Department of Electrical Engineering
Syllabus for B.Tech. (EE)

Course Title: **Telemetry and Data Transmission** *(Departmental Elective)*		Course Code: **EA8620**
Credit: 3.5	L **3**	T **1**	P **0**
Year: **4th**		Semester: **VIII**

UNIT – 1

Sampling Fundamentals: Introduction to sampling theorem and sampling process, convolution, computing minimum sampling rate. Alising Errors.

Digital Modulation Techniques: Review of PCM, DPCM, Methods of binary data transmission, Data Formats, DM code converters, PSK, QPSK, FSK, probability of error, phase ambiguity resolution and differential encoding, error detection, error correction, error correction codes.

UNIT – 2 & 3

Data Handling System: Block schematic, Sensors, Signal conditioners, Multiplexing- high level and low level, ADC- range and resolution, Word Format, Frame format, Frame synchronizer codes, R. F. links, X24, RS 422, RS423, RS 232C interfaces, Multi terminal configuration, Multiplier & Concentrator, Data Modems, Data transmission over telephone lines.

Data Reception Systems: Bit synchronizers, frame synchronizers, subframe synchronizers, PLL, Display systems.

UNIT – 4

Remote Control: Communication based processing control systems, pipelines, Operational security systems components, Pipeline control, Power system control, Programmable controllers for factory automation.

Command: Tone command system, Tone digital command system, ON/OFF command and data commands.

UNIT – 5

Aerospace Telemetry: Signal formation and conversion, Multiplexing techniques in telecontrol, Industrial telecontrol installations, reliability in telecontrol installations.

Text Books:

1. Patranabis, “Telemetry Principles”, Tata McGraw Hill.
2. Schweber, “Data Communication”, McGraw Hill.
3. Berder&Menjewlse, “Telemetry Systems”.

Department of Electrical Engineering
Syllabus for B.Tech. (EE)

Course Title: **Non-Conventional Energy Resources** *(Departmental Elective)*	Course Code: **EA8630**
Credit: 3.5	L: **3** T: **1** P: **0**
Year: **4th**	Semester: **VIII**

UNIT – 1

Introduction Various non-conventional energy resources: Introduction, availability, classification, relative merits and demerits, present energy scenario.

UNIT – 2

Solar Cells: Theory of solar cells. Solar cell materials, solar cell power plant, limitations. Solar Thermal Energy Solar radiation flat plate collectors and their materials, applications and performance, focusing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.

UNIT – 3

Geothermal Energy: Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations.
Magneto-hydrodynamics (MHD) Principle of working of MHD Power plant, performance and limitations.

UNIT – 4

Fuel Cells: Principle of working of various types of fuel cells and their working, performance and limitations. Thermo-electrical and thermionic conversions, Principle of working, performance and limitations.
Wind Energy: Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. Performance and limitations of energy conversion systems.

UNIT – 5

Bio-mass: Availability of bio-mass and its conversion theory.
Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle, performance and limitations.
Wave and Tidal Wave: Principle of working, performance and limitations. Waste Recycling Plants

Text Books:

1. D.S. Chauhan, “Non-Conventional Energy Resources”, New Age International
2. B.H. Khan, “Non-Conventional Energy Resources”, Tata McGraw Hill

Reference Books:

1. AndraGabdel, "A Handbook for Engineers and Economists".
2. Mani, "Handbook of Solar radiation Data for India".
3. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.
4. F.R. the MITTRE, "Wind Machines" by Energy Resources and Environmental Series.
5. Frank Kreith, "Solar Energy Hand Book".
6. N. Chermisinogg and Thomes, C. Regin, "Principles and Application of Solar Energy".
7. N.G. Calvert, “Wind Power Principles”.
8. W. Palz., P. Chartier and D.O. Hall," Energy from Biomass".

Department of Electrical Engineering
Syllabus for B.Tech. (EE)

Course Title: **Special Electrical Machines** *(Departmental Elective)*	Course Code: **EA8640**
Credit: 3.5	L T P **3 1 0**
Year: **4th**	Semester: **VIII**

UNIT – 1

Poly-phase AC Machines: Construction and performance of double cage and deep bar three phase induction motors; e.m.f. injection in rotor circuit of slip ring induction motor, concept of constant torque and constant power controls, static slip power recovery control schemes (constant torque and constant power), Introduction to multiphase machines.

UNIT – 2

Single phase Induction Motors: Construction, starting characteristics and applications of split phase, capacitor start, capacitor run, capacitor start, capacitor-run and shaded pole motors.

Two Phase AC Servomotors: Construction, torque-speed characteristics, performance and applications.

UNIT – 3

Stepper Motors: Principle of operation, variable reluctance, permanent magnet and hybrid stepper motors, characteristics, drive circuits and applications.

Switched Reluctance Motors: Construction; principle of operation; torque production, modes of operation, drive circuits.

UNIT – 4

Permanent Magnet Machines: Types of permanent magnets and their magnetization characteristics, demagnetizing effect, permanent magnet dc motors, sinusoidal PM ac motors, brushless dc motors and their important features and applications, PCB motors. Single phase synchronous motor; construction, operating principle and characteristics of reluctance and hysteresis motors; introduction to permanent magnet generators.

UNIT – 5

Single Phase Commutator Motors: Construction, principle of operation, characteristics of universal and repulsion motors; Linear Induction Motors. Construction, principle of operation, Linear force, and applications.

Text Books:

1. P.S. Bimbhra “Generalized Theory of Electrical Machines” Khanna Publishers.
2. P.C. Sen “Principles of Electrical Machines and Power Electronics” John willey& Sons, 2001

Reference Books:

1. G.K.Dubey “Fundamentals of Electric Drives” Narosa Publishing House, 2001
2. Cyril G. Veinott “Fractional and Sub-fractional horse power electric motors” McGraw Hill International, 1987
3. M.G. Say “Alternating current Machines” ,Pitman & Sons

Department of Electrical Engineering
Syllabus for B.Tech. (EE)

Course Title: **Utilization of Electrical Energy & Traction** *(Departmental Elective)*		Course Code: **EA8670**
Credit: 3.5	L **3**	T **1**	P **0**
Year: **4th**		Semester: **VIII**

UNIT – 1
Electric Heating: Advantage & methods of electric heating, Resistance heating, Electric arc heating, Induction heating, Dielectric heating,

UNIT – 2
Electric Welding: Electric arc welding, electric resistance welding, Electric Welding control, Electrolyte Process: Principal of Electro deposition, laws of Electrolysis, application Electrolysis.

UNIT – 3
Illumination: Various definition, laws of Illumination, requirement of good lighting, Design of indoor lighting & outdoor lighting system.
Refrigeration and Air Conditioning: Refrigeration system, domestic Refrigerator, water cooler, Types of Air conditioning, Window air conditioner

UNIT – 4
Electric Traction – I: Types of electric traction, system of track electrification, Traction mechanics-types of services, speed time curve and its simplification, average and schedule speeds, Tractive effort specific energy consumption, mechanics of train movement, coefficient of adhesion and its influence

UNIT – 5
Electric Traction – II: Salient features of traction drives, Series-parallel control of dc traction drives (bridge traction) and energy saving, Power Electronic control of dc & ac traction drives, Diesel electric traction.

Text books:

1. H. Pratab. "Art & Science of Electric Energy's" Dhanpat Rai & Sons.
2. G.K. Dubey," Fundamentals of Electric Drives" Narosa Publishing house.

Reference Book:

1. H.Pratab, "Modern electric traction" DhanpatRai& Sons.
2. C.L. Wadhwa, "Generation, Distribution and Utilization of Electrical Energy "New Age International Publishers.

Department of Electrical Engineering
Syllabus for B.Tech. (EE)

Course Title: **Power Quality** *(Departmental Elective)*	Course Code: **EA8650**
Credit: 3.5	L T P **3 1 0**
Year: **4th**	Semester: **VIII**

UNIT – 1

Power Quality Terms and Definitions: Introduction, transients, sag and swell, short duration/long duration voltage variations, voltage imbalance, waveform distortion, voltage fluctuations, power frequency variation.

Power Quality Problems: Poor load power factor, loads containing harmonics, notching in load voltage, DC offset in loads, unbalanced loads, disturbance in supply voltage.

UNIT – 2

Fundamentals of Harmonics: Representation of harmonics, waveform, harmonic power, measures of harmonic distortion; current and voltage limits of harmonic distortion: IEEE, IEC, EN, NORSOK

Causes of Harmonics: 2-pulse, 6-pulse and 12-pulse converter configurations, input current waveforms and their harmonic spectrum; Input supply harmonics of AC regulator, integral cycle control, cycloconverter, transformer, rotating machines, ARC furnace, TV and battery charger.

UNIT – 3

Effect of Harmonics: Parallel and series resonance, effect of harmonics on static power plant- transmission lines, transformers, capacitor banks, rotating machines, harmonic interference with ripple control systems, power system protection, consumer equipments and communication systems, power measurement.

UNIT – 4

Elimination/Suppression of Harmonics: High power factor converter, multi-pulse converters using transformer connections (Delta, polygon)

Passive Filters: Types of passive filters, single tuned and high pass filters, filer design criteria, double tuned filters, damped filters and their design.

UNIT – 5

Active Power filters: Compensation principle, classification of active filters by objective, systems configuration, power circuit and control strategy.

Shunt Active Filter: Single phase active filter, principle of operation, expression for compensating current, concept of constant capacitor voltage control; Three phase active filter: Operation, analysis and modeling; Instantaneous reactive power theory

Three phase series active filters: Principle of operation, analysis and modeling.

Other Techniques: Unified power quality conditioner, voltage source and current configurations, principle of operation for sag, swell and flicker control.

Text Books:

1. Roger. C. Dugan, Mark. F. McGranagham, Surya Santoso, H.WayneBeaty, ‘Electrical Power Systems Quality’ McGraw Hill, 2003. (For Chapters1,2,3, 4 and 5)

Reference Books:

2. G.T. Heydt, 'Electric Power Quality', 2nd Edition. (West Lafayette, IN, Stars in a Circle Publications, 1994). (For Chapter 1, 2, 3 and 5)
3. M.H.J Bollen, ‘Understanding Power Quality Problems: Voltage Sags and Interruptions’, (New York: IEEE Press, 1999). (For Chapters 1, 2, 3 and 5)
4. J. Arrillaga, N.R. Watson, S. Chen, 'Power System Quality Assessment', (NewYork: Wiley, 1999). (For Chapters 1, 2, 3, 4 and 5)
5. PSCAD User Manual

Department of Electrical Engineering
Syllabus for B.Tech. (EE)

Course Title: **Switch Mode and Resonant Converters** *(Departmental Elective)*		Course Code: **EA8660**
Credit: 3.5	L **3**	T **1**	P **0**
Year: **4th**		Semester: **VIII**

UNIT – 1

Introduction: Linear power supply regulators and their drawbacks; switch mode power regulators-elements, salient features and application. Switch-Mode DC-DC Regulators, Without Isolation: Characteristics and analysis of Buck, Boost, BuckBoost, Cuk and Full bridge converters, Multiple output and Diode rectifier–fed Boost converters.

Unit – 2

Switching Power DC Supplies: Overview of Switch-mode dc power supply (SMPS), Introduction to dc-dc converters and their control. Characteristics and analysis of Flyback, Forward, Push-pull, Half bridge, Full bridge and Current source converters, control circuits; Design considerations

UNIT – 3

Switch-Mode DC-AC Inverters (DC to Sinusoidal AC): Basic concepts, single phase full bridge inverter (PWM with unipolar and bipolar voltage switching) and push-pull inverters, three phase PWM inverters other switching schemes. Power conditioners and Uninterruptible Power Supplies (UPS): Disturbances in commercial power supply, power quality and power conditioners, configurations of off-line and on-line UPS, various inverter arrangements, control, batteries.

UNIT – 4

Resonant Converters – I: Concept, advantage and limitations characteristics and analysis of series, parallel, series-parallel, resonant converters, quasi resonant converters, class E resonant inverter, class E rectifier.

UNIT – 5

Resonant Converters-II: ZCS resonant converters (L and M types), and ZVS resonant converters and their comparison Two quadrant ZVS resonant converters, resonant dc link inverters. Utility interface with Power Electronic Systems: Harmonic standards and recommended practices need for improved utility interface, improved single phase utility interface, Electromagnetic interference

Text Books:

1. M.H. Rashid, “Power Electronics: Circuits, Devices and Applications” Prentice hall of India, 3rd Edition
2. Ned Mohan, T.M. Undeland and William P. Robins, “Power Electronics: Converters, Applications and Design” John Willey & Sons, 2nd Edition

Reference Books:

1. M.S. Jamil Asghar, “Power Electronics” Prentice Hall of India
2. R.P. Severns and G.E. Bloom, “Modern DC to DC Switch-Mode Power Converter Circuits” Van Nostrand Reinhold
3. K.Kit Sum, “Switch-Mode Power conversion. Basic Theory and Design” Marcel Decker.
4. G. Chryssis, “High Frequency Switching Power supplies: Theory and Design” McGraw Hill

Department of Electrical Engineering
Syllabus for B.Tech. (EE)

Course Title: **EHV A.C. and D.C. Transmission** *(Departmental Elective)*		Course Code: **EA8610**
Credit: 3.5	L **3**	T **1**	P **0**
Year: **4th**		Semester: **VIII**

UNIT – 1

Introduction: Need of EHV transmission, standard transmission voltage, comparison of EHV AC & DC transmission systems and their applications & limitations, surface voltage gradients in conductor, distribution of voltage gradients on sub-conductors, mechanical considerations of transmission lines, modern trends in EHV AC & DC transmission, Types of tower

UNIT – 2

EHV AC Transmission: Corona loss formulas, corona current, audible noise- generation and characteristics corona pulses their generation and properties, radio interference (RI) effects, over voltage due to switching, ferro-resonance, reduction of switching surges on EHV system.

UNIT – 3

Extra High Voltage Testing: Characteristics and generation of impulse voltage, generation of high AC and DC voltages, measurement of high voltage by sphere gaps and potential dividers. Consideration for Design of EHV Lines, Design factors under steady state limits, EHV line insulation design based upon transient over voltages. Effects of pollution on performance of EHV lines.

UNIT – 4

EHV DC Transmission-I: Types of dc links, converter station, choice of converter configuration and pulse number, effect of source inductance on operation of converters, principle of dc link control, converter controls characteristics, firing angle control, current and excitation angle control, power control, starting and stopping of dc link.

UNIT – 5

EHV DC Transmission- II: Converter faults, protection against over currents and over voltage, HVDC Circuit breakers, Smoothing reactors, generation of harmonics, ac and dc filters, multi –terminal dc systems (MTDC): Types, control, protection and application.

Text Books:

1. R.D. Begamudre, "Extra High Voltage AC Transmission Engineering "Wiley Eastern
2. K.R Padiyar, "HVDC power transmission System, Technology and System Reactions "New Age International.

Reference Books:

1. M.HRashid,"Power Electronics: Circuit, Devices and Applications", Prentice hall of India.
2. S .Rao, "EHV AC & HVDC Transmission Engineering and practice", Khanna Publishers
3. J Arrillaga,"High Voltage Direct current Transmission", IFFE Power Engineering Series 6, Peter Peregrionus Ltd. London.
4. M.S Naidu & V.K Kamaraju "High Voltage Engineering", Tata McGraw Hill.