FIFTH SEMESTER

THEORY

S.No	Subject Code	Subject Name	L	T	P	IA	EE	Total
1		Analog and Digital ICs	4	0	0	20	80	100
2		Digital Signal Processing	4	0	0	20	80	100
3		Bio control systems	4	0	0	20	80	100
4		Bio medical Instrumentation	4	0	0	20	80	100
5		Bio materials and Artificial organs	4	0	0	20	80	100
6		Microprocessor and application	4	0	0	20	80	100

PRACTICAL

S.No	Subject Code	Subject Name	L	T	P	IA	EE	Total
7		Microprocessor and Microcontroller lab	0	0	3	20	80	100
8		IC lab & Biomedical Instrumentation Lab	0	0	3	20	80	100

SEMESTER V

1.ANALOG AND DIGITAL ICs

UNIT I: OPERATIONAL AMPLIFIERS AND APPLICATIONS 9

Characteristics of ideal op amp, Virtual Short, differential amplifier, offset currents and voltages, Slew rate, 741 IC Specifications, inverting an non-inverting amplifiers, adder / subtractor, instrumentation amplifier, voltage to current and current to voltage converters, dc voltage follower, differential dc amplifier, bridge amplifier, integrator, differentiator, active low pass, high pass and band pass active filters, precision diode and clamp, half wave rectifier, average detector, peak detector, log – antilog amplifiers, astable, monostable and triangular wave generators, Schmitt Trigger, analog multiplier.

UNIT II: PHASE LOCKED LOOP AND APPLICATIONS, D/A AND A/D CONVERTERS 9

Basic Principles, Phase comparator, Voltage controlled Oscillator, Lock Range, Capture Range, PLL IC 565, Functional block Schematic of PLL, PLL applications – Frequency multiplication, frequency translation, AM, FM detection, D/A converter, A/D converters, Successive approximation, Parallel ADC, V to F ADC, Counter Ramp ADC.

UNIT III: NUMBER SYSTEMS 9

Binary, Octal, Hexadecimal, Conversions between Number Systems, BCD, Gray and Excess 3 Representations, r's and (r-1)'s Complements, Subtraction using 1's and 2's. Complements, Binary to Gray, Gray to Binary Conversions, Alpha numeric codes, Boolean theorems, Minterm and maxterm representation, SOP and POS forms, Karnaugh maps, Tabulation methods, Logic gates – Truth tables, Realization of Boolean functions using Gates, Universal Gates.

UNIT IV: MSI COMBINATIONAL CIRCUITS: 9

Half and Full adders, Parallel binary adder, BCD adder, Half and Full subtractors, magnitude comparator, Decoder, Encoder, Multiplier, ROM, PLA, Boolean _Expression Implementation using these IC's.

UNIT V: SEQUENTIAL CIRCUITS 9

Flip Flops – SR, JK, T, D, Characteristic equations, Excitation Tables, Design of counters using Excitation tables, Synchronous and Asynchronous Counters, 7490, 74161 Counter IC specifications, Ring and Johnson Counters, Shift Registers, 74194 Shift Register IC Specifications.

Total Hours: 45

TEXT BOOK:

1. Millman . J Halkias.C.C, "Integrated Electronics", McGraw-Hill 1972.

2. Ramakant A.Gayakwad, “OP-AMP and Linear IC’s”, Prentice Hall, 1994.
3. Mrris Mano.M, “Digital Logic and Computer Design”, Prentice Hall of India, 2001.

SEMESTER V

3. BIO CONTROL SYSTEMS

UNIT I: CONTROL SYSTEM MODELLING 9

System concept, Differential Equations, Transfer functions, Modelling of electrical systems, Translational and rotational mechanical systems, Electro-mechanical systems, physiological systems, block diagram modelling, signal flow graphs.

UNIT II: TIME RESPONSE ANALYSIS 9

Time domain specifications, step and Impulse response analysis of first order and second order systems, steady state errors, stability, Routh-Hurwitz criteria, Root locus techniques, construction of root locus, stability, dominant poles, applications of Root locus diagram.

UNIT III: FREQUENCY RESPONSE ANALYSIS 9

Frequency response, Bode plot-Nyquist plots, Nyquist stability criterion, Relative stability, Gain margin, phase margin, bandwidth magnitude plots, constant circles, Nichol’s chart

UNIT IV: PHYSIOLOGICAL CONTROL SYSTEMS 9

Introduction to physiological control systems, modelling of human movements, parameter estimation, linearizing

UNIT V: STUDY OF BIOLOGICAL SYSTEMS 9

Human Thermal system, Neuro muscular system, Respiratory system, occulomotor system.

Total Hours: 45

REFERENCES:

1. M.Gopal, “Control Systems”, Principles and Design, Tata McGraw-Hill, 1997.
2. Benjamin. C.Kuo, “Automatic Control Systems”, Prentice Hall of India, 1995.
3. Manfreclyner and John H.Milsum, “Bio Medical engineering system”, McGraw-Hill

and Co., New York, 1970.

SEMESTER V

4. BIOMEDICAL INSTRUMENTATION

UNIT I: BIO-POTENTIAL ELECTRODES 9

Electrode electrolyte interface, half-cell potential, polarisation and non-polarisable electrode, calomel electrode, needle and wire electrode, microelectrode-metal micropipete.

UNIT II: RECORDING SYSTEM 9

Low-Noise preamplifier, main amplifier and driver amplifier, inkjet recorder, thermal array recorder, photographic recorder, magnetic tape recorder, X-Y recorder, medical oscilloscope.

UNIT III: BIO-CHEMICAL MEASUREMENT 9

pH, pO2, pCO2, pHCO3, Electrophoresis, colorimeter, spectro photometer, flame photometer, auto analyser.

UNIT IV: NON-ELECTRICAL PARAMETER MEASUREMENTS 9

Respiration, heart rate, temperature, pulse blood pressure, cardiac output, O2, CO2 measurements.

UNIT V: BLOOD FLOW AND BLOOD CELL COUNTING 9

Electromagnetic and ultrasonic blood flowmeter, indicator dilution method, thermodilution method, manual and automatic counting of RBC, WBC and platelets.

Total Hours: 45

REFERENCES:

1. John G. Webster, “Medical Instrumentation Application and Design”, John Wiley and sons, New York, 1998.

2. Leslie Cromwell, “Biomedical Instrumentation and measurement”, Prentice hall of India, New Delhi, 1997.
3. Khandpur R.S, “Handbook of Biomedical Instrumentation”, Tata McGraw-Hill, New Delhi, 1997.
4. Joseph J.carr and John M. Brown, “Introduction to Biomedical equipment technology”, John wiley and sons, New York, 1997.

SEMESTER V

5. BIOMATERIALS & ARTIFICIAL ORGANS

UNIT I: STRUCTURE OF BIO-MATERIALS AND BIO-COMPATIBILITY

9

Definition and classification of bio-materials, Surface properties of materials, mechanical properties, viscoelasticity, wound-healing process, body response to implants, blood compatibility.

UNIT II: METAL AND CERAMIC IMPLANT MATERIALS

9

Metallic implant materials, stainless steels, co-based alloys, Ti-based alloys, ceramic implant materials, aluminum oxides, hydroxyapatite glass ceramics carbons, medical applications.

UNIT III: POLYMERIC IMPLANT MATERIALS &Testing of implants 9

Polymerisation, polyolefin, polyamicles, Acryrilic, polymers, rubbers, high strength thermoplastics, medical applications. Testing of implants - Methods of test for biological performance- Invitro implant tests - Invivo implant test methods

UNIT IV: ISSUE REPLACEMENT IMPLANTS

9

Soft-tissue replacements, sutures, surgical tapes, adhesive, percutaneous and skin implants, maxillofacial augmentation, blood interfacing implants, hard tissue replacement implants, internal fracture fixation devices, joint replacements.

UNIT V: Dental Implants & ARTIFICIAL ORGANS 9

Artificial Heart, Prosthetic Cardiac Valves, Limb prosthesis, Externally Powered limb Prosthesis, Dental Implants, Artificial skin

Total Hours: 45

Text books

1. J B Park, “Biomaterials - Science and Engineering”, Plenum Press, 1984.
2. Sujata V. Bhat, “Biomaterials”, Narosa Publishing House, 2002.

References

1. Jonathan Black, “Biological Performance of materials”, Marcel Decker, 1981
2. C.P.Sharma & M.Szycher, “Blood compatible materials and devices”, Technomic Publishing Co. Ltd., 1991

SEMESTER V

(COMMON TO BME AND EEE)

6.MICROPROCESSOR AND MICROCONTROLLER

UNIT I: 8-BIT MICROPROCESSOR 9

8085 Architecture and Memory interfacing, interfacing I/O devices, Instruction set, Modes, Assembly language programming, counters and time delays, interrupts, timing diagram, Microprocessor applications.

UNIT II: PERIPHERALS AND INTERFACING 9

Serial and parallel I/O (8251 and 8255), Interfacing to external world, External RAM &ROM, Display [LED/LCD] & Keyboard, ADC& DAC, Memory interfacing, Stepper motor preferably I2C compatible.

UNIT III: 80X86 PROCESSORS 9

8086 Architecture, Pin Configuration, 8086 Minimum and Maximum mode configurations, Addressing modes, Basic Instructions, 8086 Interrupts, Assembly levels programming. Introduction to 80186, 80286, 80386, 80486 and Pentium processors

UNIT IV: MICROCONTROLLERS 9

8051 Architecture and Memory interfacing, interfacing I/O devices, Instruction sets.

UNIT V: HARDWARE DESCRIPTION OF 8051 9

Counter, Timer, Timer mode, Serial I/O and Interrupt structure. Assembly language programming

TEXT BOOKS:

1. Ramesh S. Gaonkar, "Microprocessor Architecture Programming and Applications with 8085". Fourth edition, Penram International Publishing 2000
.
2. Muhammad Ali Mazidi, Janice Gillispie Mazidi, "The 8051 Microcontroller, and Embedded Systems", Prentice Hall 2000.

3. Douglas V.Hall, "Microprocessor and Interfacing, Programming and Hardware". Tata McGraw-Hill, Second Edition. 1999.

REFERENCES:

1. Kenneth J.Ayala., "The 8051 Microcontroller Architecture Programming and Applications", Penram International Publishing (India). 1996.

SEMESTER V

MICROPROCESSOR AND MICROCONTROLLER LAB

1. Familiarisation of 8085 micropocessor.
2. Code conversion - BCD to Binary, Binary to BCD.
3. Addition of two 8 – bit numbers.
4. Subtraction of two 8 – bit numbers.
5. Multification of two 8 – bit numbers.
6. Addition of two 16 – bit numbers.
7. Division of 16 – bit number by 8 – bit number.
8. Ascending and Descending order.
9. Factorial of the given number.
10. Study of 8255 chip and waveform generator.
11. Familiarisation of 8051 microcontroller.
12. Study of programmable I/O ports of 8051 microcontroller.
13. Addition of two 8 – bit numbers using 8051 microcontroller.

14. Digital to Analog interfacing.
15. Stepper motor control using 8085.
16. Moving message display using 8279.
17. Seven segment LED displays.
18. Minimum values of datas.

Total Hours: 45

SEMESTER V

IC LAB & BIOMEDICAL INSTRUMENTATION LAB

INTEGRATED CIRCUITS LAB

1. Integrator and Differentiator
2. Multivibrators using IC 555 Timer
3. Schmitt Trigger
4. Instrumentation Amplifier
5. Phase shift Oscillator and Wien Bridge Oscillator
6. Half Adder and Full Adder
7. Encoder and Decoder
8. Multiplexer
9. Shift Register
10. Decade Counter

BIOMEDICAL INSTRUMENTATION LAB

1. Study of Biological Preamplifiers.
2. Recording of ECG signal and Analysis.
3. Recording of Audiogram.
4. Recording of EMG.
5. Recording of EEG.
6. Re cording of various physiological parameters using patient monitoring system and telemetry units.
7. Measurement of pH, pO2 and conductivity.
8. Study and analysis of functioning and safety aspects of surgical diathermy.

Total Hours: 45