

SYLLABUS
FOR
B.TECH. PROGRAMME
IN
ELECTRICAL ENGINEERING



INSTITUTE OF TECHNOLOGY
ZAKURA CAMPUS
UNIVERSITY OF KASHMIR
SRINAGAR J&K, 190006
As Per BOS Held In August 2017

COURSE STRUCTURE
B.Tech 6thSemester ELE
University of Kashmir, Zakura Campus

| Course Code | Course Title | Teaching Periods per week | | | Credits |
|--------------|---|---------------------------|----------|----------|-----------|
| | | L | T | P | |
| ELE6117B | Power Systems - II | 3 | 1 | 0 | 4 |
| ELE6217B | Power Electronics | 3 | 1 | 0 | 4 |
| ELE6317B | Non-Conventional Energy Sources | 3 | 1 | 0 | 4 |
| ELE6417B | Electronic Measurements & Instrumentation | 3 | 1 | 0 | 4 |
| ELE6517B | Communication Systems | 3 | 1 | 0 | 4 |
| ELE6617B | Seminar | 1 | 0 | 2 | 2 |
| ELE6117BL | Power System Lab | 0 | 0 | 2 | 1 |
| ELE6217BL | Power Electronics Lab | 0 | 0 | 2 | 1 |
| ELE6517BL | Communication Lab | 0 | 0 | 2 | 1 |
| Total | | 16 | 5 | 8 | 25 |

Applicable To Batch 2016 & Onwards

SIXTH SEMESTER

COURSE CODE: ELE-6117B**POWER SYSTEMS II****Credits: 04**

| S. No. | Topic | No. of Hours |
|--------|--|--------------|
| 1. | Review of Per Unit Representation of Power Systems: Single line diagram, impedance and reactance diagram of a system, per unit calculations, per unit representation of a power system. | 6 |
| 2. | Fault Analysis (Balanced Faults): Faults, types of faults, symmetrical 3-phase balanced faults – calculation of fault currents, current limiting reactors. | 8 |
| 3. | Fault Analysis (Un-symmetrical Faults): Symmetrical components, sequence impedances, sequence networks, unsymmetrical faults –single line to ground, line-to-line, double line to ground faults on unloaded alternators and on power systems. | 8 |
| 4. | Insulation Co-ordination: Generation of over-voltages in a power system, lightning phenomena, lightning surges, switching surges- interruption of short circuits and switching operations, switching surges – interruption of capacitive circuits, resonance over voltages, protection of power system components against over voltages – ground wires, lightning arrestors. Concept of insulation coordination, Basic impulse insulation level, standard impulse test wave, volt-time curve, location and rating of lightning arrestors. | 13 |
| 5. | Surge Performance of Transmission Lines: Traveling waves on transmission lines, open-end line, short-circuited line, line terminated through a resistance, line connected to a cable, reflection and refraction at a T-junction, line terminated through a capacitance, line terminated through an inductance, Attenuation of traveling waves. | 10 |
| 6. | Interference of Power Lines with communication Circuit Electrostatic and Electromagnetic effects. | 3 |
| 7. | High Voltage Direct Current Transmission: Comparison of HVAC and HVDC transmission lines. | 2 |
| Total | | 50 |

TextBooks:

| S. No | Name of Book | Author | Publisher |
|-------|---------------------------|---------------------------------|---------------------|
| 1. | Power System Analysis | J.J. Grainger and W.D Stevenson | Tata McGraw Hill |
| 2. | Electrical Power Systems. | C.L. Wadhwa | New age Publication |
| 3. | Power Systems Engineering | Nagrath and Kothari | Tata McGraw hill |

COURSE CODE: ELE-6217B**POWER ELECTRONICS****Credits: 04**

| S. No. | Topic | No. of Hours |
|--------|--|--------------|
| 1. | Review of power semiconductor switching devices, Diode, Thyristors, MOSFET, IGBT and modern devices, characteristics and applications | 6 |
| 2. | Introduction to Turn-ON/Turn-OFF mechanism of switching devices, Gate-drive circuits, Switching-aid circuits, protection, Heat sink design | 6 |
| 3. | Single phase rectifiers (uncontrolled, semicontrolled, controlled) with passive loads, performance analysis. | 8 |
| 4. | Three-phase rectifiers (uncontrolled, semicontrolled, controlled) with passive loads, performance analysis, Introduction to multi-pulse converters | 6 |
| 5. | Single -phase inverter : principle of operation, single phase bridge inverter, voltage control in inverters and harmonic reduction using PWM strategies. | 7 |
| 6. | Three-phase inverters: 180 degree conduction and 120 degree conduction, voltage control in inverters and harmonic reduction using PWM strategies, Introduction to Multilevel converter | 7 |
| 7. | AC-AC voltage controllers, configurations, performance analysis, harmonics, cyclo-converters, introduction to matrix converters | 6 |
| 8. | Introduction to DC-DC converters; buck, boost and buck-boost converters | 4 |
| Total | | 50 |

TextBooks:

| S. No | Name of Book | Author | Publisher |
|-------|---|--|------------------------------|
| 1. | Fundamental of Power Electronics | Robert Erickson, D. Maksimovic | Springer |
| 2. | Power Electronics, Circuits, Devices and Applications | Muhammad H. Rashid | Pearson education India |
| 3. | Power Electronic, Devices, Applications, and Passive Components | Barry W. Williams | McGraw Hill Higher Education |
| 4. | Power Electronics - converters, Applications, and Design | Ned Mohan, Tore. M. Undeland, William P. Robbins | Wiley |

COURSE CODE: ELE-6317B**NON-CONVENTIONAL ENERGY SOURCES****Credits: 04**

| S. No. | Topic | No. of Hours |
|--------|--|--------------|
| 1. | Classification of energy resources, Importance of non-conventional energy sources, present status and growth of energy sector, Various aspects of energy conservation | 3 |
| 2. | Energy Storage: Necessity and methods, Pumped storage, flywheel storage, Battery storage, Superconducting magnetic energy storages, super/ultra-capacitor storage, applications | 6 |
| 3. | Solar thermal systems: Introduction, Solar energy basics, classification, solar water heater, solar refrigeration and air-conditioning systems, solar cookers, solar pond electric-power plant, central receiver power plant | 7 |
| 4. | Solar Photovoltaic (PV) systems: introduction, solar cell characteristics and equivalent circuit, design of solar PV module and array in solar PV system, MPPT, standalone and grid connected solar PV system, Other Applications | 7 |
| 5. | Wind Energy: Introduction, Applications of wind power, power extraction from wind, torque developed by the wind turbine, wind turbine classifications, wind generators, wind energy conversion systems, Hybrid standalone and grid connected systems | 7 |
| 6. | Small hydro resources: introduction, classification, Essential components of hydroelectric system, water turbines and their selections, generators, latest trends in micro hydro systems. | 6 |
| 7. | Biomass: Generation, Characterization, biomass plants | 5 |
| 8. | Ocean Energy: tidal energy, wave energy and ocean thermal energy | 3 |
| 9. | Geothermal Energy: Geothermal regions, Types of geothermal resources, Analysis of geothermal resources, Geothermal energy conversion Technologies | 3 |
| 10. | Latest trends in smart grid and microgrid systems | 3 |
| Total | | 50 |

TextBooks:

| S. No | Name of Book | Author | Publisher |
|-------|---|--------------------------|--------------------------|
| 1. | Non-conventional energy resources | B. H. Khan | McGraw Hill |
| 2. | Renewable Energy Resources | J.Twidell and T.Weir | Taylor and Francis Group |
| 3. | Renewable Energy Resources Basic Principles and Application | G.N.Tiwari and MK Ghosal | Narosa Publishing House |
| 4. | Non-Conventional Energy Resources | R.K Singal | DhanpatRai publication |
| 5. | Energy Technology | S. Rao, B.B Parlekar | Khanna Publications |
| 6. | Wind & Solar Power System | M.Patel | CRC Press |
| 7. | Principle of Energy Conversion | A. W. Culp | McGraw Hill Publication |

COURSE CODE: ELE-6417B**ELECTRONIC MEASUREMENTS & INSTRUMENTATION****Credits: 04**

| S. No. | Topic | No. of Hours |
|--------|---|--------------|
| 1. | INSTRUMENTATION SYSTEM: Classification of instrumentation errors. Basic features of instrumentation system. Dynamic response and accuracy of an instrumentation system. | 07 |
| 2. | TRANSDUCERS: Transducers of following types: Resistance, Inductance, Capacitance, Piezoelectric, Optical and Digital. Measurement of various electrical and non-electrical quantities.(Temp., torque, speed, stress, strain, etc.) | 08 |
| 3. | INSTRUMENTATION AMPLIFIERS | 07 |
| 4. | WAVE ANALYSERS: Analysers for Audio and radio frequency waves, Measurement of distortion. Spectrum analysis. | 06 |
| 5. | PHASE AND FREQUENCY MEASUREMENT: Analog and Digital Measurement of frequency and time. | 07 |
| 6. | DATA ACQUISITION SYSTEM: Comments of data acquisition, system, Sample and Hold circuits, Recorders: Strip Chart recorders, Magnetic tape recorder, Digital recorder, Ultraviolet recorder, Heat sensitive recorder, Single channel and Multi-channel data acquisition system. Using DAC, ADC and Multiplexing | 10 |
| 7. | Microprocessor based Measurement techniques | 05 |
| Total | | 50 |

TextBooks:

| S. No | Name of Book | Author | Publisher |
|-------|--|---------------|---------------|
| 1. | Electronic measurements and instrumentation | Cooper | Prentice-Hall |
| 2. | Electrical and Electronic measurements & instrumentation | A.K. Sawhney. | Khanna |
| 3. | Electrical and Electronic measurements & instrumentation | J.B Guptha | S.K Kataria |

COURSE CODE: ELE-6517B**COMMUNICATION SYSTEMS****Credits: 04**

| S. No. | Topic | No. of Hours |
|--------|---|--------------|
| 1. | Spectral analysis of Signals: Fourier series of repetitive signals, Fourier transform of non-repetitive signals, amplitude spectrum of special signals viz. Pulse train and pulse waveform | 10 |
| 2. | Modulation: AM, DSB/SC, SSB, VSB, Angle modulation, NBFM, WBFM, Diode detector, Frequency discriminator, AM & FM, Transmitter | 10 |
| 3. | Demodulation: AM and FM signals, Radio Receivers – AM & FM, (Block diagram) | 08 |
| 4. | Noise Analysis: Performance of AM & FM Systems in presence of noise, Threshold in AM & FM Demodulations, Pre- emphasis, and De-emphasis in FM Systems | 08 |
| 5. | Digital Communication: Sampling, Quantization, Quantization noise, Coding, Pulse code Modulation; Differential PCM, ADPCM, Relative advantages and dis-advantages. Delta modulation. PWM & PPM | 08 |
| 6. | Digital Modulation Techniques: ESK, FSK, PSK, M-FSK, DPSK, GPSK schemes | 06 |
| Total | | 50 |

TextBooks:

| S. No | Name of Book | Author | Publisher |
|-------|------------------------------------|-------------------|------------------------------------|
| 1. | Electronics communication System | G. Kennedy | Mcgraw hill education (India) Ltd |
| 2. | Principles of Communication system | Taub and Shelling | Tata Mcgraw hill education Pvt Ltd |
| 3. | Communication system | S. Haykins | Willey India Pvt Ltd |

COURSE CODE: ELE-6617B

SEMINAR

Credits: 02

The students are required to prepare a seminar report and presentation based on the latest trends and technologies in their respective fields of study. The work is to be carried out in the 6th semester of their course individually. Each student will have to select a topic of study duly approved by the faculty incharge of conducting seminar. The student will have to prepare a seminar report and deliver a presentation before a panel of experts based on the seminar work carried by him/her.

COURSE CODE: ELE-6117BL

POWER SYSTEM LAB

Credits: 01

| S. No. | Experiment |
|---------------|---|
| 1. | A.C distribution |
| 2. | D.C. distribution |
| 3. | Efficiency, Regulation & ABCD parameters of Transmission line |
| 4. | Study of cables & find charging current |
| 5. | Study of different types of insulators |
| 6. | Per unit representation of a power system. |
| 7. | Measurement of positive, negative and zero sequence impedance and currents. |
| 8. | Measurement of earth resistance. |
| 9. | Measurement of insulation resistance of insulators |
| 10. | Transmission line fault analysis |
| 11. | Computer Simulation of Power System |

COURSE CODE: ELE-6217BL

POWER ELECTRONICS LAB

Credits: 01

| S. No. | Experiment |
|---------------|--|
| 1. | To obtain the VI characteristics of an i. SCR ii. Triac |
| 2. | To study various triggering circuits |
| 3. | To obtain the UJT characteristics |
| 4. | To study the operation of a Line Synchronised UJT Relaxation Oscillator. |
| 5. | To study the illumination control using SCR. |
| 6. | To study half wave gate controlled rectifier using one SCR. |
| 7. | To study single phase half controlled, full wave rectifier. |
| 8. | To study various techniques of forced commutation of an SCR. |
| 9. | To study the speed control of a DC shunt motor using single phase bridge converter. |
| 10. | To study generation of SPWM modulation |
| 11. | To study following choppers i. Buck converter ii. Boost converter iii. Buck-Boost converter |

COURSE CODE: ELE-6517BL

COMMUNICATION LAB

Credits: 01

| S. No. | Experiment |
|---------------|--|
| 1. | Generation and detection of amplitude modulated signals. |
| 2. | Generation and detection of frequency modulated signals. |
| 3. | To measure sensitivity, selectivity, and fidelity of a radio receiver. |
| 4. | To generate PAM and PDM signals using IC555. |
| 5. | To test a pulse code modulator. |
| 6. | To measure the noise figure of the following systems: i. A.M. system. ii. F.M. System. |