ECE- 4th year

B. N. Mandal University, Laloonagar, Madhepura

Details of theory & Sessional Papers code of 4th Year B. Tech. Course

Branch: Electronics & Communication Engineering

Subject	Subject Code	Branch Code	L	T	P	Th. Ext.	Th. Int.	Sessional
Linear Control Theory	LCT	EC-401	2	1	3	70	30	Linear Control Theory-50
Advanced Electromagnetic Field Theory	AEMFT	EC-402	3	1	0	70	30	---------
Digital Signal Processing	DSP	EC-403	2	1	3	70	30	Digital Signal Processing-50
Power Electronics	PE	EC-404	2	1	3	70	30	Power Electronics-50
Computer Networks	CN	EC-405	3	1	0	70	30	---------
Microwave Engineering	μWE	EC-406	2	1	3	70	30	Microwave Engineering-50
Elective-III (Digital Communication & Telecommunication Management)	Elective-III (DCTM)	EC-407	2	1	3	70	30	Elective-III-50 (Digital Communication & Telecommunication Management)
Elective-IV (Mobile Computing)	Elective-IV (MC)	EC-408	3	1	0	70	30	---------
Project	Project	EC-409	0	0	3	---	---	Project-100
Seminar	Seminar	EC-410	0	0	3	---	---	Seminar-50

ective-III

1. Digital Communication & Telecommunication Management.
2. VLSI Design.
3. Biomedical System & Its Applications.

ctive-IV

1. Mobile Computing.
2. Nanotechnology & Its Applications.
3. Fiber Optics & Networking Technology
4. ~~Speech Processing~~ Digital Image processing

xpert-I (External) ame: esignation: ddress:	Expert-II (Internal) Name: Dr. Vipin Kr. Designation: HOD, ECE Address: MIT, Purnea	Dean Faculty of Science & Engineering BNMU, Madhepura	Principal MIT, Purnea	Member Secretary Syllabus Committee BNMU, Madhepura

bject: Linear Control Theory Branch Code: EC- 401 (ECE/EE)

-P: 2-1-3

st Term

1. **Introduction**: the control system, servomechanism, servomotor, standard test signal.
   Lecture: 4
2. **Time response analysis:** time response of second order system, design consideration for higher order system stability relative stability
   Lecture: 6
3. **The root locus technique:** concept, consideration of root loci roots contour system with transformation log.
   Lecture: 8

ond Term

4. **Frequency response analysis:** correlation between time and frequency response, bode plot. root locus and minimum phase system log magnetic vs phase plot. stability in frequency domain. polar plots.
   Lecture: 8
5. **Mathematics preliminaries:** Nyquest stability criteria, assessment of relation stability using Nyquest criteria.
   Lecture: 5
6. **Close loop frequency response.**
   Lecture: 3
7. **Compensation of control system:** Introduction type compensation approach to compensation.
   Lecture: 8

xt books:

1. Modern control system by Nagrath & Gopal

ference books:

1. Modern control engineering byn K Ogata, Pearson Education.
2. Control Engineering by kuo.

near Control Theory Lab:

1. AC & DC position control system.
2. AC & DC servomotors
3. Stepper motor control using 8085µP
4. Seven segment display from 0-9 using 8085µP.
5. OFF/ON control using 8085µP.

ct: Advanced Electromagnetic Field Theory Branch code: EC-402 (ECE)

: 3-1-0

Term

Guided wave and wave guide: waves between parallel planes, TM &TE waves, Their propagation and attenuation in parallel plane guide. Rectangular wave guide – TE & TM waves in rectangular guides, Wave impedance, circular wave guides, Introduction to resonator. **Lecture 15**

Radiation : Potential function & electromagnetic fields, a small current element radiation, power radiated by current element & radiation resistance, Radiation from quarter wave monopole & half wave dipole. **Lecture: 9**

d Term

Antenna: Network theorem, two element array, linear array, multiplication of patterns, binomial array. **Lecture: 6**

Directional properties and gain terminal Impedance: type of antenna- mutual impedance of antenna, travelling wave antenna, rhombic antenna, yagi antenna. **Lecture: 3**

Propagation of EMF waves: various paths, space waves, surface waves & propagation along spherical earth. **Lecture: 4**

Tropospheric Propagation: Mechanism of Tropospheric wave propagation, duct and super reflection **Lecture: 3**

Nature and properties of ionosphere: Chapmann's theory of ionospheric layer formation, Critical frequency, MUF, effect of geo- bar magnet, solar activity, and fading of ionospheric waves, Appleton-Hartree theory of wave propagation. **Lecture: 6**

Text Books:

1. Electromagnetic waves and radiating system by Jordan & balmain, PHI
2. Electromagnetic Fields & waves by K.D Prasad, Satya Prakashan
3. Antenna and wave Propagation Satya Prakashan.

ct: Digital Signal Processing Branch code: EC-403 (ECE)

2-1-3

erm

Overview of DSP: Basic elements of DSP system, advantage of DSP over analog classification of . Concept of frequency in continuous time and discrete time, continuous time and discrete time dal wave. **Lecture: 10**

Discrete time system: linear time invariant. Response of LTI system- convolution sum, description rete time system by difference equation and complete solution of difference equation, implementation rete time system, correlation of discrete time signal. **Lecture: 14**

l term

Z- Transform and its application to analysis of LTI system.	Lecture: 3
Discrete time fourier Transform, properties of DTFT.	Lecture: 3
Frequency domain representation of LTI system.	Lecture: 3
Sampling and reconstruction of Analog signal.	Lecture: 3
Discrete fourier series. Discrete fourier Transform. properties of DFT , FFT.	Lecture: 6
Digital filter structures, FIR and IIR designs.	Lecture: 6

ooks:

Digital signal processing by PRoakis & Manolakis, Pearson\

Digital signal processing by Ingle & proakis, Thomson

ence books:

Digital time signal processing by Oppenheim & Schafer, Pearson.

Digital signal processing computer based approach by Mitra, TMH

ical:

To represent basic signal. (unit step, unit impulse, ramp, exponential, sine and cosine)
To develop a program for discrete convolution.
To develop a program for discrete correlation.
To understand stability test.
To understand sampling theorem.
To design analog filter (low pass, high pass, band pass, band stop.)
To design digital filter (low pass, high pass, band pass, band stop.)
To design FIR filter using window technique.
To develop a program to compare direct realization value of IIR digital filter.
. To develop a program to computing parallel realization value of IIR digital filter.
. To develop a program to computing cascading realization value of IIR digital filter.
. To develop a program to computing inverse Z-Transformation of a rotational transfer function.

Subject: Power Electronics Branch Code: EC 404 (ECE)

L-T-P: 2-1-3

First Term

1. Introduction to thyristor and control circuits; terminal, characteristics, rating and protection. Lecture:8
2. Thyristor Firing Circuits: Trigring circuit suitable for 1-phase and 3-phase fully controlled convertors. Lecture:10
3. Convertors: Uncontrolled three phase power rectifiers, 1 phase and 3 phase line commutated A.C to D.C convertors. Lecture:8

Second Term

4. Inverters: Basic Bridge inverter circuit 1-phase and 3-phase McMurray- Bedford method communication, pulse width modulation inverters. Series inverter gating circuits. Lecture:8
5. Choppers: Types of choppers, steady state analysis of type A chopper, communication methods, chopper control of D.C Motor. Lecture:8
6. Other applications: A.C voltage regulator, cyclo converter. Lecture:4
7. Application of thyristors for industrial drives. Lecture:4

Text Books:

1. Power Electronics by Rashid, PHI.
2. Power Electonics by Ned Mohan, John Wiley4 Sons

Reference Books:

1. Thyristorised Power Controllers by G.K dubey, Wiley Eastern Ltd.
2. Power semiconductor circuits by Dewan & Strangten, John Wiley& Sons.

Power Electronics Lab

Practical Based On Syllabus

COMPUTER NETWORK

BRANCH CODE-EC-405 L-T-P:2-1-3

FIRST TERM

1. Introduction: Network Hardware & Software, OSI Reference model ,TCP/IP Model, Comparison of the OSI &TCP/IP model. **Lecture-04**
2. The physical link layer: Guide transmission media, physical layer standard. **Lecture-04.**
3. The data link layer : Need for data link control, Service provided by the data layer, Frame design consideration, Flow control mechanism, data link error control, error control in stop-and-wait mechanism & sliding window mechanism, Sequence numbering, piggybacking acknowledgement, Data link management. **Lecture-8**
4. MAC Protocols: Random Access Protocols-ALOHA. **Lecture-03**
5. IEER 802.3 Ethernet: Contention access, CSMA/CD, physical topology of Ethernet , Ethernet repeater , types of Ethernet. **Lecture-05**

SECOND TERM

6. Bridges and layer-2 switches: LAN bridge, transparent bridges, spanning tree algorithm , source routing bridge, route discovery in source routing, layer 2 Ethernet switches. **Lecture-6**
7. The network layer: network layer design issue, purpose of network layer, function of network layer. **Lecture-5**
8. Introduction of internet protocol: IPv4 Format, ICMP. **Lecture-2**
9. Routing Algorithms: static routing, dynamic routing, distance vector routing algorithm, routing information protocol, link state routing, OSPF routing protocol, interior and exterior protocol, border gateway protocol. **Lecture-10**
10. Introduction to transport layer: TCP & UDP. **Lecture-01**
11. Introduction to application layer: TCP/IP Application protocol. **Lecture-01**

Text Book:

1. Data communication & networking by Forouzan, Tata McGraw Hill.
2. Computer network, 4e, by Andrew s. Tenenbaum, Pearson Education/PHI.
3. Data communication and computer network, by Prakash C. Gupta, PHI.
4. Networking Ali-in-one desk Reference by Doug Lowe, wiley Dreamtech.

Reference Book:

ect: Microwave Engineering Branch code: EC-406 (ECE)

2-1-3

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Microwave Oscillators and amplifiers: Advantage and uses of microwave, limitation of conventional vacuum tubes at UHF and microwave frequency, UHF and microwave BJT.
Lecture: 4

Multicavity klystron: Reflex klystron, multicavity klystron, travelling wave tube, magnetron, backward wave oscillator, gunn oscillator, tunnel diode, IMPATT diode. **Lecture: 13**

Microwave components: Coupling probes & loops, attenuator, sorting plunger, magic tee, directional coupler, phase shifters, isolators & circulators. **Lecture: 7**

l Term;

Microwave measurement: Measurement of power, standing wave detectors and its uses, impedance measurement, measurement of frequencies by wave meters, attenuation measurement, noise factor measurement. **Lecture: 6**

Microwave receiver: Block diagram representation, varactor diode as mixer, antenna noise and noise temperature. **Lecture: 6**

Microwave antennas: Log-periodic, slot, horn antennas and parabolic reflector (dish antenna). **Lecture: 6**

Microwave Links & space communication: Geostationary satellites, geostationary orbit, active and passive satellites, up-down links, fading effect, atmospheric effects, and solar activities. Digital satellite communication. **Lecture: 6**

ooks:

Microwave devices and circuits by Samuel Y Liao, PHI.

nce books:

Microwave and radar engineering by M Kulkarni, Umesh Pub.
Foundations of microwave engg. By R F Collins, McGraw Hill.
Microwave principles by Reich et Al Van Hestrand.
Communication in space by Jaffen, Halt Renetat Winston.

ave Engg. Lab:

Measurement of frequency/ wavelength in a rectangular WG.
Study of dc V-I characteristic of gunn oscillator.
Study of multihole directional coupler and measurement of mainline and auxiliaryline VSWR.
Study of magic tee.
Study of circulator.
Study of Isolator.

bject: Elective-III (Digital Communication & Telecommunication Management)
anchCode:EC-407 (ECE)

-P: 3-1-0

t Term

1. **Comparision between Digital and Analog system:** Numbering systems, Baudet code and ASCII code, Line encoding formats. **Lecture: 3**
2. **Information theorem:** Information and entropy, Hartley Shanon theorem, discrete channel with discrete noise, channel capacity and BW efficiency, inter-symbol interference (ISI) and equalizer, communication through fading media. **Lecture: 9**
3. **Nyquist Sampling theorem:** ADC, PCM, Companding and reconstruction, source encoding, channel encoding. **Lecture: 12**

nd Term

4. **Digital modulation scheme:** Binary shift keying and M-ary keying. **Lecture: 8**
5. **Secure communication:** Spread spectrum communication and cryptography. **Lecture: 8**
6. Special topics: Various switching systems, protocol ISDN, LAN, ARPANET, ALOGA, Ethernet, Internet. **Lecture: 8**

books:

1. Telecommunication topics and applications of functions and probabilities in electronic communication by E Brya, PHI.

erence books:

1. Data communication and networking by Forouzan, TMH.
2. Data and computer communication by Stalling, Pearson.
3. Computer networking by Tenenbaum, Pearson.
4. Internet working with TCP IP vol-I Principles protocols and architecture by Douglas E Corner, PHI.
5. Internet working with TCP IP vol-II Design, implementation and internals by Douglas E Corner and David Stevens, PHI.
6. Internet working with TCP IP vol-III Client server programming and application by Douglas E Corner and David I Stevens, PHI.

ol Communication & Telecommunication Management Lab:

1. To study the waveform of sampled signal and reconstructed output.
2. To study the waveform of PAM and demodulated outputs.
3. To study the waveform of PWM and PPM.
4. To study the Fiber optic digital modulator.
5. To study the TDM and demultiplexing using optical fiber.

t: Elective-III (VLSI Design) BranchCode:EC-407 (ECE)

3-1-0

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1. **Introduction to CMOS circuits:** MOS transistors, MOS transistor switches, CMOS logic, the inverter combinational logic, NAND gate, NOT gate, Compound gates, multiplexers, memory latches and registers circuit and system representation: Behavioral representation, structural representation and physical representation. CMOS processing technology: Si semiconductor technology- An overview. Wafer processing. Oxidation, epitaxy deposition, ion implantation and diffusion. The Si gate process- basic CMOS technology, basic n-well CMOS process, p-well CMOS process, twin tub process, Si on insulator, CMOS process enhancement interconnect, circuit elements 3-D CMOS. **Lecture: 14**
2. **Layout design rule:** Layer representations. CMOS n-well rules. design rule of background scribe line, layer assignment, SOI rule, latch up. physical origin of latch up, latch up triggering, latch prevention, internal latch up prevention techniques. I/O latch up preventions. **Lecture: 10**

Term

3. **Switching characteristics:** Analysis delay models, empirical delay model, gate delay, power dissipation: static dissipation, dynamic dissipation, short-circuit dissipation, total power dissipation, CMOS design methods, design strategies, hierarchy, regularity, locality. **Lecture: 8**
4. **Programming logic:** programming logic structure, programmable interconnect and array design, full custom mask design. **Lecture: 8**
5. **Design method behavioural synthesis:** RTL synthesis, placement, routing, layout synthesis, desing capture tools, HDL design schematic, layout design, floorplanning, chip composition, design verification, simulation, limiting verifier, netlist comparisons. **Lecture: 8**

ooks & Reference books:

1. Principles of CMOS VLSI design: a system perspective by Neil H E Weste and Kamran Eshraghian, Addision Wesley pub.
2. Digital integrated circuits by Demassa and Ciccone, Wiley.
3. Modern VLSI design system on Si by Wayne Wolf: Addision Wesley Longman pub.
4. Basic VLSI design by Douglas A Pucknell and Kamran Eshranghian, PHI.
5. Digital integrated circuits: A Design perspective by Jan M Rabaey, PHI.

1. Computer networking: A Top-down approach featuring the internet, 3e by James F.Kurose.
2. Computer network by Godbole, Tata McGraw Hill.
3. Computer networking, by standard H.Rowe, Marsha I.Schuh.

COMPUTER NETWORK LAB:

PRACTRICAL BASED ON SYLLABUS

bject: Elective-III (Biomedical Systems & Its Applications) BranchCode:EC-407
(ECE)

-P: 3-1-0

st Term

1. **Production of x-rays:** X-ray generator, properties of x-ray, basic interaction between x-ray and matter, types of machines and their control, filters, x-ray beam restrictors and grids, x-ray image control, detection of x-ray, x-ray films and their processing, radiographic image. **Lecture:8**
2. **Fluoroscopic imaging:** Intensifying screen and scattered radiation, image intensifier, basic techniques, digital subtraction techniques, xeroradiography. **Lecture:4**
3. **Characteristics of ultrasound:** Ultrasound transducers, different mode of operation, characteristics of ultrasonic beam, interactions between ultrasound and matter, design and application of real time ultrasound machine, Doppler techniques, Doppler transducer and modes of operation, colour Doppler, arrays, 3-D ultrasonography. **Lecture:6**
4. **Computed tomography(CT):** Basic principle, generations of CT scan machine, spiral CT, data accumulation, data handling system, components of CT scan machine, algorithms of image reconstruction, factors affecting image quality. **Lecture:6**

ond Term

5. **Principles of magnetic resonance:** Imaging (MRI), elementary physics at MRI, nuclear magnetic resonance, imaging of magnetization, bloch equation, magnetic field gradient, receiver-transmitter and different RF coils for MRI machine. **Lecture:6**
6. **Instrumentation and principle of operation** of Gamma camera, single photon emission computed tomography (SPECT), positron emission tomography (PET), system performance and image reconstruction. **Lecture:6**
7. **Radiation biohazards:** Ionizing and non ionizing radiation hazards, radiation detecting equipment. **Lecture:4**
8. **Instrumentation of endoscope** and its attachments, types of endoscopes, cold light source, techniques applied in different type of endoscope for imaging. **Lecture:3**
9. **Fundamentals of digital image processing.** **Lecture:5**

books:

1. Introduction to Biomedical engineering by Endrele, Blanchard, Bronzino.
2. Handbook of Biomedical instrumentation by R S Khandpur.
3. Physics of Diagnostic Radiology by T S Curry, J E Dowdey & R C Murry.
4. Nuclear diagnostic imaging practical clinical application by E Edmund Kim & Thomas P Haynie.

ct: Elective-IV (Mobile Computing) **BranchCode:EC-408** (ECE)

3-1-0

erm

1. **Wireless Communication Systems & Standards:** Evolution of mobile radio communications, different generations, (1G to 4G), of cellular network, GSM, UMTS, GPRS, EDGE, Cellular telephone systems, WLAN, WLL, Bluetooth, PAN. **Lecture:6**
2. **Propagation & fading:** Propagation path loss, free space propagation model, outdoor propagation models (Okumura model & hata model), indoor propagation models (partition losses in the same flow and between floors), Multipath fading, time dispersive and frequency dispersive channels, delay spread and coherence bandwidth, LCR, and ADF. **Lecture:3**
3. **Diversity and combining techniques**: Diversity schemes (Space, frequency, field and polarization diversities) and combining techniques. **Lecture:4**
4. **Mobile radio interference and system capacity**: Co-channel interference and system capacity, channel planning for wireless systems, adjacent channel interferences, power control for reducing interference, near- end-to-end interference, inter-symbol and simulcast interference, false alarm rate and word error rate. **Lecture:6**

Term

5. **The Cellular concept:** Frequency assignment and channel assignment, frequency reuse, handoff, sectoring, repeaters for range extension, Microcell zone, spectral efficiency, DS-SS, FH-SS. **Lecture:9**
6. **Antenna design parameters:** Antennas used for mobile communications, radiation patterns, smart antenna (basic concept), antenna location, spacing and height in the base station and at the mobile unit. **Lecture:6**
7. **Multiple access techniques:** FDMA, TDMA, CDMA, SDMA, OFDM, DS-CDMA, TH-CDMA, Cellular systems, capacity of cellular CDMA, WCDMA. **Lecture:9**

oks:

1. Wireless communications: Principles and practice by T S Rapport, PHI.
2. Wireless communication technology by Roy Blake, Thomson-Delmar.
3. Mobile Cellular telecommunications systems by W C Y Lee.

: Elective-IV (Nanotechnology & Its Applications) BranchCode:EC-408
(ECE)

1-0

m

General introduction: Basics of quantum mechanics, harmonic oscillator, magnetic phenomena, band structure in solids, Mossbauer and spectroscopy, optical phenomena bonding in solids, anisotropy. **Lecture: 6**

Silicon Carbide: Application of Si carbide, nano materials preparation, sintering of SiC, x-ray diffraction data, electron microscopy sintering of nano particles, nano particles of alumina and Zinrconia: Nano materials preparation, characterization, wear materials and nano composites. **Lecture: 6**

Mechanical properties: Strength of nano crystalline SiC, preparation for strength measurements, mechanical properties, magnetic properties. **Lecture: 4**

Electrical properties: Switching glasses with nanoparticles, electronic conduction with nano particles. Optical properties: optical properties, special properties and the coloured glasses. **Lecture: 4**

Process of synthesis of nano powders, electro deposition, important nano materials. **Lecture: 4**

erm

Investingating and manipulating materials in the nanoscale: Electron microscopics, scanning probe microscopics, optical microscopics for nano science and technology, x-ray diffraction. **Lecture: 4**

Nanobiology: Interaction between biomolecules and nanoparticle surface, different types of inorganic materials used for the synthesis of hybrid nano bio assemblies, application of nano in biology, nanoprobes for analytical applications- A new methodology in medical diagnostics and biotechnology, current status of nano biotechnology, future perspectives of nanobiology, nanosensors. **Lecture: 10**

Nanomedicines: Developing of nanomedicines, nanosystems in use, protocols for nanodrug administration, nanotechnology in diagnostics applications, materials for used in diagnostics and therapeutic applications, molecular nanomechanics, molecular devices, nanotribology, studying tribology at nanoscale, nanotribology applications. **Lecture: 10**

ks:

Nano materials by A K Bandopadhyay, New age pub.
Nano essentials by T Pradeep, TMH.

t: Elective-IV (Fiber Optics & Networking Technology) BranchCode:EC-408
(ECE)

3-1-0

rm

. **Introduction:** Generations of optical communication, advantages, elements of optical fiber transmission link. Lecture: 2

2. **Optical fiber:** Classification of fibers, fiber materials and fabrication methods, ray optics representation and wave optics representation for step index and graded index fibers, modes, phases and group velocity, goos-hanchen shift, power flow in step index fibers. **Lecture: 10**

. **Attenuation and dispersion in optical fiber:** Signal attenuation and distortion in optical fibers, dispersion effects in optical fibers. **Lecture: 6**

[illegible] operating characteristics and modulation capabilities of the LED and LD sources. Lecture: 6

Term

. **Source to fiber power launching** and coupling, lensing schemes for coupling improvement, fiber to fiber coupling and alignment methods, splicing techniques, fiber connectors. **Lecture: 4**

. **Optical receiver:** Optical receiver configuration and performance, pre amplifier design for optical receiver, analog and digital receiver. **Lecture: 4**

. **Point to point transmission links**, wavelength division multiplexing, optical data buses, link power and rise time budget, optical amplifier. **Lecture: 6**

. **Optical networking:** Fiber optics in LAN, MAN, SAN, WAN, FDDI architecture, SONET/SDH architecture, SONET/SDH network elements. **Lecture: 6**

. **Potential applications and future prospects of optical fibers,** multimode intensity sensors and single mode interferometric sensors. Lecture: 4

ks:

Fundamentals of fiber optics in telecommunication and sensor systems by B P Pal, New age Pub.

books:

Optical fiber communication by G Keiser, McGraw Hill, 3rd edition.
Optical networking and WDM by Walter Goralski, TMH.
Optical fiber communications by J M Senior, PHI, 2nd edition.
Introduction to fiber optics by Ghatak Y Thyagarajan, Cambridge Univ. Press.
Optical communications by J H Franz and V K Jain, Narosa Pub.

bject: Elective-IV (Speech Processing) BranchCode:EC-408 (ECE)

-P: 3-1-0

st Term

1. **Speech signal and processing:** Speech production mechanism, classification of speech sounds. Nature of speech signal, model of speech production, purpose of speech signal processing, digital models of speech signal, digital proce[illegible] **Lecture: 12**
2. **Time domain methods for speech processing:** Time domain parameters of speech, methods for extracting the parameters. Zero crossing, auto correlation function, pitch estimation. **Lecture: 12**

ond Term

~~analysis, spectrographic analysis, format extraction, pitch extraction, analysis.~~ ~~**Lecture: 8**~~

4. **Synthesis system linear predictive coding of speech:** Formulation of linear prediction problem in time domain solution of normal equation, interpretation of linear prediction in auto correlation and spectral domains. Application of speech signal processing: Speech recognition, speech synthesis and speaker identification and verification. **Lecture: 10**

t books:

1. Speech and language processing by Daniel Jurafsky and James H Martin, Pearson.