SYLLABUS

For

B.TECH. PROGRAMME

In

ELECTRONICS & COMMUNICATION ENGINEERING

INSTITUTE OF TECHNOLOGY

UNIVERSITY OF KASHMIR

ZAKURA CAMPUS

SRINAGAR, J&K, 190006

Course No.	Subject	Teaching Periods			Credits
		Lect	Tut	Prac	
ECE5117B	**Digital Signal Processing**	3	1	0	4
ECE5217B	**Electrical Machines**	3	1	0	4
ECE5317B	**Digital Communication and Information Theory**	3	1	0	4
ECE5417B	**Microprocessors**	3	2	0	5
ECE 5517B	**Control Systems**	3	1	0	4
ECE5117BL	**DSP Lab**	0	0	2	1
ECE5217BL	**Electrical Machines Lab**	0	0	2	1
ECE5417BL	**Microprocessors Lab**	0	0	2	1
ECE 5517BL	**Control Systems Lab**	0	0	2	1
Total		15	6	8	25

Course No	Subject	Teaching Periods		Credits
		Lect	Tut	
ECE5117B	Digital Signal Processing	3	1	4

Section	Course Contents	Hours
1.	Introduction: Limitations of analog signal processing, Advantages of digital signal processing and its applications; Some elementary discrete time sequences and systems;	3
2.	Basic elements of digital signal processing such as convolution, correlation and auto correlation, Concepts of stability, causality, linearity, difference equations.	4
3.	Frequency Domain Representation of Discrete Time Signal and Systems: Complex exponentials as Eigen functions of LTI systems;	3
4.	Fourier Transform of sequences. Fourier Transform theorems and symmetry properties of Fourier Transform.	3
5.	Sampling of Continuous Time Signals: Sampling and aliasing problem, Reconstruction of a continuous time signal from its samples.	3
6.	Discrete Time Processing of Continuous time signals and vice-versa. Decimation & Interpolation; changing the sampling rate by integer and non-integer factors using discrete time processing.	3
7.	Z-Transform, Region of convergence.	1
8.	Properties of the Z-transform; convolution theorem; Parseval's relation.	4
9.	Unilateral Z-transform and its application to difference equations with non zero initial condition.	3
10.	Discrete Fourier Transform: DFT and its properties; Linear Periodic and Circular convolution	4
11.	Linear Filtering Methods based on DFT; Filtering of long data sequences	3
12.	Fast Fourier Transform algorithm using decimation in time and decimation frequency techniques; Linear filtering approaches to computation of DFT.	4
13.	Linear Phase FIR filters; Design methods for FIR filters; IIR filter design by Impulse Invariance, Bilinear Transformation, Matched Z-Transformation	4
14.	Frequency Transformation in the Analog and Digital Domain, Applications of DSP Processing	4
15.	Architecture of a Real time Signal Processing System, Digital Signal Processor Architecture, comparative study between a General Purpose Processor and Digital Signal Processor	3
16.	Evolution of Digital Signal Processors, Different types of Digital Signal Processors, Various practical DSP's.	3
TOTAL HOURS FOR THE COURSE		**52**

References

1. A textbook of DSP Techniques by Steven W. Smith
2. Digital Signal Processing using John. G. Proakis and Dimitry G. Manolakis.
3. Digital Signal Processors, B. Venkataramani & M. Bhaskar, Tata McGrawHill

Course No.	Subject	Teaching Periods		Credits
		Lect	Tut	
ECE5217B	Electrical Machines	3	1	4

Section	Course contents	Hours
1.	Transformers: Operating principle, classification, construction, emf equation, phasor diagrams, equivalent circuit model, losses & efficiency, voltage regulation, frequency response, polarity test	6
2.	autotransformers, three- phase transformer connections, impedance matching	4
3.	isolation & instrument transformers	3
4.	D.C. Machines: Operating principle, generator & motor action, construction, types of excitation, emf & torque equations, power stages & efficiency. Commutation & Armature Reaction,	6
5.	characteristics & application of d.c generators, starting & speed control of d.c motors,	4
6.	characteristics & applications of d.c motors,	3
7.	electric braking	1
8.	Induction Machines: Three-phase induction motors. Principle of operation, construction, types.	3
9.	Rotating magnetic field, emf equation of an AC Machine, torque developed in an induction motor, equivalent circuit model, torque-speed characteristics, starting & speed control	6
10.	Single phase induction motors, starting, application	3
11.	Synchronous Machines: Construction, types & operating principle of synchronous generator, A.C armature windings, equivalent circuit, phasor diagrams, voltage regulation, parallel operation, synchronization, Power Angle characteristics, effect of field excitation change	6
12.	Synchronous Motor, principle, starting, hunting, damper windings	3
13.	Special Purpose Motors: Stepper Motor, Universal Motor, Shaded-pole Motor.	4
TOTAL HOURS FOR THE COURSE		**52**

Books Recommended

1. Electric Machinery by Fitzgerald
2. Electric Machinery by Nagrath

Course No.	Subject	Teaching Periods		Credits
		Lect	Tut	
ECE5317B	Digital Communication and Information Theory	3	1	4

Section	Course contents	Hours
1.	Discrete messages, concept of amount of information and its properties.	2
2.	Average information, Entropy and its properties. Information rate, Mutual information and its properties	5
3.	Introduction to Source coding, Advantages, Shannon's theorem, Shanon-Fano coding, Huffman coding, efficiency calculations	3
4.	Channel capacity of discrete and analog Channels, capacity of a Gaussian channel, bandwidth–S/N trade-off.	3
5.	Introduction to LINEAR BLOCK CODES, Matrix description of Linear Block codes	3
6.	Error Detection and error correction capabilities of Linear block codes, Hamming codes, Binary cyclic codes	4
7.	Algebraic structure, encoding, syndrome calculation, BCH Codes.	3
8.	Introduction to CONVOLUTION CODES, encoding of convolution codes, time domain approach, transform domain approach.	4
9.	Graphical approach: state, tree and trellis diagram decoding using Viterbi algorithm.	3
10.	Elements of digital communication systems, advantages of digital communication systems, pulse modulation as a base to digital communication.	3
11.	Pulse Amplitude Modulation (PAM), PAM Modulator Circuit, Demodulation of PAM Signals	3
12.	Pulse Time Modulation(PTM); Pulse Width Modulation (PWM), Pulse Position Modulation (PPM), PWM and PPM Demodulators.	5
13.	Elements of PCM: Sampling, Quantization & Coding, Quantization error, Companding in PCM systems.	4
14.	Differential PCM systems(DPCM)	1
15.	Delta modulation, its drawbacks, adaptive delta modulation	2
16.	Comparison of PCM and DM systems, noise in PCM and DM systems.	2
TOTAL HOURS FOR THE COURSE		**50**

References

1. Principles of Communication Systems by Taub & Schelling.
2. Electronic Communication Systems by G. Kennedy.
3. Communication systems by S. Haykins.

Course No.	Subject	Teaching Periods		Credits
		Lect	Tut	
ECE5417B	**Microprocessors**	3	2	5

Section	Course contents	Hours
1.	Microcomputer Structure and Operations: Basic Microcomputer Elements	3
2.	Typical Microcomputer Structure	2
3.	CPU, Memory System	3
4.	Input Output	3
5.	Microprocessors and Memory: Typical 8, 16 and 32 bit Microprocessors	5
6.	8085 Microprocessor Specification	2
7.	Memory Technologies	2
8.	Assembly Language Programming I: Programming Model of 8085, Registers, Fetch, Execute Operation of CPU, Instruction Set	6
9.	Assembly Language Programming II: Addressing Modes, Basic Operations, Microprocessor Arithmetic, Program Flow Control Using Looping and Branching.	6
10.	Assembly Language Programming III: Stack, Subroutines, Interrupts, Resets	6
11.	Bus System: System Bus Structure, Bus Operations, Cycle by Cycle Operations, Timing and Control, Priority Management, Address Decoding.	6
12.	Microprocessors Interfacing: Interfacing concepts, Parallel Input Output, Memory Interfacing, Direct Memory Access, The Serial Subsystems, Peripheral Interface, Analog Converter Subsystem	6
TOTAL HOURS FOR THE COURSE		**50**

References

1. Microprocessor Architecture, Programming & Applications by Ramesh Goankar
2. Microprocessor & Applications by Leventhal.
3. Microprocessors by Mathur.

Course No.	Subject	Teaching Periods		Credits
		Lect	Tut	
ECE5517B	**Control Systems**	3	1	4

Section	Course contents	Hours
1	**Introduction to linear Control System:** Control Systems, types of control systems, feedback and its effects, mathematical modeling of physical systems	5
2	System Representations: Block diagrams, transfer functions, signal flow graphs.	5
3	Time Domain Analysis of Control Systems: Typical test signals for time response of control systems, time domain performance of first and second order control systems (steady state response and transient response),	6
4	P I D Controllers	4
5	Stability of Control Systems: Stability characteristic equation, state transition matrix, stability of linear time invariant systems, Rough-Hurwitz Criterion, Nyquist criterion, Root locus plot, Bode diagrams	6
6	Frequency Domain Analysis of Control Systems: Frequency domain characteristics second order systems relative stability	6
7	graphic methods of determining gain margin and phase margin, Nichols chart	5
8	Introduction to Modern Control Theory: State Equations, State Transition Matrix, State transition equations,	7
9	State Diagrams, concept of controllability and observability	6
TOTAL HOURS FOR THE COURSE		50

References

1. Modern Control Engineering by K. Ogatta
2. Automatic Control Systems by B. C. Kuo

Course No.	Subject	Teaching Periods	Credits
		P	
ECE5117BL	**DSP Lab**	2	1

List of Experiments

1. Familiarization with DSP processor TMS 320 C 6713.
2. Write a program to generate a sine/triangular/square wave.
3. Write a program to generate a sine/triangular/square wave of variable. amplitude and frequency.
4. Write a program to generate AM signal.
5. Write a program to generate an echo of an audio signal.
6. Write a program to perform convolution of two signals.
7. Write a program to perform DFT & IDFT of a signal.
8. Write a program to design a low pass audio digital filter.

Course No.	Subject	Teaching Periods	Credits
		P	
ECE5217BL	**Electrical Machines Lab**	2	1

Exp No	Particulars
1.	Familiarisation with Transformer, Auto Transformer, Dimmerstat, Servo Stabilizer.
2.	Studying the constructional aspects and nameplate of a single-phase two-winding transformer
3.	Polarity, Open circuit and short circuit tests on a single phase transformer.
4.	Determination of Voltage Regulation and Efficiency of a single-phase transformer.
5.	Three-phase transformer connections.
6.	Studying the constructional aspects and nameplates of DC machines
7.	Determination of open circuit characteristics (OCC) of a DC machine.
8.	Starting and speed control of a DC shunt motor.
9.	Studying the constructional aspects and nameplates of single and three-phase induction motors.
10.	Connection and starting of a three-phase induction motor (direct online (DOL) , star-delta starter)
11.	Testing of three-phase induction motors; circle diagram

Course No.	Subject	Teaching Periods	Credits
		P	
ECE5417BL	**Microprocessor Lab**	2	1

List of Experiments

1.
i) To develop a program to add two double byte numbers.
ii) To develop a subroutine to add two floating point quantities.
2.
i) To develop program to multiply two single byte unsigned numbers, giving a 16 bit product
ii) To develop subroutine which will multiply two positive floating point numbers.
3. To write program to evaluate P* Q*+R* & S are 8 bit binary numbers.
4. To write a program to divide a 4 byte number by another 4 byte number.
5. To write a program to divide an 8 bit number by another 8 bit number upto a fractional quotient of 16 bit.
6. Write a program for adding first N natural numbers and store the results in memory location X.
7. Write a program which decrements a hex number stored in register C. The Program should half when the program register reads zero.
8. Write a program to introduce a time delay of 100 ms using this program as a subroutine display numbers from 01H to OAH with the above calculated time delay between every two numbers.
9. N hex numbers are stored at consecutive memory locations starting from X. Find the largest number and store it at location Y.
10. Interface a display circuit with the microprocessor either directly with the bus or by using I/O ports. Write a programme by which the data stored in a RAM table is displayed.
11. To design and interface a circuit to read data from an A/D converter, using the 8255 A in the memory mapped I/O.
12. To design and interface a circuit to convert digital data into analog signal using the 8255A in the memory mapped I/O.
13. To interface a keyboard with the microprocessor using 8279 chip and transfer the output to the printer.
14. To design a circuit to interface a memory chip with microprocessor with given memory map.

Course No.	Subject	Teaching Periods	Credits
		P	
ECE5517BL	**Control Systems Lab**	2	1

List of Experiments

1. Study working of PID Trainer Kit for various controller configurations.
2. Use of Simulink for response study of inputs like:
   i. Step
   ii. Ramp

   for systems of various orders: with and without feedback.
3. Write a Matlab program to find
   a. Step response of a first order system
   b. Impulse response of first order system
4. Write a Matlab program to obtain impulse, step & ramp response of a second order system.
5. Write a Matlab program to find rise time, peak time, maximum overshoot & settling time of second order systems.
6. Write a Matlab program to find unit step response of second &higher order systems.
7. Write a Matlab program to plot root locus of second & higher order system & hence comment on stability.
8. Write a Matlab program to demonstrate effect of addition of poles & zeros to a transfer function.
9. Write a Matlab program to obtain Bode plot of transfer function. Find gain margin & hence comment on stability.
10. Write a Matlab program to determine Polar plot of a given transfer function.

Write a Matlab program to draw Nyquist plot of a second & high