NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION

SEMESTER: IV

S. No	BoS	Sub Code	Subject Name	Periods/ week			Examination Scheme					Total Marks	Credits L+(T+P)/ 2
				L	T	P	TA	FE	SE	T.C.A.	ESE		
1	Math	MA20411	Probability and stochastic process	3	1	-	20	15	15	50	70	120	4
2	ETC	ET20411	Analog communication	3	1	-	20	15	15	50	70	120	4
3	ETC	ET20412	Computer organization and architecture	3	1	-	20	15	15	50	70	120	4
4	ETC	ET20413	Electromagnetic waves and antennas	3	1	-	20	15	15	50	70	120	4
5	ETC	ET20414	Devices and circuits-II	3	1	-	20	15	15	50	70	120	4
6	ETC	ET20415	Microprocessors (8085/86)	4	1	-	20	15	15	50	70	120	5
7	ETC	ET20421	Communication system-I lab	-	-	3	30	-	-	30	20	50	2
8	ETC	ET20422	Devices and circuits-II lab	-	-	3	30	-	-	30	20	50	2
9	ETC	ET20423	Microprocessors (8085/86) lab	-	-	3	30	-	-	30	20	50	2
10	EN		Personality Development	-	-	2	25	-	-	25	0	25	1
11			Discipline	-	-	-	25	-	-	25	0	25	1
			Total	19	6	11	260	90	90	440	480	920	33

NATIONAL INSTITUTE OF TECHNOLOGY, RAIPUR
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Semester: 4 **Code: MA20411**
Subject: Probability and Stochastic Process
Credits: 4
Total Theory Periods: 30 **Total Tutorial Periods: 10**

UNIT I
Introduction to Probability and random variables:Definitions, scope and history; limitation of classical and relative-frequency-base definitions , Sets, fields, sample space and events; axiomatic definition of probability. Combinatorics: Probability on finite sample spaces. Joint and conditional probabilities, independence, total probability; Bayes' rule and applications. The random variable concept, Distribution function, Density function, The Gaussian random variable, Other distribution and density examples, Conditional distribution and density functions.

UNIT II
Operation on One Random Variable – Expectation & Multiple Random Variables
Expectation, Moments, Functions that give Moments, Transformations of a random variable, Computer generation of one random variable**.** Vector random variables, Joint distribution and its properties, Joint density and its properties, Conditional distribution and density, Statistical independence, Distribution and density of a sum of random variables, Central limit theorem.

UNIT III
Random Processes-The random process concept, Stationarity and independence, Correlation functions, Measurement of correlation functions, Gaussian random processes, Poisson random process, Complex random processes

UNIT IV
Spectral Characteristics of Random Processes-Power density spectrum and its properties, Relationship between power spectrum and autocorrelation function, Cross-Power density spectrum and its properties, Relationship between cross-power spectrum and cross-correlationfunction, Some noise definitions and other topics, power spectrum of complex processes.

UNIT V
Queueing Theory Introduction markov sequences Queueing Systems ,Birth-Death Process The M/M/1 Queueing System The M/M/s Queueing System The M/M/1/K Queueing System The M/M/s/K Queueing System

Text books:

1. Theory and Problems of Probability, Random Variables, and Random Processes schaum series. Hwei P. Hsu, TMH.
2. Probability random variables and random signals principles, Peebles, PHI.

NATIONAL INSTITUTE OF TECHNOLOGY, RAIPUR
DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION

Semester: 4 **Code: ET20411**
Subject: Analog Communication
Credits: 4
Total Theory Periods: 30 **Total Tutorial Periods: 10**

UNIT I
Amplitude modulation , DSB,SSB, (with and without carrier), VSB, frequency translation, mixing, QAM. mathematical analysis, modulation and demodulation techniques.

UNIT II
Angle modulation ,instantaneous frequency, phase and frequency modulation, Fourier spectra, NBFM, WBFM, phasor representation ,tone modulation bandwidth estimation, demodulation methods.

UNIT III
Noise, physical noise sources, shot, thermal etc ,available power, frequency dependence, characterization of noise in systems, noise figure, noise tempareture, cascaded systems, equivalent noise bandwidth, quadrature component narrowband noise, envelope phase representation, psd, white noise.

UNIT IV
Noise in analog communication, additive noise, signal to noise ratio, AWGN, Noise in baseband communication systems, amplitude and angle modulation, Pre-emphasis and de-emphasis.

UNIT V
AM generation ring bridge modulator SSB generation filter, phase, weavers Method of FM generation variable reactance ,VCO super heterodyne receiver Frequency discriminator method, PLL for fm demodulation, PLL for am carrier acquisition, zero crossing detector for FM.

TEXT BOOKS:
1. Principle of Communication –Ziener Tranter, JWS
2. Communication System- A.B. Carlson, TMH

REFERENCE BOOKS:
1. Modern Analog and Digital Communication –B.P. Lathi, Oxford
2. Principle of Communication – Taub & schilling, TMH

NATIONAL INSTITUTE OF TECHNOLOGY, RAIPUR
DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION

Semester: IV **Code: ET20412**
Subject: Computer Organization and Architecture
Credits: 4
Total Theory Periods: 30 **Total Tutorial Periods: 10**

UNIT I
Introduction to Processor Architecture – Design Methodology- System Representation – Gate level – Register level – Processor level – CPU Organization – Data Representation – Basic Formats – Fixed Point Numbers – Floating Point Numbers – Instruction Sets – Instruction Formats – Instruction Types – Programming Considerations.

UNIT II
Datapath Design – Fixed Point Arithmetic – Addition and Substraction – Multiplication – Division – Arithmetic Logic Units – Combinational ALUs – Sequential ALUs – Floating Point Arithmetic – Pipeline Processing – Control Design : Basic Concepts – Introduction – Hardwired Control – Design Examples – Microprogrammed Control – Basic Concepts – Multiplier Control Unit – CPU Control Unit – Pipeline Control – Instruction Pipelines – Pipeline Performance – Superscalar Processing

UNIT III
Memory Organisation – Memory Hierarchy – Main memory – RAM and ROM chips – Memory Address Map – Memory Connection to CPU – Auxiliary Memory – Magnetic disks – Magnetic Tape – Associative Memory – Hardware Organization - Read Operation – Write Operation – Cache Memory : Associative Mapping – Direct Mapping – Set Associative Mapping –Virtual Memory – Address Space and Memory Space – Address Mapping Using Pages – Associative Memory Page Table – Page Replacement – Memory Management Hardware – Segmented Page Mapping

UNIT IV
System Organization – Communication Methods – Basic Concepts – Bus Control – I/O and System Control – I/O Organization – Isolated Versus Memory Mapped I/O - Programmed I/O – DMA and Interrupts – I/O Processors – Operating Systems – Parallel Processing – Processor Level Parallelism – Multiprocessors – Fault Tolerance.

Text Books:

1. Computer Architecture and Organization, John P Hayes, McGraw-Hill International Editions, Computer Science Series.
2. Computer System Architecture, Morris Mano, Prentice-Hall India, Eastern Economy Edition.

Reference Books:

1. Computer Organization, Carl Hamacher, Zvonko Vranesic & Safwat Zaky, Mc Graw Hill.
2. Computer Organization and Design, Pal Choudhuri P., Prentice-Hall India
3. Computer Organization and Design, Patterson D.A. & Hennessy J.L., Morgan Kaufmann Publishers
4. Computer Organization and Architecture, William Stallings, Pearson Education.

NATIONAL INSTITUTE OF TECHNOLOGY, RAIPUR
DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION

Semester: 4 **Code:ET20413**
Subject: Electromagnetic Waves and Antennas
Credits:4
Total Theory Periods: 30 **Total Tutorial Periods: 10**

UNIT I
Introduction: Review of electromagnetic fields, Gradient, divergence and curl, their physical interpretation, divergence and stroke's theorems, linear, homogenous and isotropic media. Electrostatic Field**:** Coulomb's law, Gauss's law and it's applications ,Poisson's equations. Magnetic Field: Ampere's law magnetic vector potential magnetic flux and it's calculation for different current distribution ,boundary conditions. Electromagnetic Induction: Electromotive force ,Lenz's law ,Faraday's law, Energy stored in magnetic field.

UNIT II
Fields and waves: Displacement Current: Maxwell's Equations: Circuit Theory as Quasi-static Approximation: Poynting's theorem and Flow of power. Plane wave: Solution of Wave Equation for Loss less and lossy media; Phase Velocity, Dispersion: *Group* Velocity, Complex Propagation Constant, Intrinsic Impendence, Normal and Oblique Incidence of Plane Wave on a Perfect Conductor and polarization: Linear, Circular and elliptical.

UNIT III
Transmission lines: Complex Propagation constants, loss less transmission lines, distortion and distortion less condition, characteristics impedance, Reflection Coefficient, standing Wave Ratio, Transmission line parameters, Line Calculation for matched and General Terminations, Impedance Transformation buy quarter Wave line ,Stub Matching.

UNIT IV
Wave Propagation- Electromagnetic or radio waves, modes of propagation, structure of atmosphere, characteristics of different ionized regions, sky wave propagation, definition: virtual height, maximum usable frequency, lowest usable frequency, skip distance, ionospheric absorption, multi hop propagation, space wave propagation, duct propagation.

UNIT V
Antennas and Radiation: Isotropic Radiator and Radiation Pattern; Radiation Intensity: Antenna Gain: Reciprocity Theorem and its Application: Effective Length; Antenna Top Loading and Tuning: Effect of Earth: Antenna Efficiency: Bandwidth: Effective Aperture of short Dipole and Half –wave Dipole: polarization Antenna Arrays and their Design: Broadside and End fired Array: collinear Array: Array of point sources: Nonisotropic Dolph. Tchebycheff Array, Practical Antennas – Resonant and Non-resonant Antenna; Rhombic Antenna & Loop Antenna.

Text Books:

1. Engineering Electromagnetism, Hayt, 7th Ed., TMH
2. Electromagnetic Fields – Jordan & Ballman, PHI.

NATIONAL INSTITUTE OF TECHNOLOGY, RAIPUR
DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION

Semester: 4 **Code:ET20414**
Subject: Device and Circuits-II
Credits: 4
Total Theory Periods: 30 **Total Tutorial Periods: 10**

UNIT I
HIGH FREQUENCY TRANSISTOR AMPLIFIERS: CE hybrid π- model: Validity and parameter Variation: Current Gain with Resistive load: frequency response of a single stage CE Amplifier: Gain-Bandwidth product: CC stage High frequencies: Multistage Amplifiers: sources of Noise in Transistor Circuits; Noise Figure.

UNIT II
MULTISTAGE AMPLIFIERS: Classification: Distortion in Ampli1iers: Frequency Response: Bode plots: Step Response: pass band of Cascaded Stages: Response of a Two-stage RC Coupled Amplifier at Low and high frequencies: Multistage amplifiers: Sources of Noise in Transistor Circuits: Noise Figure.

UNIT III
LARGE SIGNAL AMPLIFIER-Classification , large signal amplifier characterstics, class A amplifiers: class A amplifier with direct-coupled resistive load , transformer-coupled class A amplifier, class A push-pull amplifiers, class B amplifiers- transformer-coupled push-pull class B amplifier, complementary-symmetry push-pull class B amplifier, class AB amplifier, class C amplifier, class D amplifiers.

UNIT IV
FEEDBACK AMPLIFIERS: Classification: Feedback concept; Ideal Feedback amplifier: Properties of Negative Feedback Amplifier Topologies: Method of Analysis of Feedback amplifiers: Voltage series Feedback: Voltage series Feedback pair: Current series, Current shunt and Voltage shunt feedback; Effect of feedback on amplifier Bandwidth and stability.

UNIT V
OSCILLATOR: Sinusoidal oscillator: phase shift oscillators, Wien Bridge oscillator: Resonant circuit oscillators: LC Collpit & LC Hartley, Amplitude Frequency and phase stability analysis of all Oscillators,General form of Oscillator Configuration; Crystal oscillator.

Text Books:

1. Microelectronics Circuits- Sedra/Smith , Oxford University press.
2. Microelectronics – Millman and Grabel, TMH.

Reference books:

1. Integrated Electronics – Millman & Halkias, TMH
2. Art of Electronics, Cambridge University Press

NATIONAL INSTITUTE OF TECHNOLOGY, RAIPUR
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Semester: IV **Code:ET20415**
Subject: Microprocessor (8085/8086)
Credits: 5
Total Theory Periods: 48 **Total Tutorial Periods: 12**

UNIT I
Review of logic design using MSI/LSI chips such as De-multiplexers/Decoders, Multiplexers, Priority encoders, Registers, Counters, Buffers, Latches. Introduction to functions performed by microprocessor, R/W and ROM memory models, Memory map and addresses, I/O devices, I/O Addressing. The 8085 programming model, Instruction classification, Instruction and data formats, Addressing modes, Data transfer operations, Arithmetic operations, Logic operations, Branch operations, Writing Assembly Language programs, Hand assembly of a program 8085 Microprocessor architecture, Logic pin-out, machine cycles and bus timings

UNIT II
Memory interfacing, Absolute, Partial decoding, Multiple Address range, Interfacing memory with wait states, Interfacing I/O devices, Peripheral I/O, Memory mapped I/O, 8085 single-board microcomputer system. Interfacing of 8085 with 8155/8156 (RAM), 8355/8755 (ROM). Programming techniques with additional instructions, Looping, counting and indexing, Data transfer from/to memory to/from microprocessor, 16-bit arithmetic instructions, Logic operations like rotate, compare, Time delays, Counters, Stack, Subroutine, Call and return instructions. Interrupts, The 8085 interrupt process, multiple interrupt and priorities, vectored interrupts, Restart as software instruction.

UNIT III
Programmable Interfacing devices, Basic concept, 8279 programmable Keyboard/Display interface, 8255A programmable Parallel interface, Interfacing keyboard and display using 8255A, 8254 programmable Interval Timer, 8259A programmable Interrupt Controller, Direct Memory Access (DMA), 8237 DMA Controller. Serial I/O and Data communication, Basic concept in serial I/O, Data communication over telephone lines, Standards in serial I/Os, The 8085-serial I/O lines, 8251A programmable communication interface Microprocessor Applications, Interfacing scanned multiplexed displays and Liquid Crystal Displays, Interfacing a matrix keyboard.

UNIT IV
Architecture and pin configuration of 8086, Instruction Format; Addressing modes Basic 8086 system bus architecture, Minimum mode Configuration, Maximum mode configuration; memory interfacing with 8086 in minimum and maximum mode; System Bus Timings, Bus Standards. Interrupts of microprocessor 8086

UNIT V
Instruction set of 8086 and programming examples, Data Transfer Instruction; Arithmetic Instructions; Branching and Looping Instructions, NOP and Halt, Flag Manipulation Instructions; Logical, Shift and Rotate Instruction. Byte and String Manipulation: String Instructions; REP Prefix, Table Translation, Number Format conversions. Assembler Directives and Operators; Assembly Process; Translation of assembler Instructions. Programming of microprocessor 8086.

Text Books:

1. Microprocessor Architecture, Programming and Application by R. S. Gaonkar, Wiley Eastern.
2. Advance Microprocessor and Peripherals (Architecture, Programming & Interfacing) by A. K. Roy & K. M. Bhurchandi – TMH

Reference Books:

1. The Intel Microprocessor – (Architecture, Programming & Interfacing) by Barry B. Bery.
2. Microprocessors and Programmed Logic (2nd Edition), Pearson Education by Kenneth L. Short
3. Microcomputer Systems: The 8086/8088 Family, Yu-Cheng Lieu & Glenn A. Gibson, Prentice Hall India.
4. Microprocessors & Interfacing: Programming & Hardware, Douglas V. Hall, Tata McGraw Hill.

Semester: 4 **Code: ET20421**
Subject: Analog Communication Laboratory
Credits: 2

Lab assignments based on ET20411 Analog Communication.

Semester: 4 **Code: ET20422**
Subject: Devices and Circuits-II Laboratory
Credits: 2

Lab assignments based on ET20414 using trainer kits and Multisim/Orcad. Practical PCB design and fabrication in workshop.

Semester: 4 **Code: ET20423**
Subject: Microprocessor (8085/86) Laboratory
Credits: 2

Lab assignments based on ET20415.