |
| CO3: Skills in IPR writing. | V | V | V | V | V | V | V | V | Knowledge | Yes |

Paper: MTR-101B-18 DISASTER MANAGEMENT

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | Skill | Focus of Assessment Tools to Measure Attainment of CO |
|---|-----|-----|-----|-----|-----|-----|-----|-----|------------|---|
| CO1: Know, how to reduce disaster risk and humanitarian relief. | V | | | | | | | | Knowledge | Yes |
| CO2: Policy and practice for disaster risk reduction. | V | V | V | V | V | V | V | V | Challenge | Yes |
| CO3: Understand the practical relevance of conflict situations. | V | V | V | V | V | V | V | V | Understand | Yes |
| CO4: Planning, programming and strength and weakness of aid. | V | V | V | V | V | V | V | V | Challenge | Yes |

Paper: MTR-101C-18 SANSKRIT FOR TECHNICAL EDUCATION

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | Skill | Focus of Assessment Tools to Measure Attainment of CO |
|--|-----|-----|-----|-----|-----|-----|-----|-----|------------|---|
| CO1: Understanding basic Sanskrit language. | V | | | | | | | | Understand | Yes |
| CO2: Student Sanskrit literature about science & technology. | V | V | V | V | V | V | V | V | Challenge | Yes |
| CO3: Being a logical language will help to develop logic in student. | V | V | V | V | V | V | V | V | Challenge | Yes |

Paper: MTR-101D-18 VALUE EDUCATION

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | Skill | Focus of Assessment Tools to Measure Attainment of CO |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----------|---|
| CO1: Knowledge of self-development. | V | | | | | | | | Knowledge | Yes |
| CO2: Learn the importance of Human values. | V | V | V | V | V | V | V | V | Apply | Yes |
| CO3: Developing the overall personality. | V | V | V | V | V | V | V | V | Knowledge | Yes |

Paper: EEP5-201-18 DIGITAL PROTECTION OF POWER SYSTEM

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | Skill | Focus of Assessment Tools to Measure Attainment of CO |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----------|---|
| CO1: Learn the importance of Digital relays. | V | | | | | | | | Knowledge | Yes |
| CO2: Apply Mathematical approach towards protection. | V | V | V | V | V | V | V | V | Apply | Yes |
| CO3: Learn to develop various Protection algorithms. | V | V | V | V | V | V | V | V | Ability | Yes |

Paper: EEP5-202-18 POWER SYSTEM DYNAMICS-II

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | Skill | Focus of Assessment Tools to Measure Attainment of CO |
|---|-----|-----|-----|-----|-----|-----|-----|-----|------------|---|
| CO1: Gain valuable insights into the phenomena of power system. | V | | | | | | | | Knowledge | Yes |
| CO2: Understand the power system stability problem. | V | V | V | V | V | V | V | V | Understand | Yes |
| CO3: Analyze the stability problems and implement modern control. | V | V | V | V | V | V | V | V | Analyze | Yes |
| CO4: Simulate small signal and large signal stability problems. | V | V | V | V | V | V | V | V | Analyze | Yes |

Paper: EEP5-203A-18 RESTRUCTURED POWER SYSTEMS

| Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | Skill | Focus of Assessment Tools to Measure Attainment of CO |
|--|-----|-----|-----|-----|-----|-----|-----|-----|----------------|---|
| CO1: Describe various types of regulations in power systems. | V | | | | | | | | Knowledge | Yes |
| CO2: Identify the need of regulation and deregulation. | V | V | V | V | V | V | V | V | Identification | Yes |

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| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------------|-----|---|
| CO3 Define and describe the technical and Non-technical skill | V | | | | | | | | | | | | | | | | | | Challenge | Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| CO3 Identify and give examples of existing electrical machine | V | V | | | | | | | | | | | | | | | | | Identification | Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| CO3 Classify different motor mechanisms and summarize them | V | | | | | | | | | | | | | | | | | | Knowledge | Yes | Mid-Term Tests, Tutorials, End Semester Exams |

Paper: EEP5-203B-18 ADVANCED DIGITAL SIGNAL PROCESSING

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|--|--|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------|-----|---|
| CO1 Knowledge about the time domain and frequency domain | V | | | | | | | | | | | | | | | | | | Knowledge | Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| CO2 Study the design techniques for FIR and IIR filters and its V | | | | V | V | | | | | | | | | | | | | | Designing | Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| CO3 Acquire knowledge about the finite word length effects | V | | | | | | | | | | | | | | | | | | Knowledge | Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| CO4 Knowledge about the various linear signal models and e | V | | | | | | | | | | | | | | | | | | Knowledge | Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| CO5 Design of optimum FIR and IIR filters | | | | | V | | | | | | | | | | | | | | Designing | Yes | Mid-Term Tests, Tutorials, End Semester Exams |

Paper: EEP5-203C-18 DYNAMICS OF ELECTRICAL MACHINES

| | | | | | | | | | | | | | | | | | | | | | |
|--|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------|-----|---|
| CO1 Formulation of electro-dynamic equations of all electric | | | | | | | | | | | | | | | | | | | | | |
| CO2 Knowledge of transformations for the dynamic analysis | V | V | | | | | | | | | | | | | | | | | Analyze | Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| CO3 Knowledge of determination of stability of the machine | V | | | | | | | | | | | | | | | | | | Knowledge | Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| CO4 Study about synchronous machine | | | | | | | | | | | | | | | | | | | Ability | Yes | Mid-Term Tests, Tutorials, End Semester Exams |

Paper: EEP5-203D-18 POWER APPARATUS DESIGN

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|--|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|---------|-----|--|
| CO1 To give a systematic approach for modeling and analysis | V | V | | | | | | | | | | | | | | | | | Analyze | Yes | Experiments, Viva-Voce, End Semester Exams |
| CO2 Ability to model and design all types of rotation | | | | V | V | | | | | | | | | | | | | | Analyze | Yes | Experiments, Viva-Voce, End Semester Exams |
| CO3 To design special machines | V | | | | | | | | | | | | | | | | | | Analyze | Yes | Experiments, Viva-Voce, End Semester Exams |

Paper: EEP5-204A-18 ADVANCED MICRO-CONTROLLER BASED SYSTEMS

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|--|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------|-----|---|
| CO1 A processor in assembly language and develop an advan | V | V | | | | | | | | | | | | | | | | | Apply | Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| CO2 To learn configuring and using different peripherals in a | V | V | | | | | | | | | | | | | | | | | Ability | Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| CO3 To complete and debug a program | V | V | | | | | | | | | | | | | | | | | Designing | Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| CO4 To generate an executable file and use it | | | | V | V | | | | | | | | | | | | | | Designing | Yes | Mid-Term Tests, Tutorials, End Semester Exams |

Paper: EEP5-204B-18 SCADA SYSTEMS AND APPLICATIONS

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------|-----|---|
| CO1 Describe the basic tasks of Supervisory Control Systems | V | V | | | | | | | | | | | | | | | | | Ability | Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| CO2 Acquire knowledge about SCADA architecture, various si | V | V | | | | | | | | | | | | | | | | | Knowledge | Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| CO3 Knowledge about single unified standard architecture IE | V | V | | | | | | | | | | | | | | | | | Knowledge | Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| CO4 To learn about SCADA system components, remote term | V | V | | | | | | | | | | | | | | | | | Utilization | Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| CO5 Learn and understand about SCADA applications in trans | V | | | | | | | | | | | | | | | | | | Understand | Yes | Mid-Term Tests, Tutorials, End Semester Exams |

Paper: EEP5-204C-18 POWER QUALITY

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------|-----|---|
| CO1 Acquire knowledge about the harmonics, harmonic disto | V | V | | | | | | | | | | | | | | | | | Knowledge | Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| CO2 To develop analytical modeling skills needed for modeli | V | V | | | | | | | | | | | | | | | | | Designing | Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| CO3 To introduce the student to active power factor correct | V | V | | | | | | | | | | | | | | | | | Knowledge | Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| CO4 To introduce the student to series and shunt active power | V | V | | | | | | | | | | | | | | | | | Knowledge | Yes | Mid-Term Tests, Tutorials, End Semester Exams |

Paper: EEP5-204D-18 ARTIFICIAL INTELLIGENCE TECHNIQUES

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------------|-----|---|
| CO1 Learn the concept of biological foundations of artificial | V | V | | | | | | | | | | | | | | | | | Understand | Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| CO2 Learn feedback networks and radial basis function netw | V | V | | | | | | | | | | | | | | | | | Understand | Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| CO3 Identifications of fuzzy and neural network | V | | | | | | | | | | | | | | | | | | Identification | Yes | Mid-Term Tests, Tutorials, End Semester Exams |
| CO4 Acquire the knowledge of CA | V | | | | | | | | | | | | | | | | | | Knowledge | Yes | Mid-Term Tests, Tutorials, End Semester Exams |

Paper: EEP5-205A-18 POWER SYSTEM PROTECTION LAB

| | | | | | | | | | | | | | | | | | | | | | |
|--|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------------|-----|--|
| CO1 Understand the concept of protection relays with th | V | V | | | | | | | | | | | | | | | | | Understand | Yes | Experiments, Viva-Voce, End Semester Exams |
| CO2 Understanding of relay and nonharmonic principle of differ | V | V | | | | | | | | | | | | | | | | | Designing | Yes | Experiments, Viva-Voce, End Semester Exams |

Paper: EEP5-205B-18 POWER QUALITY LAB

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------|-----|--|
| CO1 Understand and analyze power quality | V | V | | | | | | | | | | | | | | | | | Analyze | Yes | Experiments, Viva-Voce, End Semester Exams |
| CO2 Performance and analysis of occurrence of harmonics | V | V | | | | | | | | | | | | | | | | | Analysis | Yes | Experiments, Viva-Voce, End Semester Exams |
| CO3 Knowledge of grounding techniques | V | | | | | | | | | | | | | | | | | | Knowledge | Yes | Experiments, Viva-Voce, End Semester Exams |

Paper: EEP5-205C-18 ARTIFICIAL INTELLIGENCE LAB

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------|-----|--|
| CO1 Understand and analyze power quality | V | V | | | | | | | | | | | | | | | | | Analyze | Yes | Experiments, Viva-Voce, End Semester Exams |
| CO2 Performance and analysis of occurrence of harmonics | V | V | | | | | | | | | | | | | | | | | Analysis | Yes | Experiments, Viva-Voce, End Semester Exams |
| CO3 Knowledge of grounding techniques | V | | | | | | | | | | | | | | | | | | Knowledge | Yes | Experiments, Viva-Voce, End Semester Exams |

Paper: EEP5-205D-18POWER ELECTRONICS APPLICATIONS

| | | | | | | | | | | | | | | | | | | | | | |
|--|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------------|-----|--|
| CO1 Learn the concept of protection relays with th | V | V | | | | | | | | | | | | | | | | | Understand | Yes | Experiments, Viva-Voce, End Semester Exams |
| CO2 Understanding of relay and nonharmonic principle of differ | V | V | | | | | | | | | | | | | | | | | Designing | Yes | Experiments, Viva-Voce, End Semester Exams |

TO POWER SYSTEMS LAB

| | | | | | | | | | | | | | | | | | | | | | |
|--|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------------|-----|--|
| CO1 Learn the concept of protection relays with th | V | V | | | | | | | | | | | | | | | | | Understand | Yes | Experiments, Viva-Voce, End Semester Exams |
| CO2 Understanding of relay and nonharmonic principle of differ | V | V | | | | | | | | | | | | | | | | | Designing | Yes | Experiments, Viva-Voce, End Semester Exams |

Handwritten signature and date: D. K. Gupta, 2018

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Department of Electrical Engineering,
I.K. Gujral Punjab Technical University,
Patiala

Focus of Assessment Tools to Measure Attainment of CO

CO1: Understand and analyze the performance of converter
CO2: Performance analysis of drive
Yes
Yes
Analyze
Experiments, Viva-Viva, End Semester Exams

Paper: EEPs-206C-18 SMART GRIDS LAB

Course Outcome:

| PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 | PO15 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |

Understand
Yes
Experiments, Viva-Viva, End Semester Exams

Paper: MTA-105-18 CONSTITUTION OF INDIA

Course Outcome:

| PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 | PO15 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |

Knowledge
Yes
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams

Paper: MTA-106-18 PEDAGOGY STUDIES

Course Outcome:

| PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 | PO15 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |

Knowledge
Yes
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams

Paper: MTA-107-18 STRESS MANAGEMENT BY YOGA

Course Outcome:

| PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 | PO15 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |

Knowledge
Yes
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams

Paper: MTA-108-18 PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

Course Outcome:

| PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 | PO15 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |

Knowledge
Yes
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams

Paper: EEPs-301A-18 POWER SYSTEM TRANSIENTS

Course Outcome:

| PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 | PO15 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |

Knowledge
Yes
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams

Paper: EEPs-301B-18 FACTS AND CUSTOM POWER DEVICES

Course Outcome:

| PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 | PO15 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |

Knowledge
Yes
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams

Paper: EEPs-301C-18 INDUSTRIAL LOAD MODELING AND CONTROL

Course Outcome:

| PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 | PO15 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |

Knowledge
Yes
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams

Paper: EEPs-301D-18 DYNAMICS OF LINEAR SYSTEMS

Course Outcome:

| PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 | PO15 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |

Understand
Yes
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams

Paper: MTOE-301A-18 BUSINESS ANALYTICS

Course Outcome:

| PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PO13 | PO14 | PO15 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |
| V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |

Knowledge
Yes
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams
Mid-Term Tests, Tutorials, End Semester Exams

Head
The part time
Kaourhala-144006

CO3: Students will demonstrate the ability to use technical skill
 CO4: Students will demonstrate the ability to translate data into clear, actionable insights.

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | Skill |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| Identify | V | V | V | | | | | | Yes |
| Analyze | V | V | V | | | | | | Yes |

Mid-Term Tests, Tutorials, End Semester Exams

Paper: MITOE-301B-18 INDUSTRIAL SAFETY

CO1: To know about industrial safety and ways of prevention
 CO2: Learn about fault identification and periodic maintenance
 CO3: To get knowledge about all safety measures

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | Skill |
|----------------|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| Knowledge | V | V | V | V | V | V | V | V | Yes |
| Identification | V | V | V | V | V | V | V | V | Yes |
| Knowledge | V | V | V | V | V | V | V | V | Yes |

Mid-Term Tests, Tutorials, End Semester Exams
 Mid-Term Tests, Tutorials, End Semester Exams
 Mid-Term Tests, Tutorials, End Semester Exams

Paper: MITOE-301C-18 OPERATIONS/RESEARCH

CO1: Students should able to apply the dynamic programming
 CO2: Students should able to apply the concept of non-linear
 CO3: Students should able to carry out sensitivity analysis
 CO4: Students should able to carry out sensitivity analysis

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | Skill |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| Apply | V | | | | V | V | V | V | Yes |
| Apply | V | | | | V | V | V | V | Yes |
| Analysis | V | | | | V | V | V | V | Yes |
| Analysis | V | | | | V | V | V | V | Yes |

Mid-Term Tests, Tutorials, End Semester Exams
 Mid-Term Tests, Tutorials, End Semester Exams
 Mid-Term Tests, Tutorials, End Semester Exams
 Mid-Term Tests, Tutorials, End Semester Exams

Paper: MITOE-301D-18 COST MANAGEMENT OF ENGINEERING PROJECTS

CO1: Understand cost management process
 CO2: To execute project considering cost factor
 CO3: To manage planning of cost and learn about the techniques

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | Skill |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| Understand | V | V | V | V | V | V | V | V | Yes |
| Analysis | V | V | V | V | V | V | V | V | Yes |
| Ability | V | V | V | V | V | V | V | V | Yes |

Mid-Term Tests, Tutorials, End Semester Exams
 Mid-Term Tests, Tutorials, End Semester Exams
 Mid-Term Tests, Tutorials, End Semester Exams

Paper: MITOE-301E-18 COMPOSITE MATERIALS

CO1: Learn about composite materials and their process of reinforcement
 CO2: Understand about strength and manufacturing of material
 CO3: Know about biomass waste properties

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | Skill |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| Knowledge | V | V | V | V | V | V | V | V | Yes |
| Understand | V | V | V | V | V | V | V | V | Yes |

Mid-Term Tests, Tutorials, End Semester Exams
 Mid-Term Tests, Tutorials, End Semester Exams

Paper: MITOE-301F-18 WASTE TO ENERGY

CO1: Know about the energy in biomass waste
 CO2: Understand the biomass fuel conversion process for energy
 CO3: Know about biomass waste properties

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | Skill |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| Knowledge | V | V | V | V | V | V | V | V | Yes |
| Understand | V | V | V | V | V | V | V | V | Yes |
| Knowledge | V | V | V | V | V | V | V | V | Yes |

Mid-Term Tests, Tutorials, End Semester Exams
 Mid-Term Tests, Tutorials, End Semester Exams
 Mid-Term Tests, Tutorials, End Semester Exams

Signature
 (Signature of Head of Department)

Head
 Department of Electrical Engineering
 I.K. Gujral Punjab Technical University
 Kapurthala-144006

Head
 Department of Electrical Engineering
 I.K. Gujral Punjab Technical University
 Kapurthala-144006

Name of Department: Electrical Engineering

Draft of Mapping of M. Tech. Electrical Engineering (Power Systems and Renewable Energy)

MAPPING POS AND COS

Head
Department of Electrical Engineering
I.K. Gujral Punjab Technical University
Kaurthala-144006

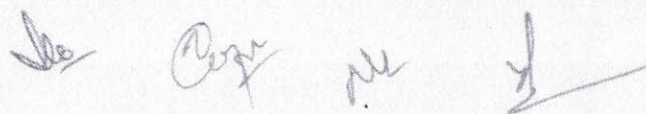
Name of Department: Electrical Engineering
Mapping of M. Tech Electrical Engineering (Power Systems and Renewable Energy)

- Draft -

MAPPING POs AND COs

Focus: refers to "Focus on employability/ entrepreneurship/ skill development"

| PSRE-101/21 COMPUTER AIDED POWER SYSTEM ANALYSIS | | | | | | | | | | | | |
|--|------|------|------|------|------|------|------|------|---------------|-------|---|--|
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO | |
| CO1: Understand various methods of load flow and their advantages and disadvantages | √ | | | | | | | | Understand | Yes | Mid-semester tests, Assignments, End-semester examination | |
| CO2: Analyze various types of faults in power system | √ | √ | | | | | | | Analysis | Yes | Mid-semester tests, Assignments, End-semester examination | |
| CO3: Understand power system security concepts and rank the contingencies | √ | | √ | | | | | | Understand | Yes | Mid-semester tests, Assignments, End-semester examination | |
| CO4: Estimate closeness to voltage collapse and calculate PV curves. | √ | | √ | | | | | | Evaluation | Yes | Mid-semester tests, Assignments, End-semester examination | |
| PSRE-102/21 DISTRIBUTED GENERATION | | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO | |
| CO1: Understand the planning and operational issues related to Distributed Generation. | √ | | √ | | | | | | Understanding | Yes | Mid-semester tests, Assignments, End-semester examination | |
| CO2: Analyse the impact of Distributed Generation | | √ | √ | | | | | | Analysis | Yes | Mid-semester tests, Assignments, End-semester examination | |
| CO3: Understand the Micro-Grids | √ | | √ | | | | | | Understanding | Yes | Mid-semester tests, Assignments, End-semester examination | |
| CO4: Analyse the micro-grids | | √ | | | | | | | Analysis | Yes | Mid-semester tests, Assignments, End-semester examination | |
| PSRE-103A/21 FACTS AND CUSTOM POWER DEVICES | | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO | |
| CO1: Acquire knowledge about the fundamental principles of Passive and Active Reactive Power Compensation Schemes at Transmission and Distribution level in Power Systems. | √ | √ | | | | | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination | |
| CO2: Learn various Static VAR Compensation Schemes like Thyristor/GTO Controlled. | √ | √ | | | | | | | Learning | Yes | Mid-semester tests, Assignments, End-semester examination | |
| CO3: Reactive Power Systems, PWM Inverter based Reactive Power Systems and their controls. | | √ | | | √ | | | | Application | Yes | Mid-semester tests, Assignments, End-semester examination | |
| CO4: To develop analytical modeling skills needed for modeling and analysis of such Static VAR Systems. | | | √ | | √ | | | | Analyse | Yes | Mid-semester tests, Assignments, End-semester examination | |
| PSRE-103B/21 ADVANCED POWER SYSTEMS PROTECTION | | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO | |
| CO1: Learn about classification and operation of static relays. | √ | | | √ | | | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination | |



Name of Department: Electrical Engineering
Mapping of M. Tech. Electrical Engineering (Power Systems and Renewable Energy)

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|---|------|------|------|------|------|------|------|------|---|---------------|-------|---|
| CO2: Understand the basic principles and application of comparators. | | √ | √ | | | | | | | Learn | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO3: Understand static version of different types of relays. | | √ | √ | | | | | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO4: Understand about numerical protection techniques. | | | | | √ | | | | √ | Understand | Yes | Mid-semester tests, Assignments, End-semester examination |
| PSRE-103C/21 MATHEMATICAL METHODS FOR POWER ENGINEERING | | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | | Skill | Focus | Assessment tools to measure attainment of CO |
| CO1: Knowledge about vector spaces, linear transformation, eigenvalues and eigenvectors of Linear operators | √ | | | | | | | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO2: Learn about linear programming problems and understanding the simplex method for solving linear programming problems in various fields of science and technology | √ | | | | | | | | | Understanding | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO3: Acquire knowledge about nonlinear programming and various techniques used for solving constrained and unconstrained nonlinear programming problems | √ | | | | √ | | | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination |
| PSRE-103D/21 ANALYSIS OF POWER CONVERTER | | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | | Skill | Focus | Assessment tools to measure attainment of CO |
| CO1: Develop a systematic approach AC-DC converters | | √ | | | | | | | | Application | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO2: Develop a systematic approach for modeling and analysis PWM Inverters | | √ | | | | | | | | Application | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO3: Ability to model of Multilevel Inverters | | | √ | | | | | | | Application | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO4: Analysis of boost power factor corrected rectifier. | √ | | | | | | | | | Analysis | Yes | Mid-semester tests, Assignments, End-semester examination |
| PSRE-104A/21 SOLAR PV ENERGY SYSTEM | | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | | Skill | Focus | Assessment tools to measure attainment of CO |
| CO1: Understand the concept of Solar Radiation Geometry. | √ | | | | | | | | | Understand | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO2: Understand the Solar Cells Conversion of Solar energy. | | | √ | | | | | | | Understand | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO3: Understand the Solar Photovoltaic System Design. | | | √ | | | | | | | Understand | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO4: Introduction of Solar Photo Voltaic System Testing Sun Simulator | | | √ | | √ | | | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination |
| PSRE-104B/21 WASTE TO ENERGY CONVERSION TECHNOLOGIES | | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | | Skill | Focus | Assessment tools to measure attainment of CO |

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Name of Department: Electrical Engineering
 Mapping of M. Tech... Electrical Engineering (Power Systems and Renewable Energy)

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|--|------|------|------|------|------|------|------|------|-------|------------|--|---|
| CO1: Understand the issues related with waste and its impact on environment. | | | √ | √ | | | | | √ | Understand | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO2: Knowledge of different type of disposal mechanism for handling different type of waste. | | | √ | √ | | | | | √ | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO3: Understand the analyse concept of recovery from industrial and agricultural waste | | | √ | √ | | | | | √ | Understand | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO4: Knowledge of rural issues and the handling of biomass. | | | √ | | | | | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination |
| PSRE-104C/21 SMALL HYDRO AND NON-CONVENTIONAL TECHNOLOGIES | | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO | |
| CO1: Understand the issues Small-hydro systems. | | √ | | | | | | | √ | Understand | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO2: Knowledge of different type of Energy from Oceans | | √ | √ | | | | | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO3: Understand the analyse concept of Geothermal Energy | | √ | √ | | | | | | √ | Understand | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO4: Knowledge of Magneto Hydro Dynamic. | | | √ | | | | | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination |
| PSRE-104D/21 SOLAR ENERGY CONVERSION TECHNOLOGIES | | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO | |
| CO1: Evaluate the solar thermal devices | √ | √ | | | | | | | | Analysis | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO2: Optimize the solar thermal power generating system. | | √ | √ | | | | | | | Apply | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO3: Knowledge of solar passive concepts and their application to buildings | √ | | | | | | | | √ | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO4: Understanding of government schemes & policies on solar energy. | | | | | | √ | | | √ | Understand | Yes | Mid-semester tests, Assignments, End-semester examination |
| MTRM-101/21 RESEARCH METHODOLOGY AND IPR | | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO | |
| CO1: To understand research problem formulation and research ethics | | | | √ | | √ | | | | Understand | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO2: To understand about control of information technology | | | | √ | | √ | | | | Understand | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO3: To understand the need of IPR & its protection | | | | √ | | √ | | | | Understand | Yes | Mid-semester tests, Assignments, End-semester examination |
| PSRE-105/21 COMPUTER AIDED POWER SYSTEM ANALYSIS LAB | | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PC 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO | |

I.K. Gaur Punjab Technical University
 Kaourhala-144006
 Department of Electrical Engineering
 H-8

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NAME OF DEPARTMENT: Electrical Engineering
Mapping of M. T. Electrical Engineering (Power Systems & Renewable Energy)

| | | | | | | | | | | | |
|--|------|------|------|------|------|------|------|------|------------|-------|---|
| CO1: To understand the formation of Y and Z bus | | √ | | | √ | | | | Understand | Yes | Hands-on work/simulation, viva-voce, end semester practical examination |
| CO2: To understand how to analyze the power system load flow studies, Faults occurring in power system | | √ | | | √ | | | √ | Evaluation | Yes | Hands-on work/simulation, viva-voce, end semester practical examination |
| CO3: To understand the security analysis | | √ | | | √ | | | √ | Understand | Yes | Hands-on work/simulation, viva-voce, end semester practical examination |
| CO4: To understand the commercial software used by industry | | √ | | | √ | | | √ | Knowledge | Yes | Hands-on work/simulation, viva-voce, end semester practical examination |
| PSRE-106/21 POWER SIMULATION LAB-I | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO |
| CO1: Various power curves considering different renewable sources | √ | | | | √ | | | | Knowledge | Yes | Hands-on work/simulation, viva-voce, end semester practical examination |
| CO2: Evaluate the capability of fuel cells and capacitors | | √ | | | √ | | | | Evaluation | Yes | Hands-on work/simulation, viva-voce, end semester practical examination |
| CO3: Understand practical issues related to wind power | | | √ | √ | | | | √ | Understand | Yes | Hands-on work/simulation, viva-voce, end semester practical examination |
| CO4: Analyze the effect of variations of parameters on solar panels | | | | | √ | | | | Analysis | Yes | Hands-on work/simulation, viva-voce, end semester practical examination |
| MTA-101/21 ENGLISH FOR RESEARCH PAPER WRITING | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO |
| CO 1: Understand that how to improve your writing skills and level of readability | | | | | | | √ | | Understand | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO 2: Learn about what to write in each section | | | | | | | √ | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO 3: Understand the skills needed when writing a Title | | | | | | | √ | | Understand | Yes | Mid-semester tests, Assignments, End-semester examination |
| MTA-102/21 DISASTER MANAGEMENT | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO |
| CO1: Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response. | | | √ | | | √ | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO2: Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives. | | | √ | | | √ | | | Evaluate | Yes | Mid-semester tests, Assignments, End-semester examination |

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 Cap & J

Name of Department: Electrical Engineering
Mapping of M. Tech Electrical Engineering (Power Systems & Renewable Energy)

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|--|------|------|------|------|------|------|------|------|-------------|-------|---|
| CO3: Develop an understanding of standards of humanitarian response and practical relevance inspecific types of disasters and conflict situations. | | | √ | | | √ | | | Synthesis | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO4: Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or thecountries they work in | | | √ | | | √ | | | Analysis | Yes | Mid-semester tests, Assignments, End-semester examination |
| MTA-103/21 | | | | | | | | | | | |
| SANSKRIT FOR TECHNICAL KNOWLEDGE | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO |
| CO1: To get a working knowledge in illustrious Sanskrit, the scientific language in the world | | | | √ | | | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO2: Learning of Sanskrit to improve brain functioning | | | | √ | | | | | Application | | Mid-semester tests, Assignments, End-semester examination |
| CO3: Learning of Sanskrit to develop the logic in mathematics, science & othersubjects enhancing the memory power. | √ | | √ | | | | | | Application | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO4: The engineering scholars equipped with Sanskrit will be able toexplore the huge knowledge from ancient literature | | | | √ | | | | | Application | Yes | Mid-semester tests, Assignments, End-semester examination |
| MTA-104/21 | | | | | | | | | | | |
| VALUE EDUCATION | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO |
| CO1: Understand value of education and self- development | | | | | | √ | | | knowledge | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO2: Imbibe good values in students | | | | | | √ | | | Application | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO3: Let the should know about the importance of character | | | | | | √ | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination |
| PSRE-201/21 | | | | | | | | | | | |
| ENERGY FORECASTING AND MODELING | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO |
| CO1: Interpret the Energy & GDP, GNP and its dynamics | √ | | | | | | | | Analysis | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO2: Develop energy system models for short term and long-term forecasting | | √ | | | √ | | | | Synthesis | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO3: Knowledge about different Energy Sources | √ | | | | | | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO4: Knowledge about different types of Development of Energy Optimization Model | | √ | | | | | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination |
| PSRE-202/21 | | | | | | | | | | | |
| POWER SYSTEM GENERATION CONTROL | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO |
| CO1: To study the unit commitment problem for economic load dispatch. | √ | √ | | | | | | | Learn | Yes | Mid-semester tests, Assignments, End-semester examination |

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 Copy No 2

Name of Department: **Electrical Engineering** (Power Systems & Renewable Energy)

| | | | | | | | | | | | | |
|--|------|------|------|------|------|------|------|------|-------------|------------|---|---|
| CO2: To study the load frequency control of single area and two area systems with and without control. | √ | √ | | | | | | | | Learn | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO3: To study the effect of generation with limited energy supply. | √ | √ | | | | | | | | Comprehend | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO4: To study the effectiveness of interchange evaluation in interconnected power systems. | √ | √ | | | | | | | | Learn | Yes | Mid-semester tests, Assignments, End-semester examination |
| PSRE-203A/21 | | | | | | | | | | | | |
| POWER QUALITY AND HARMONIC ANALYSIS | | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO | |
| CO1: To understand significance of power quality and power quality parameters. | | | √ | | | | | | Understand | Yes | Mid-semester tests, Assignments, End-semester examination | |
| CO2: To understand harmonics, their effects, harmonic indices and harmonic minimization techniques | | | √ | | | | | | Understand | Yes | Mid-semester tests, Assignments, End-semester examination | |
| CO3: Formulate energy action planning for various types of industry. | | | | | | | | √ | Synthesise | Yes | Mid-semester tests, Assignments, End-semester examination | |
| CO4: To understand different compensation techniques to minimize power quality disturbances. | √ | | | | | | | √ | Understand | Yes | Mid-semester tests, Assignments, End-semester examination | |
| PSRE-203B/21 | | | | | | | | | | | | |
| POWER SYSTEM DYNAMICS | | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO | |
| CO1: Understand the modeling of synchronous machine in details | √ | | | | | | | | Understand | Yes | Mid-semester tests, Assignments, End-semester examination | |
| CO2: Development of mathematical models for synchronous machine | | √ | √ | | | | | | Synthesise | Yes | Mid-semester tests, Assignments, End-semester examination | |
| CO3: Analysis and physical interpretation of models of Synchronous machine | | √ | √ | | | | | | Analysis | Yes | Mid-semester tests, Assignments, End-semester examination | |
| CO4: Modeling of induction motor and Understand the load modeling in power system. | | √ | √ | | | | | | Synthesise | Yes | Mid-semester tests, Assignments, End-semester examination | |
| PSRE-203C/21 | | | | | | | | | | | | |
| RELIABILITY ANALAYSIS AND PROTECTION | | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO | |
| CO1: Have knowledge of different methods to estimate different electrical quantities | √ | | | | | | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination | |
| CO2: Acquire skills in planning and building reliable power system. | | | √ | | | | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination | |
| CO3: Manage skills required in the field of power system engineering are enhanced. | | | √ | | | | | | Application | Yes | Mid-semester tests, Assignments, End-semester examination | |
| CO4: Understand about modes of failure and calculate relevant indices. | | | √ | | | | | √ | Understand | Yes | Mid-semester tests, Assignments, End-semester examination | |
| PSRE-203D/21 | | | | | | | | | | | | |
| ENERGY ECONOMICS AND POLICIES | | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO | |

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Name of Department: Electrical Engineering
Mapping of M. Te) Electrical Engineering (Power Systems at) Renewable Energy)

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|--|------|------|------|------|------|------|------|------|-------------|-------|---|
| CO1: understand the importance of energy in economic development. | | | √ | | | | | √ | Understand | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO2: Understand the need of sustainable energy. | | | √ | | | | | √ | Understand | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO3: Understand the issues related to energy pricing taxes | | | √ | | | | | √ | Understand | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO4: Take up research in energy economics. | | | √ | | | | | √ | Application | Yes | Mid-semester tests, Assignments, End-semester examination |
| PSRE-204A/21 ELECTRIC AND HYBRID VEHICLES | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO |
| CO1: Know the concept of electric vehicles and hybrid electric vehicles. | √ | | | | √ | | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO2: Familiar with different motors used for hybrid electric vehicles. | √ | | | | √ | | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO3: Understand the power converters used in hybrid electric vehicles | √ | | | | √ | | | | Understand | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO4: Know different batteries and other energy storage systems. | √ | | | | √ | | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination |
| PSRE-204B/21 SMART GRIDS | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO |
| CO1: Understand concept of smart grid and developments on smart grid. | √ | √ | | | | | | | Understand | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO2: Understand smart grid technologies and application of smart grid concept in hybrid electric vehicles. | √ | √ | | | | | | | Understand | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO3: Have knowledge on smart substations, feeder automation and | √ | | | | | | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO4: Knowledge of monitoring and protection of grid. | √ | | √ | | | | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination |
| PSRE-204C/21 ENGINEERING OPTIMIZATION | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO |
| CO1: Understand the need for optimization and different techniques involved and also constraints. | √ | | | | √ | | | | Understand | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO2: Knowledge of Linear/Non-linear Programming. | | | | | √ | | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO3: Understand the importance of optimization to solve Engineering problems | | | | | √ | | | √ | Understand | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO4: Knowledge of genetic algorithm for Engineering Optimization | | | | | √ | | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination |
| PSRE-204D/21 ARTIFICIAL INTELLIGENCE TECHNIQUES | | | | | | | | | | | |

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Name of Department: Electrical Engineering
Mapping of M. Te) Electrical Engineering (Power Systems a) Renewable Energy)

| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO |
|---|------|------|------|------|------|------|------|------|-------------|-------|---|
| CO1: Learn the concepts of biological foundations of artificial neural networks | ✓ | | | | | | | | Learning | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO2: Learn Feedback networks and radial basis function networks and fuzzy logics | ✓ | | | | | | | | Learning | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO3: Identifications of fuzzy and neural network | ✓ | | | | | | | | Application | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO4: Acquire the knowledge of GA | ✓ | | | | | | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination |
| PSRE-206/21 POWER SIMULATION LAB-II | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO |
| CO1: To understand power curves for energy sources | ✓ | | | | ✓ | | | | Knowledge | Yes | Hands-on work/simulation, viva-voce, end semester practical examination |
| CO2: Effect of variable parameters on solar panels | | | ✓ | | ✓ | | | | Application | Yes | Hands-on work/simulation, viva-voce, end semester practical examination |
| CO3: Relation of wind output and load. | | | ✓ | | ✓ | | | | Application | Yes | Hands-on work/simulation, viva-voce, end semester practical examination |
| PSRE-206/21 RENEWABLE ENERGY LAB | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO |
| CO1: Assess the performance of renewable sources of energy | | | | | ✓ | | | ✓ | Analysis | Yes | Hands-on work/simulation, viva-voce, end semester practical examination |
| CO2: Knowledge of the scope of tapping geothermal energy | | | | | ✓ | | | ✓ | Knowledge | Yes | Hands-on work/simulation, viva-voce, end semester practical examination |
| CO3: Field visit to assess the solar lighting | | | | | ✓ | | | ✓ | Application | Yes | Hands-on work/simulation, viva-voce, end semester practical examination |
| CO4: Knowledge of the practical aspects of integration of renewable sources of energy to the grid | | | | | ✓ | | | ✓ | Knowledge | Yes | Hands-on work/simulation, viva-voce, end semester practical examination |
| MTA-105/21 CONSTITUTION OF INDIA | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO |
| CO1: Understand the premises informing the twin themes of liberty and freedom from a civilrights perspective. | | | | ✓ | | | | ✓ | Understand | Yes | Mid-semester tests, Assignments, End-semester examination |



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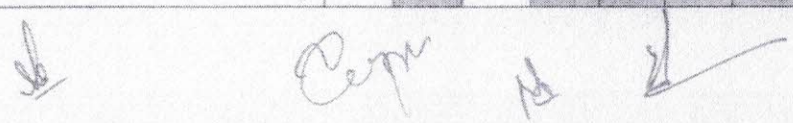
Name of Department: **Electrical Engineering**
Mapping of M. T. () . Electrical Engineering (Power Systems :) Renewable Energy)

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|--|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|--------------|---|
| CO2: To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nation hood in the early years of Indian nationalism. | | | | √ | | | | √ | Application | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO3: To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution. | | | | √ | | | | √ | Application | Yes | Mid-semester tests, Assignments, End-semester examination |
| MTA-106/21 PEDAGOGY STUDIES | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO |
| CO1: Review existing evidence on the review topic to inform programme design and policymaking undertaken by the DfID, other agencies and researchers. | | | | √ | | | | √ | Analysis | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO2: Identify critical evidence gaps to guide the development. | | | | √ | | | | √ | Analysis | Yes | Mid-semester tests, Assignments, End-semester examination |
| MTA-107/21 STRESS MANAGEMENT BY YOGA | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO |
| CO1: To achieve overall health of body and mind | | | | √ | | | | √ | Application | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO2: To overcome stress | | | | √ | | | | √ | Application | Yes | Mid-semester tests, Assignments, End-semester examination |
| MTA-108/21 PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO |
| CO1: To learn to achieve the highest goal happily a. To become a person with stable mind, pleasing personality and determination b. To awaken wisdom in students | | | | √ | | √ | | | Synthesise | Yes | Mid-semester tests, Assignments, End-semester examination |
| PSRE-301A/21 INDUSTRIAL LOAD MODELING AND CONTROL | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO |
| CO1: Knowledge about load control techniques in industries and its application. | √ | | | | | | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO2: Different types of industrial processes and optimize the process using tools like LINDO and LINGO. | √ | | | √ | | | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO3: Apply load management to reduce demand of electricity during peak time. | | | √ | √ | | | | | Application | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO4: Apply different energy saving opportunities in industries. | | | √ | √ | | | | | Application | Yes | Mid-semester tests, Assignments, End-semester examination |

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Name of Department: Electrical Engineering
Mapping of M. Te) Electrical Engineering (Power Systems a) Renewable Energy)

| PSRE-301B/21 POWER SYSTEM DEREGULATION | | | | | | | | | | | | |
|--|------|------|------|------|------|------|------|------|---------------|-------|---|--|
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO | |
| CO1: Knowledge about the restructuring and deregulation of power sector. | √ | | | | | | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination | |
| CO2: Introduction to the fundamental concepts relevant to OASIS, congestion management etc. | √ | | √ | | | | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination | |
| CO3: Knowledge of power market and its mitigation techniques | √ | | | | | | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination | |
| CO4: Understand the factors related with deregulation of power industry in different countries | √ | | √ | | | | | | Understand | Yes | Mid-semester tests, Assignments, End-semester examination | |
| PSRE-301C/21 SOLAR PV ENERGY SYSTEM | | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO | |
| CO1: Understand the fundamental theory governing the photovoltaic devise | √ | | | | | | | | Understand | Yes | Mid-semester tests, Assignments, End-semester examination | |
| CO2: Ability of carry out preliminary system design. | | √ | | | | | | | Application | Yes | Mid-semester tests, Assignments, End-semester examination | |
| CO3: Knowledge of testing and assessment of power generation by solar PV. | | | √ | | | | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination | |
| CO4: Analysis of solar data | | √ | | | | | | | Analysis | Yes | Mid-semester tests, Assignments, End-semester examination | |
| PSRE-301D/21 POWER SYSTEM GENERATION CONTROL | | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO | |
| CO1: Knowledge of Automatic Generation and Control | √ | | | | | | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination | |
| CO2: Understanding of the power system security and its analysis | | √ | | | | | | | Understanding | Yes | Mid-semester tests, Assignments, End-semester examination | |
| CO3: Knowledge of estimation and computation | √ | | | | √ | | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination | |
| CO4: Analyze the load requirement and forecast load | | | | | | | | √ | Evaluation | Yes | Mid-semester tests, Assignments, End-semester examination | |
| MTOE-301A/21 BUSINESS ANALYTICS | | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO | |
| CO1: Understand the role of business analytics within an organization. | √ | | | √ | | | | | Understand | Yes | Mid-semester tests, Assignments, End-semester examination | |
| CO2: Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization | √ | | √ | | | | | | Analysis | Yes | Mid-semester tests, Assignments, End-semester examination | |



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Name of Department: **Electrical Engineering**
Mapping of M. T (Electrical Engineering (Power Systems & Renewable Energy))

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|---|------|------|------|------|------|------|------|------|---|-------------|-------|---|
| CO3: To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making | √ | | | √ | | | | | | Understand | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO4: To become familiar with processes needed to develop, report, and analyze business data. | √ | | √ | | | | | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO5: Use decision-making tools/Operations research techniques. | √ | | | √ | | | | | | Application | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO6: Mangle business process using analytical and management tools. | √ | | | | | | | | √ | Application | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO7: Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc. | √ | | | | | | | | √ | Analysis | Yes | Mid-semester tests, Assignments, End-semester examination |
| MTOE-301B/21 INDUSTRIAL SAFETY | | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | | Skill | Focus | Assessment tools to measure attainment of CO |
| CO1: Understand about industrial safety and maintenance engineering | | | √ | √ | | | | | | Understand | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO2: Learn possible ways of prevention from wear and tear and methods of fault tracing | | | √ | √ | | | | | | Learning | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO3: Understand periodic maintenance | | | √ | √ | | | | | | Understand | Yes | Mid-semester tests, Assignments, End-semester examination |
| MTOE-301C/21 OPERATIONS RESEARCH | | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | | Skill | Focus | Assessment tools to measure attainment of CO |
| CO1: To learn the optimization techniques | √ | | | | | | | | | learn | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO2: How to formulate LPP and handling of Nonlinear programming | | | | | √ | | | | | Synthesise | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO3: How to do the scheduling and sequencing of models | | √ | | | | | | | | Application | Yes | Mid-semester tests, Assignments, End-semester examination |
| MTOE-301D/21 COST MANAGEMENT OF ENGINEERING PROJECTS | | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | | Skill | Focus | Assessment tools to measure attainment of CO |
| CO1: To get knowledge about cost concept and cost management process | | | | √ | | | | | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO2: To know about meaning and process of project execution | | | | √ | | | | √ | | Knowledge | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO3: To learn quantitative techniques and cost planning | | | | √ | | | | | | Leaning | Yes | Mid-semester tests, Assignments, End-semester examination |
| MTOE-301E/21 COMPOSITE MATERIALS | | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | | Skill | Focus | Assessment tools to measure attainment of CO |

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Name of Department: Electrical Engineering
Mapping of M. T. () Electrical Engineering (Power Systems :) Renewable Energy)

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|---|---------|---------|---------|---------|---------|---------|---------|---------|------------|------------|---|---|
| CO1: To understand composite materials and their reinforcement | √ | | | | | | | | | Understand | Yes | Mid-semester tests, Assignments, End-semester examination |
| CO2: Manufacturing of matrix | √ | | √ | | | | | | | Synthesise | Yes | Mid-semester tests, Assignments, End-semester examination |
| MTOE-301F/21 WASTE TO ENERGY | | | | | | | | | | | | |
| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | Skill | Focus | Assessment tools to measure attainment of CO | |
| CO1: Understand classification of waste and about energy from waste | √ | | √ | | | | | | Understand | Yes | Mid-semester tests, Assignments, End-semester examination | |
| CO2: Process of biomass waste conversion to energy | | | √ | | | | | | Understand | Yes | Mid-semester tests, Assignments, End-semester examination | |
| CO3: To understand biomass waste properties | √ | | √ | | | | | | Understand | Yes | Mid-semester tests, Assignments, End-semester examination | |

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Program Outcomes of Ph.D-Electrical Engineering

w.e.f: Batch 2021

The scholars who successfully completes their PhD programme in Electrical Engineering will be able to:

- PO 1: Perform an advanced research theory based, practiced and analyze the existing research of key thrust areas.
- PO 2: Competent to undertake a novel work using modern engineering tools for creating a positive impact towards the welfare and betterment of society.
- PO 3: To demonstrate the leadership skills in the chosen research domain and communicates effectively both in oral and written formats to a diverse audience.
- PO 4: Knowledge enhancement, positive impact toward the welfare and betterment of society and contribute to nation building.

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Course Outcomes of Ph.D Course Work

w. e. f. Batch 2021

CORE COURSES

| | | |
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| 1. | Research Methodology | CO1: for a basic framework of research process. CO2: analyze and interprets the various research designs and techniques CO3: understand and apply ethical dimensions of conducting applied research and carrying inter-disciplinary research. |
| | Power System Engineering | CO1: to understand the applications of various compensation devices CO2: Apply the concept of FACTS controllers in advanced hybrid power research using modern engineering tools CO3: Study and analyze the stability under varying transient conditions |
| 3. | Power Electronics | CO1: present the concepts of typical power electronic circuits: topologies and control. CO2: converter analysis, modeling, design and control of converters to different applications using modern engineering tools. CO3: design the controller for varied systems of engineering |
| | Electrical Drives Engineering | CO1: Understand the design, function, operation and control of all major components of a typical electric drive CO2: To develop the applications of multilevel inverter and its topologies in advanced research CO3: Understand the non-linear induction motor drives for various diverse applications |
| 5. | Energy Management Engineering | CO1: Apply the concept of energy audit in the industry and extend to society for energy management awareness CO2: Start the consultancy on energy management and engineering CO3: Analyze and interprets the various lighting systems and HVAC systems |
| | Microelectronics and Control Systems | CO1: Design the optimal control for various diverse applications in advanced research CO2: Learn the various filtering techniques by applying digital signal processing in power system applications CO3: Interprets and compare the stability concept of various non-linear systems using engineering softwares |
| 7. | Advanced Relaying and Protection | CO1: Learn to differentiate the unit and non-unit system of protection schemes CO2: Analyze and apply the various protection schemes for under various applications thrust areas of research |
| | | |
| 4 | Board of Studies (Electrical Engineering) (14/10/2021) IK Gujral Punjab Technical University | |

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IK Gujral Punjab Technical University

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| | CO3: To extend the development of prototypes of supervisory control schemes in research work |
| 8. | Digital System Design CO1: To apply concepts and methods of digital system design techniques CO2: To understand the principle of operation of sequential machines CO3: To analyze and interprets the design of combinational and sequential digital systems for diverse applications of power systems |
| 9. | Modelling and Analysis of Dynamic Systems CO1: Perform systematic choices of ideal elements for modeling a real dynamic system with mechanical, thermal, fluid and electrical elements and their interactions CO2: Develop the differential equations that describe the input/output behavior of a dynamic system CO3: Compute the input/output transfer function of a dynamic system for its analysis |
| 10. | Bio Medical Signal Processing CO1: To understand the concept of nervous system and apply in neural networks. CO2: To analyze the research based non-electrical parameters and use in algorithms using modern engineering tools. CO3: Understand and interprets the principle of operation of biotelemetry systems and its applications. |
| 11. | Sensors and Applications CO1: Gain the basic idea of measurements, characteristics and the errors associated with measurements and apply in advanced research meaningful for society CO2: Demonstrate the concept of resistive sensors which can be employed for real life applications CO3: Realize the concept of reactive sensors employed for real life applications |
| 12. | Scientific and Analytical Instrumentation CO1: learn the basic concept of qualitative and quantitative analysis of a given sample. CO2: Learn various spectroscopic techniques with its instrumentation and apply in inter-disciplinary research. CO3: impart the concept of separation science and its application. |
| 13. | Renewable Energy Resources CO1: Apply the basic properties of different renewable sources of energy and technologies using modern engineering tools CO2: Knowledge of the main elements of technical systems designed for utilization of renewable sources of energy CO3: Understand the advantages and disadvantages of different renewable sources of energy |
| 14. | Presentation/ Seminar |

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5 Board of Studies (Electrical Engineering)
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| <p>CO1: To identify an area of research and demonstrate the ability to present the latest carried work and explains its societal benefits CO2: To ably link the carried study with its economic analysis and demonstrate its relative merits CO3: To ably carry forward its study using modern engineering softwares</p> |
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ELECTIVE COURSE

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|-----------|--|
| 1. | Signal Processing CO1: Interpret, represent and process discrete/digital signals and systems CO2: Thorough understanding of frequency domain analysis of discrete time signals CO3: Ability to design & analyze DSP systems like FIR and IIR Filter |
| 2. | Communication Systems CO1: Analyse communication systems in both the time and frequency domains. CO2: Describe the principles of amplitude modulated and angle modulated communication systems CO3: Describe the principles of various digital modulation systems and their properties |
| 3. | VLSI Design and Embedded Systems CO1: Learn IC and ASIC Technology CO2: Understand the detailed working of combinational circuits CO3: Express the functioning of sequential circuits |
| 4. | Linear Algebra CO1: acquire basic knowledge of matrix theory CO2 comprehend basic concept of vector space and linear transformation CO3 apply the knowledge of linear algebra in engineering problems |
| 5. | Sensors for Ranging and Imaging CO1: Understand the constraints and limitations of a given ISM system in a given application CO2: Compare, contrast and select the most appropriate sensor modality CO3: Prepare a detailed sensor system specification |

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| COs | | POs | |
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| w.e.f. Batch 2021 | | | |
| 1. | Research Methodology | | |
| | CO1: for a basic framework of research process. CO2: analyze and interprets the various research designs and techniques CO3: understand and apply ethical dimensions of conducting applied research and carrying inter-disciplinary research. | PO 1: Perform an advanced research theory based, practiced and analyze the existing research of key thrust areas. PO 3: To demonstrate the leadership skills in the chosen research domain and communicates effectively both in oral and written formats to a diverse audience. | |
| 2. | Power System Engineering | | |
| | CO1: to understand the applications of various compensation devices CO2: Apply the concept of FACTS controllers in advanced hybrid power research using modern engineering tools CO3: Study and analyze the stability under varying transient conditions | PO 2: Competent to undertake a novel work using modern engineering tools for creating a positive impact towards the welfare and betterment of society. PO 4: Knowledge enhancement, positive impact toward the welfare and betterment of society and contribute to nation building. | |
| 3. | Power Electronics | | |
| | CO1: present the concepts of typical power electronic circuits: topologies and control. CO2: converter analysis, modeling, design and control of converters to different applications using modern engineering tools. CO3: design the controller for varied systems of engineering | PO 1: Perform an advanced research theory based, practiced and analyze the existing research of key thrust areas. PO 2: Competent to undertake a novel work using modern engineering tools for creating a positive impact towards the welfare and betterment of society. | |
| 4. | Electrical Drives Engineering | | |
| | CO1: Understand the design, function, operation and control of all major components of a typical electric drive CO2: To develop the applications of multilevel inverter and its topologies in advanced research CO3: Understand the non-linear induction motor drives for various diverse applications | PO 2: Competent to undertake a novel work using modern engineering tools for creating a positive impact towards the welfare and betterment of society. PO 3: To demonstrate the leadership skills in the chosen research domain and communicates effectively both in oral and written formats to a diverse audience. | |
| 5. | Energy Management Engineering | | |
| | CO1: Apply the concept of energy audit in the industry and extend to society for energy management awareness | PO 2: Competent to undertake a novel work using modern engineering tools for creating a positive impact towards | |

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| | <p>CO2: Start the consultancy on energy management and engineering CO3: Analyze and interprets the various lighting systems and HVAC systems</p> | <p>the welfare and betterment of society. PO 3: To demonstrate the leadership skills in the chosen research domain and communicates effectively both in oral and written formats to a diverse audience. PO 4: Knowledge enhancement, positive impact toward the welfare and betterment of society and contribute to nation building.</p> |
| 6. | <p>Microelectronics and Control Systems CO1: Design the optimal control for various diverse applications in advanced research CO2: Learn the various filtering techniques by applying digital signal processing in power system applications CO3: Interprets and compare the stability concept of various non-linear systems using engineering softwares</p> | <p>PO 1: Perform an advanced research theory based, practiced and analyze the existing research of key thrust areas. PO 2: Competent to undertake a novel work using modern engineering tools for creating a positive impact towards the welfare and betterment of society. PO 4: Knowledge enhancement, positive impact toward the welfare and betterment of society and contribute to nation building.</p> |
| 7. | <p>Advanced Relaying and Protection CO1: Learn to differentiate the unit and non-unit system of protection schemes CO2: Analyze and apply the various protection schemes for under various applications of thrust areas of research CO3: To extend the development of prototypes of supervisory control schemes in research work</p> | <p>PO 1: Perform an advanced research theory based, practiced and analyze the existing research of key thrust areas. PO 2: Competent to undertake a novel work using modern engineering tools for creating a positive impact towards the welfare and betterment of society.</p> |
| 8. | <p>Digital System Design CO1: To apply concepts and methods of digital system design techniques CO2: To understand the principle of operation of sequential machines CO3: To analyze and interprets the design of combinational and sequential digital systems for diverse applications of power systems</p> | <p>PO 2: Competent to undertake a novel work using modern engineering tools for creating a positive impact towards the welfare and betterment of society. PO 3: To demonstrate the leadership skills in the chosen research domain and communicates effectively both in oral and written formats to a diverse audience.</p> |



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| <p>9. Modelling and Analysis of Dynamic Systems</p> <p>CO1: Perform systematic choices of ideal elements for modeling a real dynamic system with mechanical, thermal, fluid and electrical elements and their interactions CO2: Develop the differential equations that describe the input/output behavior of a dynamic system CO3: Compute the input/output transfer function of a dynamic system for its analysis</p> | <p>PO 2: Competent to undertake a novel work using modern engineering tools for creating a positive impact towards the welfare and betterment of society.</p> |
| <p>10. Bio Medical Signal Processing</p> <p>CO1: To understand the concept of nervous system and apply in neural networks. CO2: To analyze the research based non-electrical parameters and use in algorithms using modern engineering tools. CO3: Understand and interprets the principle of operation of biotelemetry systems and its applications.</p> | <p>PO 1: Perform an advanced research theory based, practiced and analyze the existing research of key thrust areas. PO 2: Competent to undertake a novel work using modern engineering tools for creating a positive impact towards the welfare and betterment of society.</p> |
| <p>11. Sensors and Applications</p> <p>CO1: Gain the basic idea of measurements, characteristics and the errors associated with measurements and apply in advanced research meaningful for society CO2: Demonstrate the concept of resistive sensors which can be employed for real life applications CO3: Realize the concept of reactive sensors employed for real life applications</p> | <p>PO 1: Perform an advanced research theory based, practiced and analyze the existing research of key thrust areas. PO 2: Competent to undertake a novel work using modern engineering tools for creating a positive impact towards the welfare and betterment of society. PO 4: Knowledge enhancement, positive impact toward the welfare and betterment of society and contribute to nation building.</p> |
| <p>12. Scientific and Analytical Instrumentation</p> <p>CO1: learn the basic concept of qualitative and quantitative analysis of a given sample. CO2: Learn various spectroscopic techniques with its instrumentation and apply in inter-disciplinary research. CO3: impart the concept of separation science and its application.</p> | <p>PO 1: Perform an advanced research theory based, practiced and analyze the existing research of key thrust areas. PO 4: Knowledge enhancement, positive impact toward the welfare and betterment of society and contribute to nation building.</p> |
| <p>13. Renewable Energy Resources</p> | |

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| | <p>CO1: Apply the basic properties of different renewable sources of energy and technologies using modern engineering tools</p> <p>CO2: Knowledge of the main elements of technical systems designed for utilization of renewable sources of energy</p> <p>CO3: Understand the advantages and disadvantages of different renewable sources of energy</p> | <p>PO 1: Perform an advanced research theory based, practiced and analyze the existing research of key thrust areas.</p> <p>PO 2: Competent to undertake a novel work using modern engineering tools for creating a positive impact towards the welfare and betterment of society.</p> <p>PO 4: Knowledge enhancement, positive impact toward the welfare and betterment of society and contribute to nation building.</p> |
| 14. | <p>Presentation/ Seminar</p> <p>CO1: To identify an area of research and demonstrate the ability to present the latest carried work and explains its societal benefits</p> <p>CO2: To ably link the carried study with its economic analysis and demonstrate its relative merits</p> <p>CO3: To ably carry forward its study using modern engineering softwares</p> | <p>PO 1: Perform an advanced research theory based, practiced and analyze the existing research of key thrust areas.</p> <p>PO 3: To demonstrate the leadership skills in the chosen research domain and communicates effectively both in oral and written formats to a diverse audience.</p> <p>PO 4: Knowledge enhancement, positive impact toward the welfare and betterment of society and contribute to nation building.</p> |

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(14/10/2021)