UNIVERISITY OF MUMBAI

SCHEME OF INSTRUCTIONS & EXAMINATION

BE (ELECTRONICS ENGINEERING)

Semester-VI

Sr. No.	Subjects	No. of Periods per Week			Duration of Theory Paper(Hrs)	Marks				
		Lectures	Practicals	Tutorials		Theory Paper	Term Work	Practical	Oral	Total
1.	Microwave and Fiber optic Communication	4	2	-		100	25	-	25	150
2.	Analog Integrated Circuits and Applications	4	3	-	3	100	25	-	25	150
3.	Communication Systems	3	3	-	3	100	25	-	25	150
4.	Discrete Time Signal Processing	3	2	-	3	100	25	-	25	150
5.	Computer Organisation	3	2	-	3	100	25	-	25	150
6.	## Industrial Economic & Management	3	-	-	3	100	-	-	-	100
Total		20	12	-	-	600	125	-	125	850

* Subject common with Engineering branch.

Subject common with Instrumentation and Electrical and Electronics & Telecommunication Engineering branches.

T.E.(ELECTRONICS) SEMISTER VI

Microwave and Fiber optic Communication

Syllabus

1 Introduction to microwave communication :

Microwave frequencies,Microwave devices and system,Microwave applications.

2 Microwave waveguide and cavities :

Phase velocity and group velocity in waveguide,TE and TM modes in rectangular waveguides,circular waveguides,rectangular cavity resonator,circular cavity resonator,Q-factor of cavity resonator.

3 Microwave vaccume tube devices:

Limitations of conventional vaccume tubes,Two cavity Klystron amplifier,reflex Klystron-Operation ,mathematical analysis,performance and applications,Cylindrical magnetron,Helix TWT-operation, performance and applications.

4 Microwave Components:

S parameters,properties of S parameters Attenuators,Tees,Directional couplers,circulaters,Isolaters-principle of working,S-matrix represation.

5 Microwave solid state devices:

Diode dectors,Diode mixer,Gunn diode, IMPATT and TRAPATT diodes,parametric amplifier.

6 **Microwave measurement:** Power,Frequency, VSWR.

7 Introduction to optical fiber communication:

Communication system application in the electromagnetic spectrum,Elements of optical fiber transmission link,Advantages optical fiber communication.

8 Optical fiber waveguide:

Fiber types,Ray theory transmission,mode theory for circular waveguide, TE, TM and hybrid modes,single and multimode fibers,Fiber materials,Fiber fabrication,attenuation in optical fiber,Dispersion,Measurment of attenuation and Dispersion.

9 Optical Devices:

LED and Laser Diodes-working principles,structures,characters,modulation.PIN and APD-working principle,characterstics. Couplers,Splices,Connectors.

10 Optical fiber system:

Anolog system, Digital system,Multiplexing,Link power budget,Rise time budget.

T.E.(ELECTRONICS) SEMESTER VI

Analog Integrated Circuits And Applications

Lectures:4 hours/week	Theory Paper:3 hours and 100 marks
Practicals:3 hours/week	Termwork:25 marks,Oral:25 marks

Operational Amplifier Fundamentals

Basic Op Amp Configurations ,Ideal Op Amp Circuits Analysis,Negative Feedback, Feedback in Op Amp Circuits,Loop Gain,Op Amp powering

Circuits With Resistive Feedback

Current to voltage converter,voltage to current converters, current amplifiers ,difference amplifiers instrumentation amplifier, instrumentation applications,transducer bridge amplifiers

Active Filter

The transfer function,first order active filter,audio filter applications,standard second order responses ,KRC filters,multiple feedback filters,state variable and biquad filters,sensitivity,filter approximations,cascade design,genralised impedance converters,direct design,switched capacitor filters

Static Op Amp limitations

Simplified op amp circuit diagram,input bias and offset currents,low input bias current op amps,input offset voltage,low input offset voltage op amps,input offset error compensation,maximum ratings

Dynamic Op Amp limitations

Open loop response ,closed loop response ,input and output impedance,transient response,effect of finite GBP on integrator, effect of finite GBP on filters,current feedback amplifiers

Noise

Noise properties ,noise dynamics,sources of noise,op amp noise,noise in photo diode amplifiers,low noise op amps

Stability

The stability problem,stability constant-GBP op amps circuits,internal frequency compensation,Stability inCFA circuits, Composite amplifiers.

Nonlinear Circuits

Voltage comparator, comparator applications,Schmitt triggers,precision rectifier,analog switches peak detectors,sample and hold amplifiers.

Waveform Generators

Sine wave generators using Op-amps, multivibrators using Op-amps, monolithic timer-NE555,triangular wave generator using Op-amps, saw tooth wave generator using op-amps, monolithic waveform generator-ICL8038 V-F & F-V converters.

Voltage References & Regulators
Performance specifications, voltage references, voltage reference applications, linear regulators, linear regulator applications, watching regulators, monolithic switching regulators.

D-A & A-D converters
Sample & hold circuits, D-A conversion techniques, multiplying DAC applications, A-D conversion techniques performance specifications, over sampling converters.

Nonlinear Amplifiers & Phase-Locked Loops
Log/Antilog amplifiers analog multipliers operational trans conductance amplifiers, phase locked loops monolithic PLLs.

Operational Amplifier Circuit Design
Introduction, differential amplifier, current mirror output stage, general op-amp circuit op-amp, small signal analysis, frequency response.
Design, detailed circuit description & working of

Text Books.
1. Sergio France,Design with operational amp.& analog integrated circuit,Third edition,McGraw Hill International edition,2002.
2. James M.Fiore,Op Amps and Linear Integrated circuit,First reprint,Thomson Asia Pte. Ltd.,2001.
3. Robert Coughlin & F Driscoll,Op.Amp.& Linear Integrated circuits,sixth edition,pearson education Asia,2001

Additional Reading.
Donald A.Neamen,Electronic circuit Analysis & Design,Second edition McGraw Hill International edition 2001

T.E.(ELECTRONICS)
Semester –VI

Sub: Communication Systems

Lectures: 3p/week	TheoryPaper: 3 Hrs 100 marks
Practical: 3 Hrs/week	Term work: 25 marks Oral: 25 marks

1. Antennas: The half wave dipole, antenna characteristics, ground effects, effects of antenna height, antenna coupling, antenna array, special purpose antenna, UHF and microwave antenna.

2. Television Principles: Television system and standards, the composite video signal, blanking and synchronizing pulses, monochrome television and reception, horizontal and vertical deflection circuits, synchronizing circuits, color transmission color reception cable TV, digital TV, HDTV.

3. Satellite communication: Kpler's law, satellite orbits, spacing and frequency allocation, look angles, orbital perturbation and correction, satellite launching, spacecraft subsystems, satellite system link models, link equations, multiple access, direct broadcast satellite services, applications of LEO, MEO and Geo-stationary satellites.

4. Radar Systems: basic principles, radar performance factors, MTI and pulse Doppler radar, continuous wave Doppler radar, radar antenna, phased array radars.

Text Books-

1. Wayne tomasi-Electronic Communication Systems, Pearson education, IV Edition, 2001
2. Kennedy, Davis-Electronics Communication Systems, Tata McGraw-Hill, Fourth edition.
3. Roy Blake- Electronic Communication Systems, Thomson Learning, second edition , 2002.
3. Gulati- Monochrome and Color Television, New Age International (p) Limited,1983

Additional Reading :-

1. Pratt, Bostian- Satellite Communication, John Wiley and Sons, 1986
2. Dennis Reddy – Satellite Communications, McGraw-Hill, third edition, 2001
3. Skolnik- Introduction to Radar Systems, McGraw-Hill, third edition, 2001
4. Gulati- Color Television Principles and practice, New Age International(p) Ltd.1988
5. Jordon, Barman-Electromagnetic waves and Radar systems, PHI, second edition, 1988.

Term Work :-

The term work shall consist of at lest four experiments and four assignments duly recorded and graded which shall carry a weightage of fifteen marks. A test shall be conducted and will carry a weightage of ten marks.

T.E.(ELECTRONICS) SEMESTER VI

Discrete Time Signal Processing

Lectures : 3 hours/week		Theory Paper :	3 hours & 100 marks
Practicals : 2 hours/week		Termwork :	25 marks,Oral:25marks

1.Discrete Time (DT)Signals And Systems

- .Signal Classification Manipulations
- .Signal Periodicity in DT domain
- Concept of system system classification
- System representation as a difference equation
- .Impulse response
- .Finite impulse response (FIR) & Infinite Impulse Response(IIR) systems.
- Convolution
- BIBO stability

2. Z Transform

- Two-sided Z Transform and Region of Convergence (ROC)
- Proporties of Z Transform
- Relationship with Lapace Transform & mapping
- One-sided Z Transform
- Inverse Z Transform

3. Time Domain Analysis of DT System

- System Transfer function, System realizations using direct, cascade, parallel & Lattice forms
- System Analysis : Impulse response , zero input & zero state response
- Signal generation

4. Frequency Domain Analysis of DT Systems

- System Transfer function and pole-zero representation
- Frequency Domain analysis using Analytical & graphical techniques
- System classification based on pass-band as Low pass, High pass , All pass , Band pass & Band reject
- System classification based on phase response as Minimum phase , maximum phase mixed phase or linear phase systems
- Stability Analysis

5. DT Signal Analysis & Computation of Spectra

- DTFS defination froms orthogonal complex exponentials
- CTFS & DTFS and Proporties of DTFS
- Power Density spectrum
- DTFT and Proporties of DTFT
- Energy Density spectrum
- Relationship between DTFT & Z transformation

6. Discrete Fourier Transform (DFT)

- DTFT , DFT, and DFT proporties

- Block convolution using DFT by Overlap-add & Overlap-save methods
- Fast Fourier Transformm(FFT)
- Cooley- Tulkey Algoriths
- Prime Factor Algoriths
- Quantization effects in Fixed-point FFT algorithms
- DFT analysis of Sinusoidal signals

7. DSP Processors

- Need for Special architecture
- Difference between DSP processor & microprocessor
- A general DSP processor

Text Books

1. Ashok Ambardar, Analog and Digital Signal Processing, Thomson Learning Publication, second edtion,first reprint,2001

2. Oppenheim & Schafer with Buck, Discrete – Time Signal Processing, Prentice Hall Signal processing series, second edition,2000

3. S.K. Mitra, Digital Signal Processing,Tata McGraw-Hill Publication

Additional Reading

ss 1. T. J. Cavicchi, DigitalSignal Processing, Wiley Publication, 2002

Termwork :

The Termwork shall consist of at least six programs and at least four comprehensive assignments covering the whole syllabus, duly recorded and graded. This will carry a weightage of fifteen marks.A test shall be conducted and will carry a weightage of ten marks.s

TE (ELECTRONICS) SEMESTER VI
Computer Organization

Lectures: 3 hours/week — Theory Paper: 3 hours and 100 marks
Practicals: 2 hours/week — Termwork : 25 marks, Oral : 25 marks

Rational:
Subject of Computer Organization shall lay a strong fundamental base in understanding the functional and sign aspects of various units of digital computer. The emphasis shall be on understanding of Hardware issues in computer design while addressing a number of software issues related to instruction execution, storage allocation.

Performance measure- Definition, throughput and Response time, Measuring performance (MIPs, PLOPS etc.)

Preliminaries- Computer Arithmetic- Number representation and Arithmetic, Floating-point representation, Multiplication and Division algorithms and circuits. Operation on Data structures like Arrays, Lists, Stacks, and Queues.

Instruction types and sequencing, addressing moes with case study for Pentium Processor.

Input/Output Organization- I/O devices types and access methods, interrupts, DMA, I/O processors, types of busses and bus arbitration, various bus standards, I/O interface-serial and parallel ports.

Basic Processing Unit-The data path and components of ?Instruction Execution, Bus Organization, Hardwired control, Micro-programmed control, exceptions and their handling. Performance Enhancement using pipelining-Pipelining Introduction, Instruction set, Hazards, case study.

Memory organization – RAM organization SRAM and DRAM, ROM and Flash memory, addressing, Cache-mapping, handling cache miss, multi level caches, Virtual memory-Concept, address translation, paging, TLB, segmentation.

Peripherals-
Storage Devices – Organization, Access techniques, input and Output devices – Organization, Access techniques, Network devices – modems, serial communication links.

Multiprocessor systems- (Introduction only) Connection techniques, Cache issues.

Text Books
Hamacher, Vranesic, Zaky, Computer Organization, Fifth Edition, Tata McGraw-Hill, 2002