B.Tech Third Year (4YDC) Electrical Engineering
Lesson Plan
Subject : EE39508 Control System
Class : B.Tech. III Year Electrical

Lect No	Topic	CO
1	Introduction	CO1
2	Modelling of Dynamic Systems and Simulation	
3	concept of transfer function, Block diagram reduction method	
4	Signal flow graph method	
5	Analogue simulation, linearity, impulse response	
6	Mason's gain formula	
7	a-c and d-c Servomotors, servo-amplifiers (a-c & d-c) using operational amplifiers	
8	Gyro, Resolver component study	
9	Concept and mathematical theory of feedback, return ratio, return difference, open and closed loop	
10	understanding the necessity of feedback as real control action supplemented by a small example	
11	Time-Domain Analysis of Feedback Control Systems with Typical reference test signals	CO2
12	transient behaviour Proportional plus derivative	
13	rate feedback control actions for improving the transient response	
14	Steady state behaviour	
15	Types of open loop transfer functions, Steady state errors	
16	improvement of steady state errors	
17	Frequency-Domain Analysis of Feedback Control system	CO3
18	Concept of frequency-domain analysis, Bode plots	
19	Numerical Exmple	
20	Polar plots	
21	Bode of closed loop transfer function Mp	
22	Systems Bode plots of error transfer functions, Principle of Argument	
23	Nyquist criteria	
24	Conditionally stable closed loop systems	
25	Transportation lag, Constant M and constant N loci	
26	Root locus and example	

27	Compensation Techniques, need, Different types of compensation	CO4
28	Phase-lead and Phase-lag compensation	
29	Design of compensating networks for the desired frequency-domain closed loop performance	
30	Examples	
31	Examples	
32	Fundamentals of state space: concept of state and state variable.	CO5
33	Representation of linear system through state dynamics	
34	Calculation of Eigen-values and Eigen-vectors	
35	Modal matrix, Modal transformation	
36	Elementary understanding controllability and observability, Stability analysis	
37	BIBO stability, asymptotic stability	
38	Routh-Hurwitz stability analysis	
39	Nyquist stability analysis and relative stability	
40	state feedback control. - concept of stability, gain margin and phase margin	

Department of Biomedical Engineering

B.E. _IV _ Year (Department of Biomedical Engineering)

Lecture Plan

Subject Code: BM-49613 Subject Name: Medical Image Processing

Session: ___Jan-April 2024 Semester: B

Lecture No.	Date	Topic Covered (Unit No.)
1.		**Unit I**
2.		Introduction and fundamental concepts of Image Processing, simple image model, elements of image perception
3.		Basic relationship between pixels, connectivity, resolution contrast, brightness, concept of digital image quantization and sampling
4.		Color image fundamentals RGB, HSV etc.
5.		Different color model conversions and image processing concept in coloured images
6.		Mathematical operations on image matrix
7.		Basic transforms
8.		Block matrices, Kronecker and Toeplitz matrix their purpose
9.		**Unit II**
10.		Spatial domain operations in gray scale. contrast stretching and thresholding
11.		Histogram equalization & matching, Local and global operations
12.		Smoothing spatial filters
13.		Sharpening spatial filters
14.		Image enhancement in frequency domain
15.		Basics of frequency domain processing and relation between spatial and frequency domain processing
16.		Smoothing High pas, Low Pass and Gaussian filters
17.		Sharpening High pas, Low Pass and Gaussian filters
18.		**Unit III**
19.		Fourier 2d Transform
20.		Unitary transform, cosine transform
21.		KL transform, Hardmard Transform
22.		**Unit IV**
23.		Morphological techniques basics, erosion, dilation, opening and closing
24.		Boundary Extraction, Hole filling, thinning, thickening, extraction of connected components
25.		Hit and Miss Transform
26.		**Unit V**
27.		Basics fundamentals of segmentation. Point, Line and Edge

		definitions
28.		Point, Line, Edge detection techniques
29.		Continued…
30.		Basic principle of thresholding method, brief intro to Otsu's method
31.		Region based segmentation splitting and merging, region growing
32.		Introduction to Watershed algorithm
33.		Case studies related to biomedical applications
34.		Case studies and discussions

Shri G.S. Institute of Technology and Science

BM-49612: Rehabilitation engineering
Lecture Plan
(Jan 2024 – Apr 2024)

Day	Topic
L1	**Unit 1** Introduction of subject
L2	Engineering concepts in rehabilitation Engineering.
L3	Area Measurements,Measurement of characteristics and movement,
L5,6	Measurement of Muscular Strength and Capabilities.
L6	Measurement tools and processes in Rehabilitation engineering:
L7	fundamental principles, structure7
L8,9	function; performance and behaviour.
L10	Subjective and objective measurement methods.
L11	Revision
L12	**Unit 2** :Engineering concepts in sensory rehabilitation Engineering.
L13,14	Sensory augmentation and substitution: Visual system
L15	Auditory system:Auditory augmentation, Audiometer, Hearing aids,
L16	cochlear implantation, visual auditory substitution, tactual auditory substitution,
L17,18	Tactual system: Tactual augmentation, Tactual substitution
L19	Doubt solving
L20	**Unit 3** ARTIFICIAL LARYNX (pneumatic & electronic)
L21	Analyzing artificial electronic larynx,
L22,23	Augmentative communication, control and computer access (AAC)
L24	user interface; outputs; acceleration techniques; Intervention and other issues;
L25	Quiz
L26,27	**Unit 4** Orthopedic Prosthetics and Orthotics in rehabilitation:
L28	Engineering concepts in motor rehabilitation, applications.
L29	Intelligent prosthetic knee.
L30	A hierarchically controlled prosthetic hand.
L31	A self-aligning orthotic knee joint. .
L32,33	Externally powered and controlled Orthotics and Prosthetics.
L34	FES systems-Restoration of hand function,
L35	restoration of standing and walking,
L36	Hybrid Assistive Systems (HAS)
L37	Doubt clearing
L38	**Unit 5** Active Prostheses: Active above knee prostheses.
L39	Myoelectric hand and arm prostheses- different types,
L40	block diagram, signal flow diagram and functions.
L41	The MARCUS intelligent Hand prostheses

SUBJECT TEACHER
BMED

DEPARTMENT OF BIOMEDICAL ENGINEERING

LECTURE PLAN

BM-39501: Biomedical Signal Processing

Lecture no.	Topic Covered
01	Introduction to Signal Processing
02	Signals and systems, signal processing, concept of frequency in continuous time and discrete time signals
03-05	Analog to digital and digital to analog conversion
06-07	Sampling and reconstruction of signals.
08	Analysis of linear time invariant systems in the z-Domain
09-10	Correlation functions and spectra at the output of LTI systems
11-12	Linear time-invariant systems as Frequency-Selective filter, Inverse systems and deconvolution
13	Linear filtering methods based on the DFT
14-15	Frequency analysis of signals using the DFT
16	Discrete cosine transform
17	Doubt clearing session
18	Fast Fourier transform, decimation in time FFT algorithms
19-20	Decimation in frequency FFT algorithms
21-22	FFT algorithms for N composite number
23	Effects in the computation of the DFT
24-25	FIR digital filters realizations, direct, cascade, lattice forms
26-27	FIR filter design using Fourier series
28-31	Use of window functions like rectangular, raised cosine, Kaiser
32-34	IIR digital filters realizations, direct, cascade, parallel forms
35-38	Analog filter approximations, and Butterworth and Chebyshev approximations
38-39	Case study: PCA and ICA for biomedical signals

40	Doubt clearing session

Lecturer Plan Tele-medicine

Lecturer	Topics
L-1	Definition and its current application
L2	Advantages disadvantage and its scope
L3	Network Topologies
L4	Network hardware (LAN MAN WAN etc)
L5	OSI Model
L6 -L10	7 layers
L11-12	TCP/IP Model , comprasion between OSI & TCP/IP
L13	ATM technology
L14-15	IDN, ISDN, telephone telemedicine(PSTN),
L16	Switching techniques,
L17	Wireless transmission, Wireless technologies,802.11, 802.16,
L18	Satellite communication.
L19-L20	Clinical Applications: clinical parameters, cardiology, dermatology,
L21-23	Tele-radiology, ENT, Emergency medicine(CDMA,GSM)
L24-25	Gastroenterology, Homecare, Neurology, Oncology, Ophthalmology,
L26-27	Tele-rehabilition, tele-pathology & tele-surgery
L28-29	medicine equipments: IP Video and audio – video conferencing hardware/software.
L30	Video hardware (Cameras, Monitors, recorders etc.),
L31	Network equipments – Tele-medical workstations,
L32-35	Monitoring devices – Electronic stethoscope, Vital sign monitoring devices, Respiratory monitoring devices, Neurological monitoring devices, Videoscopes, robotics and virtual reality devices
L36	al and ethical issues,
L37	Licensure and accreditation, Security and confidentiality,
L38-39	Government regulations, International and National protocols-HL7, HIPAA, DICOM Indian IT act.

Department of Biomedical Engineering

B.Tech. Final Year (Semester-B)

Lecture Plan

Session: January - April 2024

Subject Code: BM 49701 Subject Nomenclature: Biomaterials

Lecture No.	Date	Topic Covered (Unit No.)
1.		Overview of subject and syllabus, brief introduction (Unit-One)
2.		Introduction, Definition, classification & properties of biomaterials, Types of bond in material (Unit-One)
3.		Introductory overview of some existing prosthetic devices, applications of biomaterials in medicine, degradation of materials in biological environment. (Unit-One)
4.		Fundamentals of biocompatibility, sterilization of implants & devices. (Unit-One)
5.		Metals as biomaterial, steps in fabrication of metallic biomaterial implants. (Unit-One)
6.		Microstructure & properties of implant metals. (Unit-One)
7.		Ceramics, glasses & glass ceramics. (Unit-One)
8.		Polymer, characterization techniques, fabrication & processing, polymeric biomaterials, polymer as biomaterial. (Unit-One)
9.		Mechanical properties of materials, mechanical testing of biomaterials. (Unit-Two)
10.		Some specific implant materials: Hydrogels, Nanopolymers. (Unit-Two)
11.		Bioresorbable & bioerodible materials. (Unit-Two)
12.		Surface characterization of biomaterials. (Unit-Two)
13.		Surface characterization of biomaterials.{cont.} (Unit-Two)
14.		Introduction to testing of biomaterials, in-vitro assessment of tissue compatibility, assay methods, clinical use. (Unit-Three)
15.		In-vivo assessment of tissue compatibility, selection of in-vivo test according to intended use. (Unit-Three)
16.		Biomaterial & device perspective in in-vivo testing. (Unit-Three)
17.		Overview of tissue engineering (Unit-Three)
18.		Overview of tissue engineering {Cont.} (Unit-Three)
19.		Introduction to application of materials in medicine & industry. (Unit-Four)
20.		Cardiovascular medical devices, cardiovascular assist devices. (Unit-Four)
21.		Dental restoration, dental implants. (Unit-Four)
22.		Orthopedic implants/applications, fracture fixation devices, joint replacement devices. (Unit-Four)
23.		Total hip arthroplasty: current technology. (Unit-Four)

24.		Ophthalmological applications. (Unit-Four)
25.		Fundamentals of drug delivery systems. (Unit-Four)
26.		Sutures, its classification, origin, absorption, general characteristics, suture materials. (Unit-Four)
27.		Needle, packaging and sterilization. (Unit-Four)
28.		Introduction of host reaction to biomaterials and their evaluation. (Unit-Five)
29.		The inflammatory reaction to biomaterials, biomaterial-tissue interactions. (Unit-Five)
30.		Sequence of host reactions following implantation of medical devices. (Unit-Five)
31.		Biofilms, biomaterials & device related infections, bacterial adhesion to surfaces. (Unit-Five)
32.		Biofilm formation on surfaces, natural control of biofilm formation, novel engineering approaches to biofilm control. (Unit-Five)
33.		Biofilm resistant biomaterials, potential agents for the control of microbial colonization of biomaterials, delivery of biofilm control agents at biomaterial surfaces. (Unit-Five)
34.		Systemic toxicity and hypersensitivity (Unit-Five)
35.		Systemic toxicity and hypersensitivity {cont.} (Unit-Five)
36.		Doubt clearing session (Unit-One)
37.		Doubt clearing session (Unit-Two)
38.		Doubt clearing session (Unit-Three)
39.		Doubt clearing session (Unit-Four)
40.		Doubt clearing session (Unit-Five)

DEPARTMENT OF BIOMEDICAL ENGINEERING

Session 2023-2024 [Jan-May, 2024]

Lesson Plan

Subject: Biomedical Instrumentation 2 (BM 39512)	**Total Lecture:** 40
Faculty: Avni Jain	**Semester:** 5th

Lecture 1: Introduction to human respiratory system
Lecture 2: Tracheobronchial tree Implications
Lecture 3: Ventilation Perfusion ratio
Lecture 4: Lung Pressure, role of surfactant and case studies
Lecture 5: Model of respiratory system -I
Lecture 6: Model of respiratory system -II
Lecture 7: Lung volume measurement: spirometer
Lecture 8: Nitrogen Washout Estimate of Lung Volume and PFT
Lecture 9: Oxygen Gas Analyzer
Lecture 10: Humidifier
Lecture 11: Nebulizers
Lecture 12: Anaesthesia Machine: Group discussions
Lecture 13-14: Ventilator
Lecture 15: Short wave diathermy
Lecture 16: Microwave diathermy
Lecture 17: Electrotherapy
Lecture 18: TENS
Lecture 20: Lithotriptors

Lecture 21: Dialysis
Lecture 24: BMD
Lecture 25: BMD
Lecture 26: LASERS

Lecture 27-28: Mechanism of hearing and audiometer
Lecture 29: Tonometer
Lecture 30: ELECTRICAL SAFETY
Lecture 31: Endoscopy, laparoscopy
Lecture 32-33: Automated drug delivery system, components of a drug infusion system, implantable infusion systems.
Lecture 34-35: Defibrillator

Shri G.S. Institute of Technology & Science, Indore

Department of Biomedical Engineering

LECTURE PLAN semester Jan to April 2024

Biomedical Statistical Signal Processing BM39603

Day	Topic
1.	Data Collection and Sampling Methods Concepts of population and sample
2.	Types of sampling- simple random sampling with and without replacement, errors in sampling and data acquisition
3.	Statistical tests of hypotheses, box plots of a data sample, distribution & scatter plots.
4.	Questions on above topics
5.	Quiz and discussion
6.	Random Variables Discrete and continuous variables cont
7.	Random Variables Discrete and continuous variables
8.	probability mass function, probability density function and cumulative distribution function contd
9.	probability mass function, probability density function and cumulative distribution function contd
10.	probability mass function, probability density function and cumulative distribution function
11.	jointly distributed random variables
12.	marginal and conditional distributions contd
13.	marginal and conditional distributions
14.	Expectation of a random variable and its properties
15.	Mid sem I
16.	Distributions of Function of Random Variables
17.	expectation of sum of random variables contd.
18.	expectation of sum of random variables
19.	product of independent random variables
20.	conditional expectation and related problems contd
21.	conditional expectation and related problems
22.	moments
23.	moment generating function & their properties,
24.	Mid sem II
25.	random vectors and central limit theorem
26.	Quiz 2 and discussion
27.	Statistical Tests correlation,
28.	regression, multiple and partial correlation,
29.	one-way and two-way analysis of variance (ANOVA),
30.	$\chi 2$ (chi-square) test
31.	t and F distributions (central cases only) and their limiting forms,
32.	bivariate normal distribution and its properties,
33.	tests of goodness of fit, tests of independence.
34.	Case study I
35.	Case study II
36.	Case study III

Shri G. S. Institute of Technology and Science, Indore (MP)

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Department of Electronics and Instrumentation Engineering

LECTURE PLAN

Fundamentals of measurement system &EI 29572:

Sr. No	Unit No	Topics to be covered	Lecture No	Remarks
1	1	Fundamental method of measurement,	1	
2	1	Classification of measuring instrument	2	
3	1	Static characteristics	3	
4	1	Dynamic characteristics	4	
5	1	Error classification and analysis	5	
6	1	Standard for displacement, time ,frequency, force, temperature	6	
7	1	Electrical standard and IEEE standard	7	
8	3	Analog indicating type instruments based on various operating principles	8	
9	3	Analog indicating type instruments based on various operating principles	9	
10	3	Analog indicating type instruments based on various operating principles and numerical	10	
11	3	Ammeter ,voltmeter	11	
12	3	Ohmmeter ,Extension of instruments range	12	
13	3	Instrument transformer	13	
14	5	A.C. bridges for measurement of inductance	14	
15	5	A.C. bridges for measurement of inductance	15	
16	5	Numerical on A.C. bridges for measurement of inductance		
17	5	A.C. bridges for measurement of Capacitance factor and loss angle,	16	
18	5	Numerical based on A.C. bridges	17	
19	5	Universal bridge,Digital multimeter	18	
20	2	Introduction and block diagram Of CRO	19	
21	2	Working principle of various elements of CRO	20	
22	2	Measurement of frequency, amplitude and phase using CRO screen and Lissajous Patterns	21	
23	2	Various type of CRO, Fundamental of EMI and RF	22	
24	2	Noise reduction techniques, network analyser,spectrum analyser	23	
25	4	Measurement of low resistance	24	

26	4	Measurement of voltage ,current	25	
27	4	Measurement of phase, frequency,	26	
28	4	Measurement of phase, frequency, power, energy, Q-factor	27	
29	4	Compensation and calibration of measuring instruments	28	

Shri G. S. Institute of Technology and Science
Department of Applied Mathematics and Computational Science
B.E. II YEAR (4YDC) BIO-MEDICAL ENGINEERING
MA 29501 MATHEMATICS – IV

Total No. of Units: 5 Total No. of Lectures:40

LECTURE PLAN

S.No.	Topic	No. of Lectures
	UNIT-I	
1	Modeling of Biological Systems through Ordinary Differential Equations:Growth and Decay	02
2	Dynamics of Tumor Growth, Radioactivity and Carbon Data	02
3	Temperature Rate of Change, Biological Growth	02
4	A problem in Epidemiology, Detection of Diabetes	02
	UNIT-II	
5	Stochastic Process: Modern Definition of Probability, Random variables,	02
6	Distribution Function and Density Function,	02
7	Concept of Stochastic Process, Classification of Stochastic Process,	02
8	Mean, Auto Correlation and Covariance	02
	UNIT-III	
9	Markov Chain: Probability Vector, Stochastic Matrix	02
10	Fixed Point of a Matrix, and Definition of Markov Chain	02
11	Transition Matrix, Some Theorems and problems	02
12	Queuing Theory , Birth and death process	02
	UNIT-IV	
13	Reliability: Basic Concepts, Failure law, Bath Tub Curve	02
14	Evaluation of Reliability of a component from Test Data, System Reliability	01
15	Components in Series and parallel, Redundancy, Non-Series Parallel System	03
16	A brief idea of Software Reliability - Markovian approach for Reliability Evaluation.	02
	UNIT-V	
17	Graphs – Definitions and basic properties	02
18	Isomorphism, Euler Circuits and Hamiltonian cycle	02
19	Digraphs. Trees- properties, spanning trees	02
20	Planer graphs. Shortest path problem, Dijkstra algorithm, spanning tree-Kruskal and Prim algorithm	02

PROPOSED LECTURE PLAN: EC- 29562/EC-29509 Digital Electronics

Lecture no.	Date	Topic Covered	Remark
01	Unit -1	Review of semiconductor devices as a switch, wave shaping circuits, time base generators.	
02		Number system, number base conversion	
03		binary codes	
04		Boolean algebra, Boolean functions, logic gates	
05		Simplification of Boolean functions	
06		combinational logic, Karnaugh map methods,	
07		SOP-POS simplification,	
08		NAND-NOR implementation, variable mapping	
09	Unit-2	combinational logic , Half adder, full adder	
10		carry look ahead, parity generator	
11		multiplexer - demultiplexer	
12		encoder - decoder	
13		Arithmetic circuits, ALU.	
14	Unit-3	Comparison bet combinational and sequential logic , sequential logic basics,	
15		Flip flops basic SR, Modified S R, Racing condition.	
16		JK ,JK MASTER SLAVE	
17		D FF And T FF	
18		Conversion or SR,JK,D,T FF	
19		Edge and level triggered ckt	
20		Shift register	
21		Asynchronous counters, their types and state diagrams.	
22		Synchronous counters, their types and state diagrams.	
23		Quiz-1	
24		MST-1	
25		Semiconductor memories,	
26		Introduction to digital ICs 2716, 2732 etc. & their address decoding. Modern trends in semiconductor memories such as DRAM, FLASH RAM etc.	
27		Comparison of N-MOS, P-MOS, C-MOS, H-MOS etc, characteristics of digital logic family	
28	Unit-4	Logic families : TTL, ECL	
29		CMOS, IIL and their comparison on the	

		basis of Fan in, Fan out, speed, propagation delay and noise margin	
30		Dieted study of NMOS,PMOS,	
31		CMOS , Design of logic gates	
32		Comparison of all logic family	
33		interfacing between ICs of different logic families	
34	Unit-5	Applications of Digital Circuits:	
35		Introduction to A/D conversion & their types,	
36		Introduction to D/A conversion & their types, sample and hold circuits	
37		Quiz-2 And MST-2	
38		Voltage to frequency conversion, frequency to voltage conversion.	
39		Multivibrators: bistable, monostable, astable,	
40		schmitt trigger, IC555, IC565 & their applications	
41		Revision unit-1	
42		Revision unit-2	
43		Revision unit-3	
43		Revision unit-4	
44		Revision unit-5	