VEL TECH MULTI TECH Dr.RANGARAJAN

Dr.SAKUNTHALA ENGINEERING COLLEGE

An ISO 9001: 2008 Certified Institution

(Owned by Vel trust 1997)

(Approved by All India Council for Technical Education,

New Delhi & Govt. of Tamil Nadu and affiliated to

Anna University

SYLLABUS
WEEKLY SCHEDULE
III SEMESTER JULY 2013-NOV 2013

BIO MEDICAL

III SEM - 4 Year Degree Course

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VEL TECH MULTI TECH Dr.RANGARAJAN

Dr.SAKUNTHALA ENGINEERING COLLEGE

DEPARTMENT OF BIOMEDICAL ENGINEERING

WEEKLY SCHEDULE

SEM : III YEAR : II

ACADEMIC YEAR: 2013 – 2014

Sl.No	WEEKS	DATE	
		FROM	TO
1	WEEK1	08.07.2013	13.07.2013
2	WEEK2	15.07.2013	19.07.2013
3	WEEK3	22.07.2013	27.07.2013
4	WEEK4	29.07.2013	03.08.2013
5	WEEK5	05.08.2013	10.08.2013
6	WEEK6	12.08.2013	17.08.2013
7	WEEK7	19.08.2013	24.08.2013
8	WEEK8	26.08.2013	31.08.2013
9	WEEK9	02.09.2013	07.09.2013
10	WEEK10	10.09.2013	14.09.2013
11	WEEK11	16.09.2013	21.09.2013
12	WEEK12	23.09.2013	28.09.2013
13	WEEK13	30.09.2013	05.10.2013
14	WEEK14	07.10.2013	11.10.2013
15	WEEK 15	15.10.2013	19.10.2013
16	WEEK16	21.10.2013	26.10.2013

WEEK 11: 9. Design of RC phase shift oscillator

WEEK 12: 10. Design of Hartely Oscillator

11. Design of Colpit oscillator

WEEK 13: 12. Study of pulse shaping circuits

i). Astable Multivibrator

ii). Monostable Multivibrator

WEEK 14: REVISION

WEEK 15: ICD CLASSES

WEEK 16: CYCLE TEST III

BM2209 ELECTRONIC CIRCUITS LAB

WEEK 1: 1. Rectifiers – HWR and FWR
(with & without capacitor filter)

WEEK 1: 2. Zener diode as regulator

WEEK 2: 3. Study of biasing circuits

WEEK 3: a.i). Fixed bias, ii).Self bias,
iii). Collector to base bias

WEEK 4: 4. FET amplifier

WEEK 5: CYCLE TEST I

WEEK 6: 5. Differential amp CMRR and determination of Gain

WEEK 7: 6. Design of RC coupled amplifier

WEEK 8: 7. Design of Voltage series feedback amplifier

WEEK 9: 8. Design of Class A and Class B amplifier

WEEK 10: CYCLE TEST II

WEEK 11: 9. Design of RC phase shift oscillator

WEEK 12: 10. Design of Hartely Oscillator

11. Design of Colpit oscillator

WEEK 13: 12. Study of pulse shaping circuits

i). Astable Multivibrator

ii). Monostable Multivibrator

WEEK 14: REVISION

WEEK 15: ICD CLASSES

WEEK 16: CYCLE TEST III

TEST SCHEDULE

CYCLE TEST - I

Sl. NO	DATE	SUB. CODE	SUBJECT
1	06.08.2013	MA2211	Transforms and Partial Differential Equations
2	07.08.2013	BM2201	Medical Physics
3	08.08.2013	BM2202	Signals and Systems
4	09.08.2013	BM2203	Sensors and Measurements
5	10.08.2013	BM2204	Electronic Circuits
6	11.08.2013	BM2205	Biochemistry
7	12.08.2013	BM2206	Anatomy and human physiology

CYCLE TEST – II

Sl. NO	DATE	SUB CODE	SUBJECT
1	16.09.2013	MA2211	Transforms and Partial Differential Equations
2	17.09.2013	BM2201	Medical Physics
3	18.09.2013	BM2202	Signals and Systems
4	19.09.2013	BM2203	Sensors and Measurements
5	20.09.2013	BM2204	Electronic Circuits
6	21.09.2013	BM2205	Biochemistry
7	21.09.2013	BM2206	Anatomy and human physiology

WEEK 13: EEG. Simple reflexes , withdrawal Reflexes.
Autonomic nervous system and its functions,Structure of eye ,ear and auditoryand visual pathways.
WEEK 14: REVISION FOR FIVE UNITS
WEEK 15: ICD CLASSES
WEEK 16: CYCLE TEST III
TEXT BOOK
1. Essential of human Anatomy and Physiology, Elaine.N. Marieb Eight edition,
Pearson Education New Delhi ,2007.
REFERENCE BOOKS
1. Review of Medical Physiology,22nd edition,William F.Ganong Mc Graw Hill New
Delhi,
2. Text book of Physiology, Prof. A.K. Jain, Third edition volume I and II Avichal
Publishing company, New Delhi

BM 2206 ANATOMY AND HUMAN PHYSIOLOGY

UNIT I STUDY OF CELLULAR SYSTEM

WEEK 1: Cell: Structure and organelles - Functions of each component in the cell. Cell membrane

WEEK 2: transport across membrane – origin of cell membrane potential (Nernst and Goldman
and Katz equations) – Action potential.

UNIT II HEMATOLOGICAL SYSTEM

WEEK 3: Blood composition - functions of blood – functions of RBC. WBC types and their functions.

WEEK 4: Blood groups –importance of blood groups – identification of blood groups.

blood flow factors regulating blood flow such as viscosity, radius , density etc (Fahreus lindqvist effect, Poiseuille's Law)

WEEK 5: CYCLE TEST 1

UNIT III RENAL AND RESPIRATORY SYSTEM

WEEK 6: Structure of Kidney and nephron. Mechanism of Urine formation and acid base

WEEK 7: regulation. Dialysis. Components in of respiratory system.

WEEK 8: Oxygen and carbon dioxidetransport and acid base regulation.

UNIT IV CARDIAC SYSTEM

WEEK 9: Structure of heart – Properties of Cardiac muscle – Cardiac muscle and pacemaker

WEEK 10: CYCLE TEST II

WEEK 11: potential - Cardiac cycle – ECG - Heart sound - volume and pressure changes andregulation of heart rate.

UNIT V SENSORY SYSTEM

WEEK 12: Structure of a Neuron. Synaptic conduction. Conduction of action potential in neuron Parts of brain cortical localization of functions..

MA2211 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

UNIT I FOURIER SERIES

WEEK 1: Dirichlet's conditions – General Fourier series – Odd and even functions

WEEK 2: Half range sine series – Half range cosine series – Complex form of Fourier series

WEEK 3: Parseval's identify – Harmonic Analysis.

UNIT II FOURIER TRANSFORMS

WEEK 4: Fourier integral theorem (without proof) – Fourier transform pair

WEEK 5: Cycle Test I

WEEK 6: Sine and
Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT III PARTIAL DIFFERENTIAL EQUATIONS

WEEK 7: Formation of partial differential equations – Lagrange's linear equation – Solutions of
Standard types of first order partial differential equations - **WEEK 8:** Linear partial differential
Equations of second and higher order with constant coefficients.

UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS

WEEK 9: Solutions of one dimensional wave equation – One dimensional equation of heat
Conduction

WEEK 10: CYCLE TEST II

WEEK 11: Steady state solution of two-dimensional equation of heat conduction (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates.

UNIT V Z -TRANSFORMS AND DIFFERENCE EQUATIONS

WEEK 12: Z-transforms - Elementary properties – Inverse Z-transform – Convolution theorem

WEEK 13: Formation of difference equations – Solution of difference equations using Z-transform.

WEEK 14: REVISION FOR FIVE UNITS

WEEK 15: ICD CLASSES

WEEK 16: CYCLE TEST

TEXT BOOKS

1. Grewal, B.S, "*Higher Engineering Mathematic",* 40th Edition, Khanna publishers,
Delhi, (2007)

REFERENCES

1. Bali.N.P and Manish Goyal, "*A Textbook of Engineering Mathematic"*, 7th Edition,
Laxmi Publications(P) Ltd. (2007)
2. Ramana.B.V., "*Higher Engineering Mathematics",* Tata Mc-GrawHill Publishing
Company limited, New Delhi (2007).
3. Glyn James, "*Advanced Modern Engineering Mathematics"*, 3rd Edition, Pearson
Education (2007).
4. Erwin Kreyszig, "*Advanced Engineering Mathematics",* 8th edition, Wiley India (2007).

UNIT IV

WEEK 9: Liver function and liver function tests, Kidney function and kidney function tests , normal& abnormal constituents of urine and their clinical significance. General characteristics of hormones.

WEEK 10; Structure , functions & disorders of thyroid , parathyroid , pituitary ,adrenal and pancreatic hormones. Hormones as chemical messengers: General assay of hormones – Bio assay , chemical assay & immuno assays. **UNIT V**

WEEK 12: Analytical techniques: Principle and applications of electrophoresis – PAGE , SDSPAGE , Isoelectric focusing , Two Dimensional Electrophoresis.

WEEK 13: Chromatography:Principle of adsorption & partition chromatography, Size exclusion , Ion exchange & affinity chromatography. Spectro photometry, fluorimetry, flame photometry, manometry, microcalorimetry , electrochemical methods, biosensors , automation in clinical laboratory , use of radio isotopes in biochemistry.

WEEK 14: REVISION FOR FIVE UNITS

WEEK 15: ICD CLASSES

TEXT BOOKS

1. Harper's review of biochemistry By David. W. Martin, Peter. A. Mayes , Victor. W.
Rodwell . LANGE medical publications, 2003.
2. Practical Biochemistry – Principles & Techniques,Keith Wilson & John Walker. Oxford university press.

REFERENCE BOOKS

1. Understanding Enzymes By Trevor palmer. Published by Ellis Horwood LTD. 2. Biochemistry Lippincott's Illustrated Reviews By Pamela.C.Champe & Richard.
A.Harvey. Lippincott-Raven publishers, 3rd edition, 2006

BM2205 BIOCHEMISTRY

UNIT I

WEEK 1: Introduction to biochemistry – Biomolecules, structure of water & its importance – Important noncovalent forces – Hydrogen bonds, electrostatic, hydrophobic & vanderwaals forces

WEEK 2: Acid, base & buffers – pH, Henderson Hasselbalch equation.Biological buffers and their significance – Principle of viscosity

WEEK 3: Surface tension, adsorption, diffusion, osmosis & their applications in biological systems.

UNIT II

WEEK 4; Classification, structure & properties of carbohydrates – mono, di , oligo & polysaccharides. Classification, structure & properties of amino acids & proteins.

WEEK 5: CYCLE TEST

WEEK 6: Classification, structure & properties of Lipids – Simple lipids , Phospholipids , glycolipids

& steroids . Transport of lipids: Lipoproteins Structure & functions of nucleic acids Nucleosides , nucleotides – Cyclic AMP , cyclic GMP , ATP , GTP – DNA & RNA

UNIT III

WEEK 7: Classification of Enzymes, Chemical nature, Active Site, Specificity of Enzyme catalyzedreactions, Regulation : Feedback , Allosteric , Covalent modification , Hormonal

regulation, co-enzymes. Assay of enzymes, enzymes in clinical diagnosis of diseases.Introduction to Metabolism: Carbohydrate metabolism, Glycolysis

WEEK 8: Lipid metabolism : fatty acid, beta oxidation , ketogenesis and cholesterol metabolism.TCA cycle : Structure of biological membranes, electron transport & Oxidative phosphorylation.

BM2201 MEDICAL PHYSICS

WEEK I: Electromagnetic spectrum and its medical application **Light** - Physics of light, Intensity of light, limits of Vision and color vision **Sound**

Physics of sound, Normal sound levels

WEEK 2: Ultrasound fundamentals- Generation of

Ultrasound (Ultrasound Transducer) – Interaction of Ultrasound with Materials-Reflection

and Refraction – Absorption and Scattering

WEEK 3: Non- ionizing Electromagnetic Radiation

Tissue as a leaky dielectric – Relaxation Processes – Overview of non – ionizing

radiation effects -Low Frequency Effect – Higher frequency effect.

UNIT II

WEEK 4: Radioactive Decay – Spontaneous Emission – Isometric Transition - Gamma ray

Emission, alpha, beta, positron decay, electron capture **Principles of Nuclear Physics**

Natural radioactivity, Decay series, Half life period, type of radiation and their

Applications.

WEEK 5: CYCLE TEST

WEEK 6: Production of radio nuclides – Cyclotron produced Radionuclide -

Reactor produced Radionuclide – fission and electron Capture reaction, Radionuclide

Generator – Milking Process - Linear accelerator, Radionuclide used in Medicine and

technology.

UNIT III INTERACTION OF RADIATION WITH MATTER

WEEK 7: Interaction of charged particles with matter – Specific ionization, linear energy Transfer

Range, Bremsstrahlung , Annihilation Interaction of Gamma radiations with matter –

WEEK 8: Photoelectric effect, Compton Scattering , pair Production, Attenuation of Gamma

Radiation, Interaction of neuron with matter

UNIT IV PHYSICS OF CARDIOPULMONARY SYSTEM

WEEK 9: The Airways, - blood and lung interaction measurement of lung volume pressure air flow volume relation ships of lungs – physics of alveoli – the breathing mechanism

Major components of cardiovascular system

WEEK 10: CYCLE TEST

WEEK 11: O2 and CO2 exchange in the capillary system – Physical activity of heart – transmural pressure – Bernolli's principles applied to cardiovascular system - Blood flow laminar and turbulent

UNIT V RADIATION EFFECTS

WEEK 12: Acute Radiation Effects - The concept of LD 50 – Radiation syndromes- Central

nervous system syndrome - Gastro-intestinal syndrome

WEEK 13: Bone Marrow syndrome

Delayed Effects of Radiation - Stochastic and Deterministic effects – Late

Deterministic effect in different organs and tissues.

WEEK 14; REVISION FOR FIVE UNITS

TEXT BOOKS

1. B.H Brown , PV Law ford, R H Small wood , D R Hose , D C Barber , "Medical Physics

and Biomedical Engineering", CRC Press, 1999.

2. Gopal B.Saha "Physics and Radiobiology of Nuclear Medicine" Springer, 3rd ed, 2006

REFERENCES

1. John R. Cameron and James G. Skofronick, "Medical Physics

WEEK 10: CYCLE TEST II

WEEK 11: Class-B push-pull amplifier – Complimentary symmetry type - Class- C amplifier – Heat sinking .

UNIT V VOLTAGE REGULATIONS WEEK 12: Shunt voltage regulator – Series voltage regulator – current limiting – feedback technique

WEEK 13: SMPS (Block diagram approach) – DC to DC converter - Three terminal IC regulators (78XX and 79XX).

WEEK 14: REVISION FOR FIVE UNITS

WEEK 15: ICD CLASSES

TEXT BOOKS:

1. Robert L. Boylestad, Louis Nashelsky , Electronic Devices and circuit Theory ,

Prentice Hall of India , 2004.

REFERENCES

1. David A. Bell , Electronic Devices And Circuits 4 th Edition Prentice Hall of India,

2003.

2. Millman Haykins, Electronic Devices And Circuits,2nd Edition Tata MC Graw

Hill,2007.

BM2204 ELECTRONIC CIRCUITS

UNIT I DIODE APPLICATIONS AND TRANSISTOR BIASING

WEEK 1: Rectifiers – HWR, FWR, Bridge rectifier with and without capacitor and pie filter.Clipper- clampers – voltage multiplier circuits - Operating point of the bi-polar junction Transistor

WEEK 2: Fixed bias circuit – Transistor on saturation Emitter stabilized Bias Circuit –Voltage divider bias – Transistors switching network

WEEK 3; Trouble shooting the Transistor (In circuit testing)-practical applications. Biasing the FET transistors - CMOS devices –MOSFET handling.

UNIT II SMALL SIGNAL AMPLIFIERS

WEEK 4: Two port network, h-parameter model – small signal analysis of BJT (CE and CCconfigurations only) — high frequency model of BJT (CE configuration only)

WEEK 5: CYCLE TEST

WEEK 6:smallsignal analysis of JFET (CS configuration only) - Frequency response of BJT and FET.

UNIT III FEEDBACK AMPLIFIER AND OSCILLATORS

WEEK 7; Basic of feedback system (block diagram approach) – Types of feedback amplifier –Basic principles of oscillator.

WEEK 8: Audio oscillators – RC phase shift and wein bridge oscillator. RF oscillators – Heartly and Collpit oscillator – Crystal oscillator,Multivibrators.

UNIT IV POWER AMPLIFIERS

WEEK 9; Definition – Types of power amplifiers – Class A (series fed – transformer coupled)- Class B amplifier

BM2202 SIGNALS AND SYSTEMS

1. Classification of Signals and Systems

WEEK 1: Classification of signals – Continuous-time signal and discrete-time signals – periodic and aperiodic signals – even and odd signals – energy and power signals deterministic and random signal.

WEEK 2: Basic operations on signals – arithmetic operations – reflections –time shifting – time scaling. Types of signals – exponential, sinusoidal, step, impulse and ramp. System - impulse response of the system.

WEEK 3: Classification of systems – stable memory – invertible – time invariant – linear – causal. Convolution integrals and its properties. Sampling theorem.

2. Fourier Series and Fourier Transform

WEEK 4: Continuous-time Fourier series (CTFS) – Exponential and trigonometric representation of CTFS. Dirichlet condition. Properties of CTFS – linearity, time-shifting, time-reversal, time-scaling, multiplication, Parseval's relation – differentiation – integration. Continuoustime Fourier transform (CTFT) – properties of CTFT – linearity, timeshifting,timereversal, time-scaling, multiplication, convolution, Parseval's relation – differentiation in time and frequency domains– integration.

WEEK 5: CYCLE TEST

WEEK 6: Application to systems - solution to differential equation using CTFT. Discrete-time Fourier series (DTFS) and Discrete-time Fourier transform (DTFT) –properties – linearity, time-shifting, time-reversal, time-scaling, multiplication, Parseval's relation – difference – accumulation. Application to systems - solution to difference equation using DTFT.

3. Laplace Transform

WEEK 7: Unilateral and bilateral Laplace transform (LT) – region of convergence (ROC) -

Properties of LT – linearity, time-shifting, time-reversal, time-scaling, multiplication, convolution,

WEEK 8: Parseval's relation – differentiation in time and frequency domain –integration – initial value and final value theorem – inversion of LT – solution to differential equation using LT – analysis of passive network using LT.

4. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT)

WEEK 9: Discrete Fourier transform – properties of DFT – linearity, circular-shifting in time and frequency domains, time-reversal, time-scaling, circular correlation,multiplication,convolution, parseval's relation – circular convolution – circle method,

WEEK 10: CYCLE TEST II

WEEK 11: matrix method –sectional convolution – overlap-add method and overlap-save method – radix-2 fast

Fourier algorithm – decimation-in-time FFT – decimation-in-frequency FFT – inverse FFT.

5. Z-tranform and state matrix

WEEK 12: Z-transform (ZT) – region of convergence (ROC) - properties of ZT – linearity, time shifting, time-reversal, time-scaling, multiplication, convolution, parseval's relation – differentiation in time and frequency domain

WEEK 13: integration – initial value and final value theorem – inversion of ZT – power series method, partial-fraction method, residual method - solution to difference equation using ZT.

State variable description for LTI system – determination of transfer function from state

model – discrete-time model.

WEEK 14: REVISION FOR FIVE UNITS

WEEK 15: ICD CLASSES

WEEK 16: CYCLE TEST III

WEEK 11: Pre-amplifier impedance matching circuits – isolation amplifier. Spectrum analyzer.

UNIT V DISPLAY AND RECORDING DEVICES

WEEK 12: Digital voltmeter – Multi meter – CRO – block diagram, CRT – vertical & horizontal deflection system, DSO, LCD monitor,

WEEK 13: PMMC writing systems, servo recorders, photographic recorder, magnetic tape recorder, X–Y recorder, thermal recorder.

WEEK 14: REVISION FOR FIVE UNITS

WEEK 15: ICD CLASSES

WEEK 16: CYCLE TEST III

TEXT BOOK

1. Principles of Applied Biomedical Instrumentation L.A Geddas and L.E.Baker – John Wiley and sons.

2. Albert D.Helfrick and William D. Cooper. Modern Electronic Instrumentation and Measurement Techniques", Prentice Hall of India, 2007.

REFERENCES

1. Ernest o Doebelin and dhanesh N manik, Measuremet systems, Application and design ,5th edition ,McGraw-Hill, 2007.

2. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi, 2007.

3. Leslie Cromwell, "Biomedical Instrumentation and measurement", Prentice hall of India, New Delhi, 2007.

4. John G. Webster, "Medical Instrumentation Application and Design", John Wiley and sons, New York, 2004

BM2203 SENSORS AND MEASUREMENTS

UNIT I SCIENCE OF MEASUREMENT

WEEK 1: Measurement System – Instrumentation – Classification and Characteristics of Transducers –

WEEK 2: Static and Dynamic – Errors in Measurements –

WEEK 3: Calibration – Primary and secondary standards.

UNIT II DISPLACEMENT, PRESSURE, TEMPERATURE SENSORS

WEEK 4: Strain Gauge: Gauge factor, sensing elements, configuration, unbounded strain gage,biomedical applications; strain gauge as displacement & pressure transducers: force Summing devices, capacitive transducer, inductive transducer, LVDT,

WEEK 5: CYCLE TEST I

WEEK 6: Passive types: RTD materials & range, relative resistance vs. temperature characteristics, thermistor characteristics, biomedical applications of Temperature sensors. Active type: Thermocouple – characteristics,

UNIT III PHOTOELECTRIC AND PIEZO ELECTRIC SENSORS

WEEK 7: Phototube, Photo Multiplier Tube (PMT), photovoltaic, photoconductive cells, photo diodes, phototransistor, comparison of photoelectric transducers, **WEEK 8:** spectro-photometric applications of photo electric transducers. Piezoelectric active transducer and biomedical applications as pressure & Ultrasound transducer.

UNIT IV SIGNAL CONDITIONING & SIGNAL ANALYSER

WEEK 9: AC and DC Bridges –wheat stone bridge, Kelvin, Maxwell, Hay, Schering

WEEK 10: CYCLE TEST II

TEXT BOOK

1. Allan V. Oppenhein et al, “Signals and Systems”, Pearson Education, 2007

REFERENCE

1. Simon Haykin and Barry Van Veen, “Signals and Systems”, John Willey, 1999

2. Roger E. Zeimer et al, “Signals and Systems”, McMillan, 2nd Edition, 1999.

3. Douglas K. Linder, ““Signals and Systems”, McGraw-Hill, 2nd Edition, 1999.