VI SEMESTER (w.e.f. 2017-2018)

SN	Course No.	Course Title	Teaching Schedule				Allotment of Marks			Marks	Dur. of Exam (Hr)
			L	T	P	Hr/ Wk	Theory	Sessional	Practical		
1	EEN-302N	Power System Engineering	4	1		5	75	25		100	3
2	EEN-304N	Data Communication & Networking	4	0		4	75	25		100	3
3	EEN-306N	Micro Processor & Micro Controller	4	1		5	75	25		100	3
4**	**EE-308N**	Electrical Machine Design	3	1		4	75	25		100	3
5**	**EE-310N**	Electric Drives & Traction	4	0		4	75	25		100	3
6	EEN-312N	Digital Signal Processing	4	1		5	75	25		100	3
7	EEN-314N	Digital Signal Processing Lab			2	2		40	60	100	3
8	EEN-316N	Micro Processor Lab			2	2		40	60	100	3
9	EEN-318N	Power System Lab			2	2		40	60	100	3
10**	**EE-320N**	Electric Drives Lab			2	2		40	60	100	3
		TOTAL	**23**	**4**	**8**	**35**	**450**	**310**	**240**	**1000**	

Note: 1. ** Subjects Common with VI Semester. B.Tech. [Electrical Engg.] Scheme, K.U.K.

2. The students will have to undergo another six weeks Industrial Training after VI sem and it will be evaluated during VII sem through submission of certified computerized report to the H.O.D. followed by conduct of viva-voce & seminar/presentation.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EEN-302N	**Power System Engineering**	**4**	**1**	**25**	**75**	**100**	**3 Hr**

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT I

Introduction: Characteristics & representation of components of a power system, synchronous machines, transformers, lines cables & loads. Single line diagram.

Protective Relaying: Scheme of protection of generators, transformers, transmission lines & bus-bars, carrier current protection.

UNIT II

Circuit Interruption : Circuit interruption, theory of arc formation and it's excitation in d.c., a.c. circuits, restriking & recovery voltage, interruption of capacitive & inductive currents. Rupturing capacity & rating of circuit breakers.

Circuit-Breakers : Classification of circuit-breakers, circuit-breakers of low medium, high & extra high voltages. Multibreak & resistance switching. H.V. circuit breakers.

UNIT III

Fault Analysis:-

Symmetrical faults: Calculation of fault currents, use of current limiting reactors.

Unsymmetrical faults: Types of transformation in power system analysis, symmetrical components transformation.

Grounding: Need of neutral grounding, various types of neutral grounding technique, equipment earthing for safety.

UNIT IV

Transients in Power Systems: Transient electric phenomenon, travelling waves, reflection & refraction of waves with different line termination.

Stability of power System: Concepts of stability, power angle characteristics of Synchronous, steady state & transient stability swing waves.

References:

1. Elements of power system analysis by W.D. Stevenson.
2. Electric Power System by B.M. Weddy.
3. The transmission & Distribution of Electric Energy by H.Cotton.
4. Modern Power System Analysis by I.J. Nagrath & D.P. Kothari.
5. A course in Electrical Power by Soni, Gupta & Bhatnagar.
6. Power System Analysis & Stability by S.S. Vadhera
7. Electrical Power System by C.L. Wadhwa. 8. Electrical Power System by Ashfag Hussain.
9. Electrical Power by S.L. Uppal.
10. Switching & Protection by Sunil S. Rao.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EX-304N	**Data Communication & Networking**	**4**	**0**	**25**	**75**	**100**	**3 Hr**

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT I: Basic & Computer Networks, Need & Evolution of Computer Networks, Description of LAN, MAN, WAN and wireless Networks, OSI and TCP/IP models with description of Data Encapsulation & peer to peer communication, Comparison of OSI and TCP/IP, Basic terminology of computer networks- bandwidth, Physical and logical topologies, LAN & WAN devices- Router, bridge Ethernet switch HUB, Modem CSU/DSU etc.

UNIT II: Physical Layer- Representation, Optical Network and wireless N/W, Encoding/Modulation- TTL Encoding, Manchester Encoding, AM, FM and PM, Dispersion, Jitter, Latency and collision. Different types of Media- Shielded twisted pair, Unshielded twisted pair, Coaxial cable, Optical Fiber cable and wireless. Layer-LLC and MAC sub layer, MAC addressing Layer 2 devices, Framing Error control and flow control. Error detection and correction CRC Codes, block parity and Checksum, elementary data link protocol, sliding window protocol, Channel allocation problem- static and dynamic.

UNIT III: Multiple Alex protocol- ALOHA, CSMA/CU Token bus Tokening, FDDI.Network Layer, Segmentation and autonomous system path determination, Network Layer addressing, Network-layer data gram, IP addressed classes, Subneting,Sub network, Subnet mark, Routing algorithm- optimality Principle, Shortest path routing , Hierarchical routing, Broadcast routing, Multicast routing.

UNIT IV: Transport Layer- Layer 4 Protocol TCP & UDP Three way hand shakes open connection ATM AAL Layer protocol, Session Layer design issue, Presentation Layer design issue and Application layer design issue. Application layer Protocol, TELNET, FTP, HTTP, SNMP.

References:

1. Tannenbum, " Computer Networks," PHI
2. Darlx, " Computer Networks and Their Protocols", DLA Labs
3. Freer, " Comp. Communication & Networks" , East-West-Pre
4. Frozen, "Data Communication & Networking (TMH)
5. Stalling ,"Data & Computer Communication.(PHI)

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EX-306N	**Microprocessor & Micro Controller**	**4**	**1**	**25**	**75**	**100**	**3 Hr**

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT I

Introduction to microprocessor, **architecture** of 8085, description of 8085 pins, flags, registers, Demultiplexing the bus AD_7 –AD_0, instruction cycle, machine cycle,T-state, fetch cycle and execute cycle ; timing diagram; addressing mode; interrupts

UNIT II

Instruction set: Data transfer group instruction, arithmetic group, logical group, machine group,

branch group instructions, stack operation; sub routine.

Data Transfer Techniques: Memory mapped I/O & input/output mapped I/O space, program data transfer techniques, interrupt data transfer techniques, DMA.

UNIT III

Assembly language programming & interfacing : introduction of machine language; assembly language, high lavel language, example of assembly language programming; interfacing of the memory (RAM, ROM, EPROM, EEPROM) , input device and output device;

Special purpose support devices: : Brief description of 8255 PPI , 8253, 8251 USART

UNIT IV

Advanced 8086 microprocessor & microcontroller: 8086 microprocessor, its architecture, operating mode, pin description for minimum mode, pin description for maximum mode, comparison of 8086 & 8085.

Microcontroller: introduction of 8051 microcontroller & its block diagram, comparison of microprocessor and microcontroller

References:

1. R.S. GAONKAR: Microprocessor architecture, programming & Application.(MGH)
2. Malvino, A.P. : Digital computer electronics-an Introduction to microprocessor.(MGH)
3. D.V.HALL: Microprocessor & Digital circuits.(MGH)
4. MATHUR A.P. : Introduction to microprocessor

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EE-308N	**Electrical Machines Design**	**3**	**1**	**25**	**75**	**100**	**3 Hr**

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT I

GENERAL: General features , limitations of electrical machine design, specific loadings **thermal design** types of enclosures, ventilation, heat dissipation, temperature rise, heating & cooling cycles, rating of machines, cooling media used, advantages of hydrogen cooling, effect of size and ventilation.

DC MACHINES: Main parts ,Output equation, choice of specific loadings, choice of poles and speed, Design of core length, armature diameter, depth of armature core ,air gap length, cross section of armature conductors, armature slots ,**design of field system** field poles, field coils, commutater.

UNIT II

TRANSFORMERS: Main parts of transformer, Standard specifications, output equation, voltage per turn , optimum design, design of core , design of winding, simplified steps for transformer design, tank and Cooling tubes, **Operating calculations** circuit parameters, magnetizing current, losses and efficiency, Temperature rise and regulations from design data.

SYNCHRONOUS MACHINES: Types of construction, types of synchronous alternators Specifications, output equation , **design of salient pole machines** main dimensions, short circuit ratio , length of air gap, choice of armature slots, turns per phase, conductor section , **design difference between turbo alternator & salient pole generators**, , direct & indirect cooling.

UNIT III

INDUCTION MOTORS:
Three Phase Induction Motor: Standard specifications, output equations, choice of specific loadings, main dimensions, conductor size and turns, no. of slots, slot design, stator core depth, **rotor design**, rotor bars& slots area, end rings .
SINGLE PHASE INDUCTION MOTOR: output equations, specific loadings, main dimensions, design of main and auxiliary winding, capacitor design, equivalent circuit parameters, torque, efficiency.

UNIT IV

COMPUTER AIDED DESIGN: Computerization of design procedures, development of computer programs & performance predictions, optimization techniques & their application to design problems.

TEXT BOOKS/REFERENCES:

1. Electrical Machine Design by A. K. Sawhney Dhanpat Rai & co.
2. M.G.Say, Performance and design of ac machines, CBS Publishers.
3. S.K. Sen., Principles of Electrical Machine Design with Computer Programs, Oxford and IBH.
4. A.E.Clayton, Hencock: Performance and design of dc machines, CBS Publishers.
5. J.H. Kuhlmann, Design of electrical operators, John Willey, 1957 .
6. CG Veinott, Theory and design of small induction machines, MGH, 1959
7. A Shanmugasundarem, Electrical machine design databook, John willey, 1979

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EE-310N	**Electric Drives & Traction**	**4**	**0**	**25**	**75**	**100**	**3 Hr**

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT-I

Introduction: Definition & classification of different type of electric drives, its Review characteristics, choice of electric drive ,components of electric drives, advantages and applications.

Dynamics of Electric drives & Rating of motors: - Fundamental load torque equation, types of loads, frequency operation of motor subjected to intermittent loads, pulse loads etc. Determination of motor rating, Heating/cooling curve, Nature of loads and classes of motor duty.

Control of Electrical Drives: Modes of operation, closed loop control of drives, sensing of current and speed**.**

UNIT-II

D.C. drives: Various methods of braking of D.C. drives, Speed control methods of D.C. drives, 1-∅ fully controlled and half controlled rectifier fed separately excited D.C. motor, 3-∅ fully and half controlled fed separately excited D.C. Motor, Performance and characteristics of 1-∅ and 3-∅ rectifier controlled D.C. drives.

UNIT-III

AC Drives: Various methods of braking of A.C. drives, Speed control methods of A.C. drives, Basic principle of induction motor drives, 3 -∅ A.C. Voltage controller fed I.M drive, Drives using chopper, multi quadrant control of chopper fed motors, Synchronous motor Drives, Automatic starting and pulling operation of synchronous motors

UNIT-IV

Traction Drives: Nature of traction load, A.C. & D.C. motor drives in transportation system and traction & its characteristics, Duty cycle & speed time relationship, Polyphase A.C. motors for traction drives, D.C. traction using chopper controlled D.C. motors.

TEXT BOOKS:

1. Fundamentals of Electrical Drives, G.K.Dubey, Narosa Publishing House

REFERENCE BOOKS:

1. Power Semiconductor controlled drives, G.K.Dubey, Prentice Hall.
2. Electric Drives: V.Subrahmaniyam TMH
3. Electric Drives: Leonard, Narosa Pub.
4. Electric Drives: Diwan
5. Power Electonics : M.D.Singh, K.B.Knanchandani : Mc Graw Hill
6. Electric Motor Drives by Krishnan,PHI
7. Electric Drives: S.K.Pillai,New Age

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EEN-312N	**Digital Signal Processing**	**4**	**1**	**25**	**75**	**100**	**3 Hr**

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT I

Introduction: Basic elements of DSP system, Advantages and disadvantage of DSP over analog processing, Application of Digital signal processing.

Z-Transform: Direct Z-Transform and importance of ROC, properties of Z-Transform, Inverse Z-transform methods, Rational Z-transform function representation, system function of LTI systems in Z-domain, one sided Z –Transform. Solution of difference equations. Analysis of LTI system in Z- domain, transient and steady- state response. Causality and stability. Pole- Zero Cancellations.

UNIT II

FREQUENCY TRANSFORMATIONS

Introduction to DFT, Direct Computation of DFT ,Properties of DFT, Circular Convolution , Fast fourier Transform(FFT),decimation in time ,decimation in frequency algorithm, Use of FFT in Linear Filtering , Goetzel Algorithm, Chirp-Z Transform algorithm.

UNIT III

Structure of Discrete-Time Systems: Structure for FIR Systems-direct form, Linear Phase, Cascade form, Frequency-Sampling structures, Structures for IIR- Direct, Cascade, Parallel & transposed structure, signal flow graphs .

Design for Digital Filters:- Symmetric and anti-symmetric FIR filters; Design of Linear Phase FIR using windowing techniques (Rectangular Window, Hamming Window, Hanning Window), Frequency Sampling Method of FIR design, Impulse Invariance transformation, Bilinear transformation and its use in design of Butterworth and Chebyshev IIR Filters; Frequency transformation in Digital Domain, Matched Z-Transformation.

UNIT IV

Implementation of Discrete Time Systems:
Lattice, Ladder and Lattice-Ladder Structures, Shur- Cohn Stability test. Jury Test, Shur-Cohn-fuzzivera stability criterion for IIR filters, Discrete Hilbert Transform.
DSP processor architecture fundamentals: Study of ADSP and TMS series of processor architectures.

References:

1. Digital Signal Processing by J.G. Proakis and D.G. Manalakis-PHI
2. Digital Signal Processing by: A.V. Oppenheim and R.W. Schafer-PHI
3. Element of Digital Signal Processing by N. Sarkar Khanna Publishers.
4. Digital Signal Processing by S. K. Mitra –TMH.
5. Digital Signal Processing by Rabinar, Gold-PHI
6. Digital Signal Processing by S. Salivahanan- TMH
7. Digital Signal Processing by IFecher

Code	Nomenclature of Lab	P	Int.	Ext.	Total	Time
EEN-314N	**Digital Signal Processing Lab**	**2**	**40**	**60**	**100**	**3 Hr**

LIST OF EXPERIMENTS / PROGRAMS:

1. Write a program in MATLAB to study the basic operation on the discrete time signals. (Amplitude and time manipulation).
2. Write a MATLAB program to perform discrete convolution (linear and circular) for a given two sequences.
3. Write a MATLAB program to perform the DFT for a given sequence.
4. Write a MATLAB program to compute DFT and IDFT for a given sequence using FFT algorithem.
5. Write a MATLAB program to perform sampling rate conversion for any given arbitrary sequence by interpolation, decimation, upsampling, downsampling and resampling.
6. Write a MATLAB program to find the time domain response (Impulse response and phase response) for a given FIR and IIR systems.
7. Write a MATLAB program to find the frequency domain response (magnitude response and phase response) for a given FIR and IIR systems.
8. Write a MATLAB program to design a low pass filler using window method for the given specification.
9. Write a MATLAB program to design Butterworth and Chebyshev low pass filler using bilinear transformation and Impulse Invariant Transformation.

Code	Nomenclature of Lab	P	Int.	Ext.	Total	Time
EEN-316N	**Microprocessor Lab**	**2**	**40**	**60**	**100**	**3 Hr**

LIST OF EXPERIMENTS:

1 To study the 8085-microprocessor kit.

2 Add two Binary numbers using 8085-Microprocessor kit.

3 Find 2's complement of a binary number using 8085-Microprocessor kit.

4 To arrange a series of numbers in descending order using 8085- Microprocessor kit.

5 Multiplication of two binary numbers using 8085-Microprocessor kit.

6 Divide a 16-bit number by 8-bit number and restore result in memory location 2700 using 8085-Microprocessor kit.

7 To find Square root of a 8- bit number using 8085-Microprocessor kit .

8 To find the largest number in a data array using 8085-Microprocessor kit.

9 To interface a D/A converter with the 8085-microprocessor kit.

10 To interface the stepper motor with the 8085-microprocessor kit.

Code	Nomenclature of Lab	P	Int.	Ext.	Total	Time
EEN-318N	**Power System Lab**	**2**	**40**	**60**	**100**	**3 Hr**

LIST OF EXPERIMENTS:

1. To find out the dielectric strength of transformer oil.
2. To find zero sequence component of three phase line.
3. To draw the characteristics of thermal overload relay.
4. To study an IDMT over current relay to obtain and plot its characteristic curves i.e. the graph between current and time.
5. To measure the ABCD parameters of a given transmission line.
6. To plot the power angle characteristics of given transmission lines.
7. To find the string efficiency of a string insulator with/without guard rings.
8. To study the characteristics of transmission line for t-network & pie- network.
9. To study and testing of a current transformer.
10. To study various types of distance relays.

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Code	Nomenclature of Lab	P	Int.	Ext.	Total	Time
EE-320N	**Electric Drives Lab**	**2**	**40**	**60**	**100**	**3 Hr**

LIST OF EXPERIMENTS-

1. Study of Industrial Applications of various mills.
2. Variable Torque Control of Induction Motor.
3. Breaking of DC Motor by using Mechanical & Electrical Methods.
4. Rotor resistance control of 3 phases Slip Ring Induction Motor.
5. Chopper Control of DC Motor.
6. Chopper Control of separately excited DC motor.
7. Study of different types of a loading on a particular load.
   (a) Intermediate Loading
   (b) Continuous Loading
8. Methods of starting Induction Motor.
9. Variable Voltage Control of Induction Motor.
10. Microprocessor Based Control of any Motor.
11. To study direct torque control of DC motor in MATLAB.

NOTE: Ten experiments are to be performed, out of which at least seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution.