Microprocessors

T.E. Sem. V [BIOM]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical & Oral Exam	2 Hrs.	25
Oral Exam	–	–
Term Work	–	25

SYLLABUS

1. **8085 Microprocessor**
   Basic 8085 Microprocessor architecture and its functional blocks, 8085 microprocessor IC pin outs and signals, address data and control buses. Clock signals, instruction cycles, machine cycles, and timing states, instruction timing diagram (e.g. MOV, MVI, LDA,LDAX,XCHG, WAIT, HALT)

2. **Intel 8086/8088 Microprocessor Family**
   Architecture and organization of 8086/8088 microprocessor family. Study of its Instruction set. Assembly language programming, Introduction to mixed language programming using Assembly language. 8086 interrupt structure. 8086 family minimum and maximum mode operation. Study of 8288 bus controller. Timing diagram for 8086 family in maximum and minimum mode.

3. **Memory snd I/O Design**
   Memory system design for 8086 family including interface of dynamic Read/ write memory. Considerations for memory interfacing. Connection of I/O Controllers 8255AH programmable peripheral Interface, Programmable Interrupt Controller 8259A, UART 8250, programmable D.M.A. Controller 8237.

4. **8087 Math Co-processor**
   Study of architecture of 8087 floating point co- processor. Data types supported by 8087. Host and co-processor interface, Assembly language Programming for 8086 - 8087 based systems.

5. **Introduction to Multiprocessor Systems**
   Multiprocessor configurations. Study of the 8289 bus arbiter. Design of 8086 based multiprocessor systems (without timing considerations).

Reference :

1. Microprocessor Architecture, Programming and Applications with 8085 (*Gaonkar*) John Wiley Eastern Ltd. Publication.
2. 8086/8088 Design Programming and Interfacing (*John Uffenback*) Prentice Hall of India, 2001 (2nd Edition).
3. Microprocessors Interfacing and Programming (*Douglas Hall*) Tata McGraw Hill (3rd Edition).
4. The 80X86 Family Design, Programming and Interfacing (*John Uffenback*) (3rd Edition).
5. Intel Corporation, Pearson Education, 2002.
6. Data Manuals of Microprocessors.

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Principles of Analog and Digital Communications

T.E. Sem. V [BIOM]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical & Oral Exam	–	–
Oral Exam	–	25
Term Work	–	25

SYLLABUS

1. **Introduction to Communication Systems**
   Elements of communication system, Types of electronic communication system, Noise, Signal to Noise ratio, Noise factor, Noise figure, Noise Temperature.

2. **Amplitude Modulation**
   Mathematical analysis of AM wave, Different types of AM (DSBFC, DSBSC, SSB, ISB with and without pilot carrier), Modulator Circuits, Spectrum, Bandwidth, Waveforms, Low level and high level transmitter.

3. **AM Receivers**
   Receiver Parameters – Sensitivity, selectivity, fidelity, image frequency and its rejection, double spotting, dynamic range.
   TRF receiver, Super heterodyne receiver, Double conversion receiver.
   AM detectors – Simple and Practical Diode detector.
   Principles and types of tracking, Principles and types of AGC.
   Demodulation of DSBSC and SSB waves.

4. **FM Transmission and Reception**
   Principles of FM, waveforms, spectrum, bandwidth, FM generation – Direct FM and Indirect FM, Principle of AFC, Pre–emphasis and De–emphasis and De–emphasis in FM, Effect of noise in FM, Noise triangle.
   FM Demodulation – Simple slope detector, balanced slope detector, Foster Seely Discriminator, Ratio detector, Quadrature detector, Block diagram of FM receiver, Capture effect in FM receivers, Comparison of AM and FM systems.

5. **Analog Pulse Modulation Techniques**
   Sampling theorem for low pass signals and Band pass signals, Proof of sampling theorems, Concept of Aliasing, PAM, PWM, PPM – Generation, detection, advantages, disadvantages, comparison.

6. **Digital Pulse Modulation Techniques**
   Advantages and disadvantages of Digital Transmission, PCM – Transmitter, Receiver, Quantization, Companding, DPCM, DM, ADM – Transmitter, Receiver, Advantages, Disadvantages.

7. **Digital Transmission**
   Types of Digital transmission methods – ASK, FSK, PSK, Generation, Detection, Advantages, Disadvantages, Comparison.

8. **Multiplexing Techniques**
   Concept of multiplexing and multiple access, FDM, TDM – Transmitter, Receiver, Hierarchy, Applications, Advantages, Disadvantages. PCM – TDM system, FDMA, TDMA, CDMA.

Reference :

1. Electronic Communication Systems (*Wayne Tomasi*) Pearson Education.
2. Electronic Communication Systems (*Roy Blake*) Thomson Learning.
3. Electronic Communication Systems (*Kennedy and Davis*) TMH.
4. Digital and Analog Communications (*Leon W. Couch*) Pearson Education.
5. Principle of Communication Systems (*Taub and Schilling*) TMH.

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Biomedical Instrumentation – I

T.E. Sem. V [BIOM]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical & Oral Exam	–	–
Oral Exam	–	25
Term Work	–	25

SYLLABUS

1. **Introduction to Communication Systems**
   Basic principle, technical specification, working and applications of Analytical and Laboratory Instruments.
   - Spectrophotometer
   - Colorimeter
   - pH meter
   - Cell and Plasma Separator
   - Centrifuge
   - Electrolyte Analyser
   - Blood cell counter
   - Electrophoresis
   - Chromatography and mass spectroscopy
   - Autoanalyser
   - Microscopes
   - ELISA reader and WASH

2. **Blood Gas Analyser**
   Measurements of Blood pH, pCO_2 pO_2 and complete Blood Gas analyser.

3. **Blood Flow Measurement**
   Electromagnetic, Ultrasonic, NMR, and Laser Doppler flow metry, cardiac output measurement, impedance plethysmography.

4. **Pulmonary Function Analyser and Ventilator**
   Respiration measurement technique, Lung volume and capacities, Spirometry, Pulmonary function measurement and analyzer, spirometer and respiratory function analyzer.
   Oximetry, Ventilators Respirator Therapy Equipment and Anesthesia Equipment

5. **Heart Lung Machine**

6. **Audiometers**
   Basic audiometer, Pure tone and Speech audiometer, evoked response Audiometry.

Reference :

1. Handbook of Biomedical Engineering (*R.S. Khandpur*) TMH Pub.
2. Handbook of Analytical Instruments (*R.S. Khandpur*) TMH Pub.
3. Medical Instrumentation, Application and Design (*J.G. Webster*).
4. Medical Electronics (*A.G. Patil, R.K. Jha, R. Hariharan*) Excel Books, New Delhi.
5. Encyclopedia of Medical Devices and Instrumentation (*J.G. Webster)* Vol.1,2,3,4; John Willey.
6. Introduction to Biomedical Equipment Technology (*Carr-Brown*) Pearson Education.
7. Introduction to Biomedical Engineering (*Joseph Bronzion*) CRC Press.

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Design of Analog Circuits

T.E. Sem. V [BIOM]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical & Oral Exam	2 Hrs.	25
Oral Exam	–	–
Term Work	–	25

SYLLABUS

1. **Static and Dynamic Op-amp Limitations**
   Simplified Op–amp circuit diagram, Input bias and Offset current, Low input offset op–amps, Input offset voltage, Low input offset voltage op–amps, Input offset error compensation, maximum ratings, Circuits to measure opamp parameters as above, Open loop response, Closed loop response, Input and output impedances, Transient response, Effect of finite GBP (on integrator circuit, filter circuit), current feedback amplifiers.

2. **Noise and Stability**
   Noise properties, Noise dynamics, Sources of noise, Op amp noise, noise in photodiode amplifiers, Low noise op amplifiers, Noise reduction techniques. The stability problems, Stability in constant GBP in on op amp circuit, Internal frequency compensation, External frequency compensation, Stability in CFA (Current Feedback Amplifiers) circuits.

3. **Specialized Op-amp Applications**
   Negative impedance converter, opamp with offset, instrumentation amplifiers and INA 101, analog switches, sample and hold circuits, multipliers, dividers, op amp based fixed voltage reference circuits, DC–DC converter circuits, voltage limiters,

4. **Active Filters**
   Transfer function, First order active filter and application, Standard second order response, KRC filter, Multiple feedback filters, State variable filters, Filter approximation, Cascade design, Generalized impedance converter, Direct design, The capacitor filter, Switched capacitor filters.

5. **Study, Design and Applications of Special Function Integrated Circuits**
   It is essential to remember the design concepts and selection criterion rather than IC pin configuration)
   Waveform Generation and Wave shaping : (IC 555 and applications, PLLL – (IC 4046), IC's – IC 8038), V to F and F to V converters – (AD 537), Comparators (function and specifications) applications of comparator (such as level detector, window detector, Pulse width modulation, Schmitt trigger) comparator IC (LM 339), Opto–isolators (4N25/35), Isolation Amplifiers (ISO 101), PWM controller (SG 3525 (or equivalent)).

Reference :

1. Operational Amplifiers (*Ramakant Gaikwad*) PHI.
2. Design with Operational Amplifiers & Analog Integrated Circuits (*Sergio Franco*).
3. Design and applications of Analog Integrated Circuits (*Sidney Soclof*).
4. Data Manuals of IC Manufacturers.
5. Op-amps and Linear Integrated Circuits for Technicians (*Frank R. Dungan*).

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Signal and Systems

T.E. Sem. V [BIOM]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical & Oral Exam	–	–
Oral Exam	–	25
Term Work	–	25

SYLLABUS

1. **Introduction to Signals**
   Basic of continuous time signals and discrete time signals like unit step, ramp, exponential, operation on signals like flipping, shifting, scaling and multiplication, Classification of signals : Periodic / Aperiodic, Power and Energy, Even and Odd.

2. **Introduction to Systems**
   System representation in the continuous and discrete time domain. Classification of systems on the basis of Causal/non–Causal, Time variance/Time invariance, Linear/Non–Linear, Stable/Unstable. Continuous convolution, Discrete convolution.

3. **Fourier Analysis of Continuous Time Signals**
   Orthogonal functions, Representation of signals in terms of weighted orthogonal basis functions, Coefficient calculation on the basis of minimum square error.
   Fourier series : Representation of Fourier series in terms of sine, cosine, exponential functions. The complex Fourier spectrum, Properties of Fourier Series, convergence of Fourier series, Gibbs phenomenon Fourier transform and its properties. Fourier transform of singular functions. Energy density spectrum.

4. **Laplace Transform**
   Convergence, properties of Laplace transform, double sided Laplace transforms, applications of Laplace transform to the solution of differential equations. Relationship between Laplace and Fourier transform.

5. **Time domain and Frequency Domain Behaviour of Systems**
   Transfer function and its properties for linear, lumped and stable systems, Impulse response of a system, Zero input and zero state response of a system. Time domain analysis of first order and second order systems. Condition of BIBO stability in time domain. Pole zero diagram, Frequency response of linear systems. Stability and Routh array, Bode plots, Root Locus, Polar and Nyquist Plots.

6. **Z transform**
   Definition, Convergence, properties and inversion of z transform. Analysis of discrete time systems using Z–transform. Relationship between Laplace and Z transform.

Reference :

1. Signals and Systems (*Oppenheim, Wilsky and Young*) Latest Edition.
2. Signals and Systems (*James Cadzow*) Latest Edition.
3. Signals and Systems (*Gabar*).
4. Principles of Signals and Systems (*F.J. Taylor*).

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