Curriculum Structure (L-T-P) for ECE DeptforM.Tech. (Electronics and Communication Engineering)

Specializations: **General ECE , Micro-electronics,**

Semester 1: (Common to BOTH the Specialisations)

Course Name	Core/Elective	Code	Credit	L-T-P	Pre Requisites
Applied Mathematics	Core	Hard	4	3-1-0	Nil
Programming for Engineering Applications	Core	Hard	4	0-2-2	Nil
Digital System Design	Core	Hard	4	2-1-1	Nil
Introduction to Microelectronics	Core	Hard	4	3-0-1	Nil
Communication Engineering	Core	Hard	4	2-1-1	Nil
Total			20	10-10-10= 30	

Semester 2:(Depending upon the Electives Chosen as specified in the Basket on Next Page)

Course Name	Core/Elective	Code	Credit	L-T-P	Pre Requisites
Elective 1	Elective	Soft[1]	4	3-1-0	Nil
Elective 2	Elective	Soft[1]	4	3-1-0	Nil
Elective 3	Elective	Soft[1]	4	3-1-0	Nil
Elective 4	Elective	Soft[1]	4	3-1-0	Nil
Independent Study	Elective	Soft[1]	4	0-2-2	Nil
Total			20	12-12-4=28	

Semester 3:

Course Name	Comp/Elective	Code	Credit	L-T-P	Pre Requisites
Elective 5	Elective	Soft[1]	4	3-1-0	Nil
Elective 6 / Independent Study	Elective	Soft[1]	4	3-1-0 / 0-2-2	Nil
Mini Project	Core	Soft[1]	4	0-1-3	Nil
Total			12	06-06-06=18 / 6-8-10 =24	

Semester 4:

Course Name	Core/Elective	Code	Credit	L-T-P	Pre Requisites
Thesis	Core	Hard	12	0-2-12	**Mini Project**
Total			12	0-04-24=28	

[1]*The elective courses by nature are all "SOFT" courses. If a candidate needs MTech (Electronics and Communication) with specialization, the electives will be translated as "HARD".*

[2]*Independent study should be chosen on recommendation of the concerned faculty member of the department. For this course, the assessment procedure should be same as applicable for any other electives in the format of $C_1 + C_2 + C_3$ under the mentorship of a suitable faculty expert. .*

Specialization: Micro-Electronics								**Semester : 2nd Semester**
Electives **(Choose any 4 from the row)**	Embedded Systems Design	Hardware Design Methodology	Testing and Verification	Analog VLSI Design	VLSI Design and Automation	Advanced Embedded System Design	RTOS	Any other subjects- to be decided later
Specialization: Micro-Electronics								**Semester : 3rd Semester**
Electives **(Choose any 2 from the row)**	-	Mixed Signal IC Design	Advanced Computer Architecture	MEMS	Low Power Design	RF circuit Design	Any other subjects- to be decided later	Any other subjects- to be decided later
Specialization: General ECE								**Semester: 2nd Semester**
Elective 1 **(Choose any 1 from the row)**	-	Advanced VLSI Technology	Quantum Mechanics	VLSI Design and Automation	Advanced Engineering Electromagnetics	Advanced Digital Signal Processing	Optical Electronics	Modern Control System
Elective 2 **(Choose any 1 from the row)**	-	Physics of Nanoscale Devices		Advanced Embedded System Design	Advanced Anteena Design and Measurements	Stochastic Process	Guided Optical Component and Devices	Embedded Control System
Elective 3 **(Choose any 1 from the row)**	-	Semiconductor Optoelectronics		RTOS	Microwave measurement and Design	Detection and Estimation Theory	Optical Communication Systems	Intelligent Control Systems

Elective 4 **(Choose any 1 from the row)**	-	Physics of Semiconductor Materials	Testing and Verification	RF Component Design and Testing	Principles of Wireless Communication	Advanced Information Theory and Coding	CMOS Photonics	Advanced Industrial and Electronics Instrumentation
Specialization: General ECE							**Semester: 3rd Semester**	
Elective 1 **(Choose any 1 from the row)**	-	Advanced Lithography	Nanoscale Device Modelling	Advanced Computer Architecture	Analytical and Computational techniques in EM's	MIMO Communications	Optical Networks	Robust Control Systems
Elective 2 **(Choose any 1 from the row)**	-	Thin Film Science and Technology	High Speed Devices	-	Monolithic Microwave Integrated Circuits	MIMO RADAR Systems	Photonic Sensors	Digital Control Systems

Syllabus

I Semester

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. Name of the Course: Applied Mathematics
2. **LTP structure of the course:** 3–1–0
3. **Objective of the course:** To make the students aware about the wonderful topics of Applied Mathematics
4. **Outcome of the course:** The student is expected to solve and apply in their research activities.
5. **Course Plan:**

Component	**Unit**	**Topics for Coverage**	**Chapter No.(Optional)**
Component 1	Unit 1	Analytic function of a complex variable, Calculus of residues, linear response, dispersion relations.	
	Unit 2	Analytic continuation gamma function, Mobius transforms, Multivalued functions, integral representations.	
Component 2	Unit 3	Fundamentals of Green's function, diffusion equation, non-relativistic scattering, The wave equation, rotation group	
	Unit 4	Random Variables and Random Processes	

6. **Text Book:**

1. M R Spiegel, Complex variables, Schaum Outline Series, 2000

2. M Boas, Mathematical Methods in Physical Sciences, Wiley, 1998

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. **Name of the Course: Programming for Engineering Applications**
2. **LTP structure of the course:** 0–2–2
3. **Objective of the course:** To prepare the student as an independent scientific programmer.
4. **Outcome of the course:** The student is expected to apply the methods in his/her research topics.
5. **Course Plan:**

Component	Unit	Topics for Coverage	Chapter No.(Optional)
Component 1	Unit 1	MATLAB programming and Simulink, Mathematica	
	Unit 2	NetSim, OptiWave, Computational Electromagnetics	
Component 2	Unit 3	HDL Tools and Programming	
	Unit 4	Software Programming	

6. **Text Book/References:-**

1. Operation and modeling of MOS transistor, by Y. Tsividis.

2. Introduction to MATLAB, manual by MATLAB.

3. Verilog hardware description language by samir palnitkar.

4. Introduction to Optiwave, Tutorial and manual by Optiwave.

5. Bruce F. Torrence and Eve A. Torrence, "The Student's Introduction to MATHEMATICA 174;: A Handbook for Precalculus, Calculus, and Linear Algebra" 2nd Edition, Cambridge
6. Peterson, A.F, Ray, S.L. and Mittra, R., "Computational Methods for Electromagnetics", Wiley-IEEE Press. 1998

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. Name of the Course: Digital System Design

2. **LTP structure of the course**: 2-1-1

3. **Objective of the course**: To let the first year M. Tech. students exposed to CMOS digital circuit design using commercial process design kits.

4. **Outcome of the course**: The students will learn how to design digital circuits using state-of-the-art design kits.

5. **Course Plan:** As per the below format only

Component	Unit	Topics for Coverage	Chapter No.(Optional)
Component 1	Unit 1	**Static and Dynamic MOS circuits**: Basic logic gates design, Performance-Speed, Power- study and calculation, Layout design	
	Unit 2	**Combinational and Sequential Circuits**, Switching Characteristics, Timings Analysis, delay calculations, metastability, Arithmetic (adders and multipliers)	
Component 2	Unit 3	**Memory:** SRAM, DRAM design and Integration issues, Non-volatile memory design.	
	Unit 4	**Frontend, Backend Design and synthesis**: RTL and GATE level modeling for digital systems, Logic Synthesis (floorplanning, placement, routing etc).	

6. Text Book:

1.Rabaey, Jan M., Anantha P. Chandrakasan, and BorivojeNikolic. Digital integrated circuits.Vol. 2. Englewood Cliffs: Prentice hall, 2002.

7. References:-

1. B. Parhami, *Computer Arithmetic: Algorithms and Hardware Designs,* 2nd edition, Oxford University Press, New York, 2010.

Kang, Sung-Mo, and Yusuf Leblebici.CMOS digital integrated circuits.Tata McGraw-Hill Education, 2003.

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. Name of the Course: Introduction to Microelectronics
2. **LTP structure of the course:** 3–0-1
3. **Objective of the course:** To prepare the student to learn the physics of solid state devices.
4. **Outcome of the course:** The student is expected to
5. **Course Plan:**

Component	Unit	Topics for Coverage	Chapter No.(Optional)
Component 1	Unit 1	Energy Bands and charge carriers in semiconductors, Metal-Semiconductor junction	
	Unit 2	BJT: Basic Operation &Model, Field effect transistors. Modern CMOS technology.	
Component 2	Unit 3	Crystal growth, Thermal oxidation of Si, ion implantation, basic diffusion process, CVD and PVD techniques.	
	Unit 4	Etching, lithography, metallization, refractory metals and applications	

6. **Text Book/References:**

1. B G Streetman and S Banerjee, Solid State Electronic Devices, PHI, 2000
2. R F Pierret, Field Effect Devices, Addison Wesley, 1990
3. S M Sze, VLSI Technology

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

Name of the Course: Communication Engineering

2. **LTP structure of the course**: 3-1-0

3. **Objective of the course**: To let the first year M. Tech. students exposed to fundamentals of communications engineering.

4. **Outcome of the course**: The students will learn the basics of the various communication theories.

5. Course Plan: As per the below format only

Component	**Unit**	**Topics for Coverage**	**Chapter No.(Optional)**
Component 1	Unit 1	Baseband and Band Pass Transmission of Digital Signals	
	Unit 2	RF Communications	
Component 2	Unit 3	Information Theory	
	Unit 4	Data Communications Protocols	

6. Text Book:-

1. A P Godse and UA Bakshi, Communication Engineering, Pearson, 2009

II SEMESTER

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. **Name of the Course**: Embedded System Design

2. **LTP structure of the course**: 3-1-0

3. **Objective of the course**: To let the first year M. Tech. students exposed to embedded system design.

4. **Outcome of the course**: The students will learn how to design embedded systems.

5. Course Plan: As per the below format only

Component	**Unit**	**Topics for Coverage**	**Chapter No.(Optional)**
Component 1	Unit 1	**Introduction:** Evolution of processors for embedded application, Design Process, Hardware/Software Interface.	
	Unit 2	**Embedded system design challenges**: Sensors and actuators, Interfacing, design constraints in design, Heterogeneity, Constructivity;	
Component 2	Unit 3	**Embedded Processor:** Performance and efficiency of ARM architecture (ARM 7, ARM 9, ARM 11). Thumb and ARM Instruction set and Programming; Parallelsim.	
	Unit 4	**Interfacing:** Memory Interfacing,, I/O interfacing, Interface IP: AMBA, DDR, Ethernet, USB, Analog IP: Data Converter and PLL, Embedded Memory IP;	

6. Text Book: Heath, Steve. Embedded systems design. Newnes, 2002.

7. References: Wolf, Wayne. FPGA-based system design.Pearson education, 2004.

B. Parhami, *Computer Arithmetic: Algorithms and Hardware Designs,* 2nd edition, Oxford University Press, New York, 2010.

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. **Name of the Course**: Hardware Design Methodology

2. **LTP structure of the course**: 3-1-0

3. **Objective of the course**: To let the first year M. Tech. students exposed to chip design methods.

4. **Outcome of the course**: The students will learn how to design state-of-the-art chips.

5. Course Plan: As per the below format only

Component	**Unit**	**Topics for Coverage**	**Chapter No.(Optional)**
Component 1	Unit 1	**Introduction to hardware design:** Various abstraction levels for hardware design, Introduction to commercial technology design kits (CMOS, BiCMOS, HV-CMOS), EDA tools, RTL-GDSII	
	Unit 2	Design Methods: Design techniques for analog integrated circuits and systems, Design techniques for digital integrated circuits and systems, Integration issues,	
Component 2	Unit 3	**Hardware implementation:** Techniques to improve hardware performance per unit power; Performance Analysis and Optimization: Speed, Power and Area; Low power design techniques	
	Unit 4	**Frontend, Backend Design**: RTL and GATE level modeling for digital systems, Logic design and synthesis, Placement, floor planning, Routing, clock tree.	

6. Text Book:
1. Analog Integrated Circuit Design, Ken Martin and David Johns, April 2012.
2. Wolf, Wayne. FPGA-based system design. Pearson education, 2004.

7. References: Navabi, Zainalabedin. Verilog digital system design.McGraw-Hill, 1999.

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. **Name of the Course**: Testing and Verification

2. **LTP structure of the course**: 3-1-0

3. **Objective of the course**: To let the first year M. Tech. students exposed to Testing and to demonstrate their application on real time system.

4. **Outcome of the course**: The students will learn how to handle Verification Students will be exposed to Testing and explore many areas of Testing & Verification

5. Course Plan: As per the below format only

Component	**Unit**	**Topics for Coverage**	**Chapter No.(Optional)**
Component 1	Unit 1	Basics of testing and fault modeling: Introduction- Principle of testing - types of testing - DC and AC parametric tests - fault modeling	
	Unit 2	Testing and testability of combinational & sequential circuits,algorithms, Boundary scan, Memory, IDDQ	
Component 2	Unit 3	Testing : Testable memory design - test algorithms for RAMs, IDDQ testing - testing methods - limitations	
	Unit 4	Built-in self-test: Test pattern generation (BIST) - Output response analysis – BIST architectures.	

6. Text Book: Mandatory for UG core courses

7. References:-

1. P. K. Lala, “Digital Circuit Testing and Testability”, Academic Press.
2. M.L. Bushnell and V.D. Agrawal, “Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits”, Kluwar Academic Publishers.
3. N.K. Jha and S.G. Gupta, “Testing of Digital Systems”, Cambridge University Press.
4. ZainalabeNavabi, “Digital System Test and Testable Design: Using HDL Models and Architectures”, Springer.

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. **Name of the Course**: Analog VLSI design

2. **LTP structure of the course**: 3-1-0

3. **Objective of the course**: To let the first year M. Tech. students exposed to design analog integrated circuits.

4. **Outcome of the course**: The students will learn how to design analog ICs.

5. Course Plan: As per the below format only

Component	**Unit**	**Topics for Coverage**	**Chapter No.(Optional)**
Component 1	Unit 1	**Semiconductor device basics:**Review of integrated circuit device characteristics & models.	
	Unit 2	**Analog Sub circuits and design of single stage amplifiers:**Current sinks, current Sourse, current mirrors, types, CS, CG and CD amplifier, Inverters Cascode Amp. .	
Component 2	Unit 3	**Multistage amplifiers:** Differential amplifier and Operational Amplifiers:Design,and analysis, 2 stage, folded cascade, Telescopic	
	Unit 4	**High performance CMOS op-amp and Practical application**	

6. Text Book: Allen Holberg, CMOS Analog Circuit Design

7. References: Razavi, Behzad. Design of analog CMOS integrated circuits. 2005.

Gray, Paul R., and Robert G. Meyer. Analysis and design of analog integrated circuits.John Wiley & Sons, Inc., 1990.

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. **Name of the Course**: VLSI Design & Automation

2. **LTP structure of the course**: 3-1-0

3. **Objective of the course**: To let the first year M. Tech. students exposed to VLSI Design and to demonstrate their application on real time system.

4. **Outcome of the course**: The students will learn how to handle Automation issues in VLSI. Students will be exposed to this field and explore many areas of VLSI Design & Automation.

5. **Course Plan**: As per the below format only

Component	**Unit**	**Topics for Coverage**	**Chapter No.(Optional)**
Component 1	Unit 1	VLSI physical design automation and Fabrication: VLSI Design cycle, Int. to fabrication process, layout	
	Unit 2	Partitioning, Floor planning, Placement: algorithms, Placement Problem formulation and algorithms	
Component 2	Unit 3	Routing and Detailed routing: Two layers over the cell routers, constrained & unconstrained via min. Compaction	
	Unit 4	compaction algorithms, onedimensionalcompaction, two dimension based compaction, hierarchical compaction	

6. Text Book:

1. Jansen, Dirk, ed. The electronic design automation handbook. Springer Science & Business Media, 2010.

2. Lavagno, Luciano, Grant Martin, and Louis Scheffer. Electronic design automation for integrated circuits handbook-2 volume set. CRC Press, Inc., 2006.

7. References:

1. Naveed Shervani, “Algorithms for VLSI physical design Automation”, KluwerAcademic, Publisher, Second edition.

2. ChristophnMeinel& Thorsten Theobold, “Algorithm and Data Structures for VLSIDesign”,Kluwer Academic Publisher.

2. R. Drechsler, “Evolutionary Algorithm for VLSI CAD”, Kluwer Academic Publication.

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. **Name of the Course**: Advanced Embedded System Design

2. **LTP structure of the course**: 3-1-0

3. **Objective of the course**: To let the first year M. Tech. students exposed to Advance Embedded System and to demonstrate their application on real time system.

4. **Outcome of the course**: The students will learn how to handleEmbedded System Design. Students will be exposed to this area and explore many areas of Advanced Embedded System Design.

5. Course Plan: As per the below format only

Component	**Unit**	**Topics for Coverage**	**Chapter No.(Optional)**
Component 1	Unit 1	Typical Embedded System, Characteristics and Quality Attributes: Hardware Software Co-Design, and Modeling	
	Unit 2	Embedded Hardware Design and Development: EDA Tools, PCB Layout Design – PCB track routing.	
Component 2	Unit 3	ARM -32 bit Microcontroller. Architecture, Interrupt Controller, Ad. Programming, Embedded Firmware Design	
	Unit 4	RTOS based Embedded System Design: OS System Basics, Threads, Processes and Scheduling, ES Dev. Environment	

6. **Text Book:**

1. Shibu K V, “Introduction to Embedded Systems”, Tata McGraw Hill Education Private Ltd

2. Joseph Yiu, “The Definitive Guide to the ARM Cortex-M3”, Newnes, (Elsevier).

3. James K Peckol, “Embedded Systems – A contemporary Design Tool”, John Weily& Sons.

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. **Name of the Course**: Real-Time Operating System (RTOS)

2. **LTP structure of the course**: 3-1-0

3. **Objective of the course**: To let the first year M. Tech. students exposed to Real-Time Operating System and to demonstrate their application on real time system.

4. **Outcome of the course**: The students will learn how to handle Operating System. Students will be exposed to Real Time aspects and explore many areas of Real-Time Operating System.

5. **Course Plan**: As per the below format only

Component	**Unit**	**Topics for Coverage**	**Chapter No.(Optional)**
Component 1	Unit 1	Int. to RTOS Embedded Systems: RT Systems, Scheduler Concepts, Real-Time OS, Thread Safe Reentrant Fun.	
	Unit 2	Processing and Memory: Pre-emptive, Deadline, Dynamic priority policies, I/O Resources, Memory.	
Component 2	Unit 3	Multi-resource Services: Blocking, Mixed hard and soft RT services, Embedded System Components, Debugging	
	Unit 4	Performance Tuning: Basic concepts of drill-down tuning, High availability and Reliability RTOS, microcontroller	

6. Text Book:/ References:

1. Sam Siewert, “Real-Time Embedded Systems and Components”, Cengage Learning India.

2. MykePredko, “Programming and Customizing the PIC microcontroller”, TMH Publication.

3. Programming for Embedded Systems, Dreamtech Software Team, Jhon Wiley, India

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. Name of the Course: Advanced VLSI Technology

2. **LTP structure of the course**: 3-1-0

3. Objective of the course: To analyze and study the advanced VLSI devices, technologies and material systems.

4. Outcome of the course: The students will learn about Advanced VLSI Devices & Technologies.

5. Course Plan: As per the below format only

Component	Unit	Topics for Coverage	Chapter No.(Optional)
Component 1	Unit 1	Overview on Scaling of MOS devices, Short Channel effects	
	Unit 2	Issues and technology of scaling of MOS devices to nm Gate oxide/ Shallow junction/Contacts/Interconnects (15)	
Component 2	Unit 3	Compound Semiconductor Devices & Technology GaAsMESFETs,HEMTs,HBTs ,SiGe HBT, High Speed Digital ICs, MMICs	
	Unit 4	Optoelectronics Devices and ICs, Lasers/Detectors/ OEICs/Integrated, Optics/Silicon Photonics	

6. Text Book/References:-

1. VLSI Technology by S M Sze
2. VLSI Fabrications Principles: Silicon and Galliam Arsenide by: S.K.Gandhi.
3. Silicon VLSI Technology: Fundamentals, Practice, and Modeling. By: J. D. Plummer.

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. **Name of the Course**: Quantum Mechanics

2. **LTP structure of the course**: 3-1-0

3. **Objective of the course**: To let the first year M. Tech. students exposed to Quantum Mechanics.

4. **Outcome of the course**: The students is expected to apply in the concepts developed in their research activities.

5. Course Plan: As per the below format only

Component	**Unit**	**Topics for Coverage**	**Chapter No.(Optional)**
Component 1	Unit 1	Basic postulates of quantum mechanics, Stern-Gerlach experiment and spin, Kets, Bras and operators, Wave functions.	
	Unit 2	Schrodinger equation, Schrodinger and Heisenberg picture, Simple Harmonic Oscillator, Hydrogen Atom	
Component 2	Unit 3	Symmetries, conservation laws and degeneracy's, Continuous and discrete symmetries	
	Unit 4	Theory of angular momentum, Addition of angular momentum, Bell's inequality, Tensor operators. Identical particles.	

6. Text Books/References:-

1. Introduction to Quantum Mechanics by D. J. Griffiths.
2. Modern Quantum Mechanics by J. J. Sakurai.
3. Principles of Quantum Mechanics by R. Shankar.

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. **Name of the Course:** Advanced Engineering Electromagnetic
2. **LTP structure of the course**: 3-1-0

3. **Objective of the course**: To learn about the advanced topics in the field of Advanced Engineering Electromagnetic.
4. **Outcome of the course**:
5. **Course Plan:**

Component	Unit	Topics for Coverage	Chapter No.(Optional)
Component 1	Unit 1	**Review of Electromagnetics and Plane Wave Propagation:** Wave Equation, TEM Wave Propagation, Normal Incidence at plane conducting boundary.	
	Unit 2	Auxiliary Vector Potential, Construction of Solution, Radiation and Scattering Equations. Electromagnetic Theorems and Concepts:	
Component 2	Unit 3	**Green's Functions and Plane Wave Functions, Cylindrical Wave Functions:** The Wave functions, Plane Waves, The rectangular Waveguide, Partially filled waveguide.	
	Unit 4	**Scattering by circular cylinders, Perturbation and Variational Technique, Geometric Theory of Diffraction.**	

6. Text Book:

1. Balanis, Constantine A.**,** *Advanced Engineering Electromagnetics*,Wiley India Pvt. Ltd., Reprint 2008.
2. Cheng, D.K., *Field and Wave Electromagnetic*, 2nd Ed., Welsley Publishing Company, 1989.
3. Harrington, R.F., *Field Computation by Moment Methods*, Wiley IEEE Press. 1993.
4. Collin, R.E., *Field Theory of Guided Waves*, 2nd Ed., Wiley-IEEE Press. 1991
5. Jordan, E.C. and Balmain, K.G., *Electromagnetic Waves and Radiating Systems*. 2nd Ed., Prentice-Hall of India. 1993.

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. Name of the Course: Advanced Digital Signal Processing

2. LTP structure of the course: 3-1-0

3. Objective of the course: To learn about the advanced topics in the field of Digital Signal Processing.

4. Outcome of the course: Student will learn to utilize the advanced approaches of processing the signals and various aspects of discrete system design.

5. Course Plan: As per the below format only

Component	Unit	Topics for Coverage	Chapter No.(Optional)
Component 1	Unit 1	Review of the fundamental concepts of digital signal processing, DFT and FFT	
	Unit 2	The structures for realization of FIR and IIR systems and their analysis.	
Component 2	Unit 3	Multirate Signal processing and polyphase filtering	
	Unit 4	Statistical signal processing, applications of autoregressive (AR), Moving Average (MA), ARMA processes	

6. Text Book: -

1. S. K. Mitra, Digital Signal Processing: A Computer-Based Approach, McGraw-Hill International Editionsseries , 2001.

2. Dimitris G Manolakis, John G. Proakis,:Digital Signal Processing : Principles, Algorithms, and Applications,Pearson, Edition- 4

7. References:-

1. Oppenheim, Schafer: Discrete-Time Signal Processing, Pearson, Edition- 3

2. Richard G.Lyons: Understanding Digital Signal Processing, Pearson, Edition-3

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. Name of the Course: Stochastic Process
2. LTP structure of the course: 3-1-0
3. Objective of the course: - To learn about the fundamental concepts of the stochastic process.

4. Outcome of the course: : Student will learn to model various real life scenarios and technical problems as stochastic processes and analyze them..

5. Course Plan: As per the below format only

Component	Unit	Topics for Coverage	Chapter No.(Optional)
Component 1	Unit 1	Review of Random Variable theory, multivariable Gaussian distribution, Random Walks	
	Unit 2	Stochastic process: Discrete time and continuous Time	
Component 2	Unit 3	Discrete Time and Continuous Time Markov Chains, Markov Processes	
	Unit 4	The Queuing Theory, Networks of Queues	

6. Text Book:

1. Papoulis, et. al., *Prabability, Random Variables and Stochastic Processes*, 4th Ed. TMH 2011

7. References:

1. Kishor S. Trivedi, *Probability & Statistics with Reliability Queuing and Computer Science Applications*, 2ed Paperback – 2008

2. . Kovacevicet. al., *Fundamentals of Stochastic Signals, Systems and Estimation theory with worked examples*, 2nd Ed. Springer, 2007

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. Name of the Course: Optical Electronics

2. LTP structure of the course: 3-1-0

3. Objective of the course: To let the 2nd Semester M. Tech. (ECE) students be introduced to the various optical fiber modes, configurations and various signal degradation factors associated with optical fiber. Finally to discuss about digital transmission and its associated parameters on system performance.

4. Outcome of the course: The students will learn how to handle optical systems, and to get knowledge about the construction mechanism and selection criteria of Optical fiber cables.

5. Course Plan: As per the below format only

Component	Unit	Topics for Coverage	Chapter No.(Optional)
Component 1	Unit 1	Electro optic effect and electro optic modulators and switches	
	Unit 2	Liquid crystal devices and spatial light modulators	
Component 2	Unit 3	Acousto-Optic effect, Acousto-Optic Tunable Filter and Deflector	
	Unit 4	Nonlinear effects in optical fibers	

6. Text Book/Refrences:

1. Optical Electronic by: Ajoy Kumar Ghatak , K. Thyagarajan

2. Optoelectronics - an Introduction – Wilson and Hawkes, Prentice Hall, 1998

7. **Reference:** -

1. Semiconductor Optoelectronic devices – Pallab Bhattacharya, Prentice Hall of India, 1995

2. Semiconductor Optoelectronics – Jasprit Singh, Tata Mc Graw Hill, 1995

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. Name of the Course: Modern Control Systems

2. LTP structure of the course: 3-1-0

3. Objective of the course: To introduce the nature of nonlinearities found in control systems both in the forward path and in the feedback path.

4. Outcome of the course: Ability to apply knowledge of advanced principles to the analysis of electrical and computer engineering problems, design of electrical and computer engineering systems.

5. Course Plan: As per the below format only

Component	**Unit**	**Topics for Coverage**	**Chapter No.(Optional)**
Component 1	Unit 1	Introduction to Linear Systems, Vector spaces, Linear systems, similarity transformations,	
	Unit 2	Canonical forms, Controllability, Observability, Realisability etc. Minimal realization, State-space realizations Root locus concepts, State Feedback	
Component 2	Unit 3	Deadbeat response-pole assignment with state and with output feedback.	
	Unit 4	Quadratic Regulator (LQR), Linear Quadratic Gaussian (LQG) control, Loop Transfer Recovery (LTR).	

Primary References Books:

1. Ogata, K., Modern Control Engineering, Prentice-Hall, [2002]

2. Hsu, J. C. & A. U. Meyer, Modern Control Principles and Applications, McGraw-Hill, [1968]

3. P.R. Belanger, *Control Engineering – A Modern Approach*, Oxford University Press, 1995.

Secondary References:

1. Gopal, M., Modern Control System Theory, John Wiley Eastern Ltd. New Delhi, [1984]

2. Friedland, B., Control System Design, McGraw-Hill, [1986]

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. Name of the Course: Physics of Nanoscale Devices
2. **LTP structure of the course:**3–1–0
3. **Objective of the course:** To develop the fundamental concepts underlying the operation of nanoscale devices
4. **Outcome of the course:**The student is expected to apply in the concepts developed in their research activities.
5. **Course Plan:**

Component	Unit	Topics for Coverage	Chapter No.(Optional)
Component 1	Unit 1	**Basic concepts:** Ballistic and diffusive conductance, Drude formula, angular averaging	
	Unit 2	**Energy Band model:** E-k relation, counting States, DOS number of modes, conductivity vs. Electron Density quantum capacitance	
Component 2	Unit 3	Quasi-Fermi Levels (QFL's), current from QFLs, Landauer Formulas, Boltzmann Equation	
	Unit 4	**Heat and Energy:**Seebeck Coefficient, heat current, one-level device, second law, entropy, fuel Value of Information	

6. **Text Book:**

1. S. Datta, “Lessons from Nanoelectronics: A New Perspective on Transport”, World Scientific, 2012.

7. References:

I. Research papers related to the topics.

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. **Name of the Course:** Advanced Antenna Design and Measurement
2. **LTP structure of the course**: 3-1-0
3. **Objective of the course**: The objective of the course is to provide the M.Tech (ECE) General students an in-depth knowledge of state-of-the-art antennas used in modern communication systems
4. **Outcome of the course**:The emphasis will be laid on the detailed design procedures and analysis of various antennas used in advanced communication systems.

5. Course Plan: As per the below format only

Component	Unit	Topics for Coverage	Chapter No.(Optional)
Component 1	Unit 1	**Revision of fundamental parameters of Antennas, Circularly Polarized Wire Antennas:** Overview of antenna parameters, Circularly polarized uniform plane wave, RHCP and LHCP waves.	
	Unit 2	**Circularly Polarized Printed Antennas :** Basics of microstrip patch antenna, double and single feed printed CP antenna.	
Component 2	Unit 3	**MIMO Antennas and Metamaterial Antennas:** Examples of printed MIMO Antennas, Introduction to metamaterials, composite right left handed (CRLH) transmission line.	
	Unit 4	**Base Station Antennas and Antennas for Modern Communication Systems:** Basics of cellular networks, Printed Inverted F Antenna (PIFA), Mobile antenna,	

6. Text Book:

1. C. A Balanis, *Modern Antenna Handbook*, John Wiley & Sons, 2008.
2. C. Caloz and T. Itoh, *Electromagnetic Metamaterials: Transmission Line Theory and Microwave Applications*, John Wiley & Sons, 2006.
3. Z. N Chen and K. M. Luk, *Antennas for Base Stations*, McGraw-Hill, 2009.

References

1. Literature from various Journals relevant to specific topics.

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. **Name of the Course**: Guided Optical Component and Devices

2. **LTP structure of the course**: 3-1-0

3. **Objective of the course**: The course is aimed at teaching the basics of guided-optical media used in the communication systems. This course will cover the types of guided-media, related devices and components, operation principle, fabrication/manufacturing and its application.

4. **Outcome of the course**: The students will be able to identify the types guided media according to the application and able to analyze the performance of the system.

5. Course Plan:

Component	Unit	Topics for Coverage	Chapter No.(Optional)
Component 1	Unit 1	Optical Fibers for Broadband Lightwave Communication: Evolutionary Trends in Design, emergence of fiber amplifiers and DWDM systems, Course wavelength division multiplexing	
	Unit 2	Development of a Polymer Optical Fiber, manufacturing and Its Application, Comparison between conventional silica fibers and POFs. Gratings in POFs.	
Component 2	Unit 3	Photonic Bandgap-Guided Bragg Fibers, Dispersion compensated Bragg fibers, fabrications, Soft glass fibers	
	Unit 4	Erbium-Doped Fiber Amplifiers: Introduction, Population Inversion and optical amplification, optical amplification in EDFAs, Gain flattening, Noise in amplification, Applications	

6. Text Book:

1. Guided Wave Optical Components and Devices: basics, Technology and Application, by Bishnu B. Pal, Elsevier Academic Press.

7. References:

1. Foundations for Guided-Wave Optics, Chin-Lin Chen, John Wiley & Sons, Inc.(2005)

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. Name of the Course: Embedded Control Systems

2. LTP structure of the course: 3-1-0

3. Objective of the course: To expose students to different real time embedded system they see in their daily life. How they can build any of these. What are the basic principles involved in this.

4. Outcome of the course: Acquire and apply the knowledge of domain engineering for system modelling, analysis and problem solving. Design control for various systems. Use simulation software and embedded tools for analysis and implementing controller.

5. Course Plan: As per the below format only

Component	Unit	Topics for Coverage	Chapter No.(Optional)
Component 1	Unit 1	CONTROL SYSTEM BASICS: Z-transforms – performance requirements - block diagrams	
	Unit 2	CONTROL SYSTEM IMPLEMENTATION: CONTROL SYSTEM TESTING:	
Component 2	Unit 3	INPUT DEVICES:KEYBOARD, LCD MODULES, Timer Interrupts, multiple channel analog to digital dataacquisitionOUTPUT DEVICES AND SENSORS:	
	Unit 4	H-bridge, dc motor control, optical encoders, different sensors interfacing, Case study of application.	

5. Text Books/ References

1. Jim Ledin, “Embedded control systems in C/C++”, CMP Books, 2004.
2. TimWiscott, “Applied control for embedded systems”, Elsevier Publications, 2006.
3. Jean J. Labrosse, “Embedded Systems Building Blocks: Complete and Ready-To-Use Modules in C ”, The publisher, Paul Temme, 2011.
4. Ball S.R., “Embedded microprocessor Systems - Real World Design”, Prentice Hall, 2002.
5. Lewin A.R.W. Edwards, “Open source robotics and process control cookbook”, Elsevier Publications, 2005.
6. Ben-Zion Sandler, “Robotics”, Elsevier Publications, 1999

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. **Name of the Course**: Semiconductor Optoelectronics

2. **LTP structure of the course**: 3-1-0

3. **Objective of the course**: To let the first year M.Tech. students exposed to Optoelectronic Devices.

4. **Outcome of the course**: The students will learn how to fundamentals of optoelectronic devices.

5. Course Plan: As per the below format only

Component	**Unit**	**Topics for Coverage**	**Chapter No.(Optional)**
Component 1	Unit 1	Energy bands in solids, the E-k diagram, Density of states, Heterostructures and Quantum Wells.	
	Unit 2	Interaction of photons with electrons and holes, Rates of emission and absorption, Condition for amplification by stimulated emission	
Component 2	Unit 3	Semiconductor Photon Sources: Electroluminescence. DFB-, DBR- and vertical-cavity surface-emitting lasers (VCSEL).	
	Unit 4	Semiconductor Photodetectors:Types of photodetectors, Photoconductors, Single junction under illumination	

6. Text Book/References:

S. Lien Chuang, Physics of photonic devices. Vol. 80.John Wiley & Sons, 2012.
P. Bhattacharya, Semiconductor Optoelectronic Devices, 2nd Edition
J. Piprek, Semiconductor Optoelectronic Devices: Introduction to Physics and Simulation, Academic press, 2003

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. **Name of the Course:** Microwave Measurements and Design

2. LTP structure of the course: 3-1-0

3. Objective of the course: The objective of the course is to provide the M.Tech (ECE) General students an insight into different aspects of the advanced design and measurements techniques for RF and microwave circuits.

4. Outcome of the course The course covers in-depth-knowledge of various microwave equipment like vector network analyzer (VNA), spectrum analyzer, noise figure meter, power meter etc.

5. Course Plan: As per the below format only

Component	Unit	Topics for Coverage	Chapter No.(Optional)
Component 1	Unit 1	**Transmission Line and S-Parameters:** Smith Chart, Concept of measurement at low and high frequencies; Basics of S-parameters.	
	Unit 2	**Directional Coupler and Scalar Network Analyzer:** Operating principle of directional coupler, S-parameter of directional coupler.	
Component 2	Unit 3	**Vector Network Analyzer and Spectrum Analyzer:** Operating principle of Vector Network Analyzer (VNA); Calibration of VNA, error model.	
	Unit 4	**Noise Figure measurement:** Noise figure, noise figure of cascaded network.	

6. Text Book:

1. Cheng, D.K., *Field and Wave Electromagnetic*, 2nd Ed., Welsley Publishing Company, 1989.
2. Bryant, G.H., P*rinciples of Microwave Measurements*, The Institution of Engineering and Technology.
3. Yip P.C.L., *High frequency circuit design and measurements*, Springer, 1990.
4. Ginzton, E.L., *Microwave Measurements.*Literary Licensing, LLC ,2012.
5. I.L. Kosow, *Microwave Theory and Measurements*, Hewlett Packard, 1st Edition, 1962.

References:

1. Technical Notes/Application Notes of various instruments and devices.

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. Name of the Course: Detection and Estimation Theory
2. LTP structure of the course: 3-1-0
3. Objective of the course:

a. To acquire the fundamental concepts of Signal Detection and Estimation
b. To get familiarize with different Hypotheses in detection and estimation problems
c. To familiarize with the detection and estimation of random signals.

4. Outcome of the course:

a. Acquire basics of statistical decision theory used for signal detection and estimation.
b. Comprehend the elements and structure of nonparametric detection.
c. Examine the performance of signal parameters using optimal estimators.

5. Course Plan: As per the below format only

Component	Unit	Topics for Coverage	Chapter No.(Optional)
Component 1	Unit 1	Bayes Risk Criterion, ML Criterion, N-P Criterion, Probability of Error Criterion, Max-Min Criterion.	
	Unit 2	Composite Hypothesis, Sequential Detection. General Gaussian Problem, Erasure Decision Problems.	
Component 2	Unit 3	ML Estimation, Bayes Cost Methods, CRLB, Multiple Parameter Estimation, Best Linear Unbiased Estimator	
	Unit 4	Linear Minimum-Variance and Least Square Methods, Kalman Filter, Miscellaneous Estimation Techniques	

6. Text Book:

1. H. L. Van Trees, *Detection, Estimation and Modulation Theory (Part I),* John Wiley & Sons, 2001, ISBN: 978-0471095170.

7. References:

1. S. M. Kay, *Fundamentals of Statistical Signal Processing - Estimation Theory (Vol. 1),* Prentice-Hall, Inc., 1993, ISBN: 978-0133457117.

2.H. V. Poor, *An Introduction to Signal Detection and Estimation*, (2nd edition), Springer, 2010, ISBN: 978-1441928375.

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. Name of the Course: Optical Communication Systems

2. LTP structure of the course: 3-1-0

3. Objective of the course: To let the 2nd Semester M. Tech. (ECE) students revise basic laws of optical communication and to demonstrate their application on optical devices. Also, let them exposed to in-depth view of Advanced Optical Communication

4. Outcome of the course: The students will learn how to handle optical systems.

5. Course Plan: As per the below format only

Component	**Unit**	**Topics for Coverage**	**Chapter No.(Optional)**
Component 1	Unit 1	Optical Sources and Detectors	
	Unit 2	Optical Power Launching and Coupling	
Component 2	Unit 3	Optical Amplifiers and Point-to-point Optical Link Design	
	Unit 4	Introduction to WDM Concepts and Optical Network	

6. **Text Book:**

1. Optical Fiber Communications by *Gred Keiser* (McGraw Hill)

7. References:

1. Optical Fiber Communications by *John M. Senior* (Pearson Education)
2. Optical Communications by Robert Gagliardi, Sherman Karp
3. Optical Communications System by *John Gowar* (Prentice Hall of India).

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. Name of the Course: Intelligent Control Systems

2. LTP structure of the course: 3-1-0

3. Objective of the course: To expose students to different real time intelligent system they see in their daily life. How they can build any of these. What are the basic principles involved in this.

4. Outcome of the course: Acquire and apply the knowledge of domain engineering for system modeling, analysis and problem solving. Design control for various systems. Use simulation software and tools for analysis and implementing controller.

5. Course Plan: As per the below format only

Component	**Unit**	**Topics for Coverage**	**Chapter No.(Optional)**
Component 1	Unit 1	Intelligent systems, control and intelligent systems Fuzzy and expert control, planning systems, attentional systems,	
	Unit 2	Learning and function approximation, adaptive control introduction, learning/adaptation,	
Component 2	Unit 3	stable fuzzy/neural adaptivecontrol, Evolutionary methods, foraging, bacteria and connections to optimization and control,	
	Unit 4	coordinated vehicular guidance applications, motor control application, inverted pendulum application.	

6.Text Books/Primary References Books:

1..K. Passino, ”Biomimicry for Optimization, Controland Automation”, springer verlag,2005.

2.Kevin M. Passino and Stephen Yurkovich, ”Fuzzy Control”, Addison Wesley Longman, Menlo park,CA 1998.

3.Antsaklis P.J., Passino K.M. ,”An Introduction to Intelligent and Autonomous Control”, Kluwer Piblishers Norwell MA 1993.

4.Timothi J. Ross, ”Fuzzy logic with engineering applications”, Wiley, 1995.

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. **Name of the Course**: Physics of Semiconductor Materials

2. **LTP structure of the course**: 3-1-0

3. **Objective of the course**: To let the first year M.Tech. students exposed to semiconductor materials.

4. **Outcome of the course**: The students will learn how to fundamentals of semiconductor maerials.

5. **Course Plan:** As per the below format only

Component	**Unit**	**Topics for Coverage**	**Chapter No.(Optional)**
Component 1	Unit 1	Chemical bonds in crystal, Conductivity, Hall effect, Nernst effect thermal and thermoelectric measurement.	
	Unit 2	Elemental semiconductors: B, Diamond, Si, Ge,Gray tin, P, Se, Te, Chemical interaction: B-C, B-Si, Si-Ge, B-P	
Component 2	Unit 3	Binary IV-Vi and III-V semiconductors: BN, BP, Bas GaN, GaP, InN, InP, InAs, InSb	
	Unit 4	Binary II-VI and I-VII tetragonal semiconductors: ZnO, ZnS, ZnSe, ZnTe, CdSe, HgTe, HgSe, Hg2S	

6. Text Book:

L I Berger, Semiconductor Materials, CRC Press, 1997.
Z Chuan, III-Nitride Semiconductor Materials, Imperial College Press, 2006

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. **Name of the Course:** RF Components Design and Testing

2. **LTP structure of the course:** 3-1-0

3. **Objective of the course:** To let the M. Tech. (ECE) students exposed to analysis and design of advanced RF components and systems design.

4. **Outcome of the course:** Outcome of the course: The students will get the exposure of active and passive microwave component design and development.

5. **Course Plan:** As per the below format only

Component	Unit	Topics for Coverage	Chapter No.(Optional)
Component 1	Unit 1	**Multiconductor lines:** Coupled strip lines, Fin lines, Modal analysis of micro strip lines , Discontinuities and Bends	
	Unit 2	**Advanced Microwave Filters:** Coupled line filter, Dielectric resonator filter, metamaterial filter	
Component 2	Unit 3	**Solid state Amplifiers :** Low Noise amplifier design, amplifier stability criteria	
	Unit 4	**Oscillators and Mixers:** Transistor oscillator, Dielectric resonator oscillator, Linear, Non-linear and balanced Mixer	

6. Text Book:

1. Pozar, D.M., *Microwave Engineering*. 3rd Ed., John Wiley & Sons. 2004.
2. Collin, R.E., *Foundations for Microwave Engineering*. 2nd Ed., John Wiley & Sons. 2000.
3. Gupta, K.C., Garg, R., Bahl I J, *Microstrip lines and Slot lines*,Artech House; 1st Edition edition (June 1, 1979)
4. Matthaei, G., Young L., Jones E. M. T., *Microwave filters, impedance- matching networks and coupling structures*, Artech House,1990 .

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. Name of the Course: Principles of Wireless Communication
2. LTP structure of the course: 3-1-0
3. Objective of the course:

d. To enable the student to synthesis and analyze wireless and mobile cellular communication systems over, stochastic fading channel, To provide an understanding of advanced multiple access techniques and diversity reception techniquesTo give an understanding of future wireless communication systems

4. **Outcome of the course:**

a. By the end of the course, the student will be able to analyze and design wireless and mobile cellularsystems.
b. By the end of the course, the student will have the ability to work in advanced research wireless andmobile cellular programs.

5. Course Plan:

Component	Unit	Topics for Coverage	Chapter No.(Optional)
Component 1	Unit 1	Fundamentals of cellular Networks, Frequency reuse; handoff; co-channel interference	
	Unit 2	Multipath Fading; Characteristics of fading channel; Diversity Techniques	
Component 2	Unit 3	CDMA; OFDM; LTE Networks	
	Unit 4	Cooperative Communication, Relaying Networks, Cognitive Radio Networks	

6. Text Book:

1. T. S. Rappaport, *Wireless Communications*, 2nd ed. Principles and Practice, Pearson EducationIndia, 2009.
2. D. Tse and P. Viswanath, *Fundamentals of Wireless Communications*, Cambridge University Press, 2005.

7. References:

1. A. B. Carlson, P. B. Crilly, and J. C. Rutledge, *Communication Systems: An Introduction to Signals and Noise in Electrical Communication*, 4th ed. McGraw Hill, 2002.
2. L. Song and J. Shen, *Evolved Cellular Networks planning and optimization for UMTS and LTE*, 1st ed.CRC Press, 2010.
3. Y.-W. P. Hong, W.-J. Huang, C.-C. Jay Kuo, *Cooperative Communications and Networking: Technologies and System Design*, 1st ed. Springer, 2010.

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. Name of the Course: Advanced Information Theory and Coding

2. LTP structure of the course: 3-1-0

3. Objective of the course: To learn about the fundamental concepts and latest advancements in the field of information theory and error control **coding.**

4. Outcome of the course: Student will learn to use the knowledge of information theoretical approaches and coding techniques for designing various communication networks.

5. Course Plan: As per the below format only

Component	Unit	Topics for Coverage	Chapter No.(Optional)
Component 1	Unit 1	Review of fundamental concepts like Source coding, channel capacity, channel coding and decoding approaches.	
	Unit 2	Advanced error control codes	
Component 2	Unit 3	Principles of Network Coding: Analog and Digital	
	Unit 4	Applications of ITC in modern systems and physical layer security	

6. Text Book/

1. Cover, T M and Thomas :Elements of Information Theory,New York-Wiley, 1991

2. R. G. Gallager, Information Theory and Reliable Communication, Wiley, 1969

7. References: -

1. Shannon, C and Weaver, W: Mathematical Theory of Communication. Urbana: University of Illinois Press, 1949

2. A. Khinchin :Mathematical foundations of information theory, Dover, 2001 edition.

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. **Name of the Course**: CMOS Photonics

2. **LTP structure of the course**: 3-1-0

3. **Objective of the course**: The course is aimed at teaching the basics and advancements in the area of CMOS photonics including integration of optical modulator, receivers etc., along with CMOS process.

4. **Outcome of the course**: Thestudents will be able to understand the principles and challenges behind the technologies employed forCMOS photonics of modern era.

5. **Course Plan:**

Component	Unit	Topics for Coverage	Chapter No.(Optional)
Component 1	Unit 1	Introduction to CMOS photonics, fundamental difference between CMOS electronics and CMOS Photonics, Reliability and compatibility issue of CMOS photonislasers on silicon	
	Unit 2	Silicon-on-insulator (SOI) Technology, Silicon waveguides, Waveguides & Refractive Index in CMOSsilicon modulators,non-linear silicon photonics,	
Component 2	Unit 3	CMOS-Photonic hybrid integration, Nanophotonics-Photonic crystals, Slow light and its applications.	
	Unit 4	phase modulators,Silicon-germaniumdetector,waveguide photo-detectors,	

6. Text Book:

1. G. T. Reed, Silicon Photonics: The state of the art, John Wiley and Sons (2008)

2. S. V. Gaponenko, Introduction to Nanophotonics, Cambridge University Press (2010).

7. References:

1. B. E. A. Saleh and M. C. Teich, Fundamentals of Photonics, Wiley (2007).

2. H. Nishihara, M. Haruna, T. Suhara, Optical Integrated Circuits, Mc-Graw Hill (2008).

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. Name of the Course: Advanced Industrial and Electronics instrumentation

2. LTP structure of the course: 3-1-0

3. Objective of the course: The purpose of this course to introduce the students about the latest developments in the field of Advanced Industrial and Electronics instrumentation.

4. Outcome of the course: This course will encourage the students to apply the principles of electronic instrumentation in the field of various industrial, medical and computational applications.

5. Course Plan: As per the below format only

Component	Unit	Topics for Coverage	Chapter No.(Optional)
Component 1	Unit 1	Biomedical Instrumentation, medical devices and imaging equipments such as CT, MRI and EEG	
	Unit 2	Computational Instrumentation: Analysis of more than one sensing and measuring parameters with the higher level objectives of Control	
Component 2	Unit 3	Industrial Automation	
	Unit 4	Modern Instrumentation and control devices	

6. Text Book:

1, A.K. Sawhney, PuneetSawhney,A Course In Electrical And Electronic Measurements And Instrumentation, DhanpatRai Publications, 2012
2. H. S. Kalsi, Electronic Instrumentation,3 edition, McGraw Hill Education, 2017

3. Doeblin, E.O., Measurement systems, Applications and Design, McGraw Hill (1982).

4. Nakra, B. C. and Chaudhry, K. K., Instrumentation Measurement and Analysis, Tata McGraw Hill (2003)

7. References:-

1. Doebelin, E.O., "Measurement Systems Application and Design", fourth edition McGraw Hill International, 1978.

2. Noltingk, B.E., “Instrumentation Reference Book”, II edition Butterworth Heinemann, 1996.

3. Flow measurement, “Practical Guides for Measurement and Control”, ISA publication, 1991.

4.Anderew, W.G., “Applied Instrumentation in Process Industries” - a survey Vol-I Gulf Publishing Company.

5. Liptak, B.G., “Process Measurement & Analysis”, IV Edition, Chilton Book Company 1995.

6.Considine, D.M., “Process Instruments and Control & Handbook", McGraw Hill 1985

III SEMESTER

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. **Name of the Course**: Mixed Signal IC Design

2. **LTP structure of the course**: 3-1-0

3. **Objective of the course**: To let the M. Tech. students exposed to Mixed Signal IC Design and to demonstrate its application.

4. **Outcome of the course**: The students will learn how to design Mixed Signal IC. Students will be exposed to this field and explore many areas of Mixed Signal IC Design.

5. Course Plan: As per the below format only

Component	**Unit**	**Topics for Coverage**	**Chapter No.(Optional)**
Component 1	Unit 1	Review of Current and Voltage Sources, Current Mirrors, Voltage Referencesand CMOS op-amps	
	Unit 2	Noise in MOS Circuits, Introduction to Data Conversion Circuits	
Component 2	Unit 3	Data Conversion Circuits, Basic Requirements, Different A/D and D/A circuits, design & working	
	Unit 4	Clock Generation for Mixed Signal System ICs , PLL, SC circuits	

6. **Text Book/ References: -**

1. Allen and Holberg - CMOS *Analog Circuit Design*.

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. **Name of the Course**: Advanced Computer Architecture

2. **LTP structure of the course**: 3-1-0

3. **Objective of the course**: To let the first year M. Tech. students exposed to Computer Architectureand to demonstrate their application on real time system.

4. **Outcome of the course**:The students will learn how to handle Advance Computer Students will be exposed to Architecture and explore many areas of Advanced Computer Architecture.

5. Course Plan: As per the below format only

Component	Unit	Topics for Coverage	Chapter No.(Optional)
Component 1	Unit 1	Essential features of Instruction set architectures: CISC, RISC, DSP processors and their implications for Implementation as VLSI Chips, performance of recent INTEL processors	
	Unit 2	Data path and control: Introduction, multi cycle implementation, exceptions, micro programming, simplifying control design, digital design using hardware description language	
Component 2	Unit 3	Enhancing performance with pipelining: pipelining, data hazards and stalls, advanced pipelining: Computational accuracy in DSP implementations, A/D & D/A conversion errors	
	Unit 4	Architectures for programmable digital signal processing devices: bus architecture and memory, programmability and program execution, features for external interfacing.	

6. Text Book:

1. D.A, Patterson, J.L. Hennessy, Computer Organization and Design: Hardware / Software

Interface, 4th Edition, Elsevier.

2. A.S. Tannenbaum, Structured Computer Organization, 4th Edition, Prentice-Hall

3. W. Wolf, Modern VLSI Design: Systems on Silicon, 2nd Edition, Pearson Education

4. KeshabParhi, VLSI digital signal processing systems design and implementations, Wiley

5. Avatar Sigh, Srinivasan S, Digital signal processing implementations using DSP

microprocessors with examples, Thomson.

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. **Name of the Course**: Microelectromechanical Systems (MEMS)
2. **LTP structure of the course**: 3-1-0
3. **Objective of the course**: The course is aimed at teaching the basics and advancements micro and nano-electromechanical system with technology and design part on the prime focus.
4. **Outcome of the course**: Thestudents will be able to understand the principles and technologies behind micro and nano-electromechanical system being used in modern era.

5. Course Plan:

Component	Unit	Topics for Coverage	Chapter No.(Optional)
Component 1	Unit 1	Introduction, Surface micromachining, Transport in PolySi, Basic Electrical &Mechanical concepts: Transduction Methods Magnetic Sensing & actuation	
	Unit 2	Bulk micromachining; Bonding, Comparison of bulk and Surface micromachining: LIGA; SU-8; Moulding processes, Basic Electrical &Mechanical concepts: Electrostatic/Thermal/Piezoresistive	
Component 2	Unit 3	Stiction process, Pull-in parallel plate capacitor Pressure Sensor: piezo-resisitivity, Diffused Si, Poly, porous Si, Beams, Accelerometer,	
	Unit 4	RF MEMS, Optical MEMS, Micro-fluidics, Chemical & Bio MEMS, Packaging & testing Nanoelectromechanical systems (NEMS), MEMSbased nanotechnology , NEMS physics	

6. Text Book:

a) Foundations of MEMS, Chang Liu,Illinois ECE series,Pearson International edition

b) An Introduction to microsystem Engineering, N.Maluf,Artech House,2000

7. References:

a) Fundamentals of Microfabrication, M.Madau,2ndedition,CRC Press,2002

b) RF MEMS Theory,Design& Technology, G.M.Rebeiz,John –Willey,2003

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. **Name of the Course**: Low power System Design (LPD)

2. **LTP structure of the course**: 3-1-0

3. **Objective of the course**: The course is aimed at teaching the low power techniques for VLSI system design.

4. **Outcome of the course**: The students will be able to understand the principles of design techniques for VLSI systems.

5. Course Plan:

Component	Unit	Topics for Coverage	Chapter No.(Optional)
Component 1	Unit 1	Power and Energy, static and dynamic power of logic gates	
	Unit 2	Device feature size scaling, Multi-Vdd Circuits, Architectural level approaches: Parallelism, Pipelining, Voltage scaling using high-level transformations, Dynamic voltage scaling, Power Management.	
Component 2	Unit 3	Hardware Software Tradeoff, Bus Encoding, Two's complement Vs Sign Magnitude, Architectural optimization, Clock Gating, Logic styles, Adiabatic Switching Circuits.	
	Unit 4	Variable-threshold-voltage CMOS (VTCMOS) approach, Multi-threshold-voltage CMOS (MTCMOS) approach, Power gating, Transistor stacking, Dual-Vt assignment approach (DTCMOS).	

6.Text Books:

1. Sung Mo Kang, Yusuf Leblebici, CMOS Digital Integrated Circuits, Tata Mcgrag Hill.
2. Neil H. E. Weste and K. Eshraghian, Principles of CMOS VLSI Design, 2nd Edition, Addison Wesley.
3. A. Bellamour, and M. I. Elmasri, Low Power VLSI CMOS Circuit Design, Kluwer Academic Press, 1995.
4. Anantha P. Chandrakasan and Robert W. Brodersen, Low Power Digital CMOS Design, Kluwer Academic Publishers, 1995.
5. Kaushik Roy and Sharat C. Prasad, Low-Power CMOS VLSI Design, Wiley-Interscience, 2000.

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. **Name of the Course**: Radio Frequency Circuit Design (RFCD)

2. **LTP structure of the course**: 3-1-0

3. **Objective of the course**: The course is aimed at teaching RF integrated circuit design.

4. **Outcome of the course**: The students will be able to understand the principles of design techniques for RF integrated circuit design.

5. Course Plan:

Component	Unit	Topics for Coverage	Chapter No.(Optional)
Component 1	Unit 1	CMOS and BiCMOS Technology, RF systems, Basic radio architectures, Process design kit, Passive and active components, Thermal Noise and Flicker Noise, Noise figure.	
	Unit 2	High frequency amplifiers, Low noise amplifiers, Power Amplifiers.	
Component 2	Unit 3	Up conversion and down conversion mixer design, PLL, Voltage controlled oscillator, Phase detector, charge pump, phase lock loop.	
	Unit 4	High speed OPAMP, OTA, negative feedback, active inductor, first order and second order low pass, high pass, band pass and band reject filter design.	

Books:

1. Lee, Thomas H. The design of CMOS radio-frequency integrated circuits. Cambridge university press, 2004.
2. Razavi, Behzad, and RazaviBehzad. RF microelectronics. Vol. 1. New Jersey: Prentice Hall, 1998.

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. **Name of the Course**: Advanced Lithography

2. **LTP structure of the course**: 3-1-0

3. **Objective of the course**: To let the students learn the advanced lithography techniques being used in the modern VLSI technology.

4. **Outcome of the course**: The students will be able to understand the basic and advanced lithography methods which will help them to pursue in the research and development the VLSI domain.

5. Course Plan:

Component	**Unit**	**Topics for Coverage**	**Chapter No.(Optional)**
Component 1	Unit 1	Overview of nanofabrication, Lithographies, Thin film deposition techniques.Etchingtechniques.High resolution photon-based lithography. Electron beam lithography. (4h)	
	Unit 2	Resists and developers, resolution limits, contrast, sensitivity, etching selectivity. Nano-patterning by focused ion beam. Ion source, ion optics, instrumentation.	
Component 2	Unit 3	Nanoimprint lithography (NIL). Nano-patterning by scanning probes. AFM-based, local oxidation and dip-pen lithography. STM-based, manipulation of atoms and exposure of resist.	
	Unit 4	Soft lithography. Micro-contact printing of chemical patterns, capabilities and resolution limits. Nano-transfer printing. Nano-patterning by self assembly, Anodized aluminum oxide,	

6. Text Book:

1. Nanofabrication: principles, capabilities and limits, by Zheng Cui

7. References:

1. Silicon VLSI Technology: Fundamentals, Practice, and Modeling by by James D. Plummer,,Michael Deal Peter D. Griffin, Pearson (2nd Edition)

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. Name of the Course: Nanoscale Device Modeling
2. **LTP structure of the course:**3–1–0
3. **Objective of the course:** To make students aware of underlying concepts of nanoscale transistors.
4. **Outcome of the course:**The student is expected to apply the physical concepts in modeling of any nanoscaled device.
5. **Course Plan:**

Component	Unit	Topics for Coverage	Chapter No.(Optional)
Component 1	Unit 1	**Basic concepts:** DOS, semiclassical and quantum transport, scattering	
	Unit 2	1D, 2D MOS electrostatistics, I-V characteristics, ultimate limits of CMOS technology	
Component 2	Unit 3	**Ballistic nanotransistor:** Natori's theory and beyond Natori's model, nondegenerate, degenerate characteristics	
	Unit 4	Scattering theory of MOSFET: scattering physics, transmission coefficient under high and low bias	

6. **Text Book:**

1. M.Lundstrom, J.Guo, "NANOSCALE TRANSISTORS: Device Physics, lVlodelingandSimulation", Springer, 2006.

7. References:

1. M. Lundstrom, "Fundamentals of Carrier Transport", Cambridge University Press, 2000.
2. Research papers related to the topics.

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. **Name of the Course:** Analytical & Computational Techniques In Electromagnetics
2. **LTP structure of the course: 3-1-0**

3. **Objective of the course**: The objective of this course is to introduce the students to advanced computational techniques for the solution of partial differential equations and integral equations encountered in electromagnetic boundary value problems.

4. **Outcome of the course**: The students will get the exposure of various computational and analytical techniques used to solve real-world electromagnetic and microwave related problems.

5. **Course Plan:**

Component	Unit	Topics for Coverage	Chapter No.(Optional)
Component 1	Unit 1	Review of boundary conditions, integral equations versus differential equations, radiation and edge conditions, modal representation of fields in bounded and unbounded media.	
	Unit 2	**Integral Equations:** Formulation of typical problems: wire antennas, scattering, apertures in conducting screens and waveguides, discontinuities in waveguides and microstriplines.General	
Component 2	Unit 3	**Finite Element Method:** Typical finite elements, Solution of two-dimensional Laplace and Poisson's equations, solution of scalar Helmholtz equation.	
	Unit 4	**Finite-difference Time-domain Method.** Yee's finite difference algorithm, stability conditions, programming aspects, absorbing boundary conditions.	

6. Text Book:

1. Collin, R.E., "Field Theory of Guided Waves", 2nd Ed., Wiley-IEEE Press. 1991
2. Peterson, A.F, Ray, S.L. and Mittra, R., "Computational Methods for Electromagnetics", Wiley-IEEE Press. 1998
3. Harrington, R.F., "Field Computation by Moment Methods", Wiley IEEE Press. 1993.
4. Sadiku, M.N.O., "Numerical Techniques in Electromagnetics", 2nd Ed., CRC Press. 2001.
5. Stutzman, W.L. and Thiele, H.A., "Antenna Theory and Design", 2nd Ed., John Wiley & Sons. 1998
6. Volakis, J.L., Chatterjee, A. and Kempel, L.C., "Finite Method for Electromagnetics", Wiley-IEEE Press. 1998 7. Taflov, A. and Hagness, S.C., "Computational Electrodynamics", 3rd Ed., Artech House.

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. Name of the Course: MIMO Communications

2. LTP structure of the course: 3-1-0

3. Objective of the course:

e. To acquire the fundamental concepts of MIMO wireless communications
f. To get familiarize with different MIMO receivers
g. To familiarize with the multi-user MIMO concepts.

4. Outcome of the course:

d. Acquire basics of spatial diversity used for wireless communication systems.
e. Understand the space-time block codes and the estimation of MIMO channels.
f. Examine the BER performance of MIMO Systems

5. Course Plan:

Component	Unit	Topics for Coverage	Chapter No.(Optional)
Component 1	Unit 1	Modeling of wireless systems under fading channels Diversity techniques in wireless communication.	
	Unit 2	MIMO system model, Alamouti and Space-Time Codes, OSTBC codes, Estimation in MIMOChannel	
Component 2	Unit 3	MIMO Beamforming, MIMO Zero-Forcing Receiver,MIMO MMSE receiver, SVD of MIMO channel	
	Unit 4	Nonlinear MIMO Receiver, single -user MIMO, multi-user MIMO, MIMO relying techniques	

6. Text Book:

1. D. Tse and P. Viswanath, *Fundamentals of Wireless Communications*, Cambridge UniversityPress, 2005

7. References:

1. J. R. Hampton, *Introduction to MIMO Communications*, Cambridge University Press., 2013, ISBN: 9781107042834.
2. R.K. Kshetrimayum*Fundamentals of MIMO Wireless Communications*, 1st ed. Cambridge University Press, 2017, ISBN: 9781108415699

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. Name of the Course: Optical Networks

2. LTP structure of the course: 3-1-0

3. **Objective of the course:** To let the 3rd Semester M.Tech. (ECE) students exposed to the Network aspects of optical communication and to demonstrate its application for various types of Optical Networks

4. **Outcome of the course:** The students will learn how to handle various features e.g., Routing, Congestion, WDM aspects of Optical Networks.

5. Course Plan: As per the below format only

Component	**Unit**	**Topics for Coverage**	**Chapter No.(Optional)**
Component 1	Unit 1	Photonic Packet Switching	
	Unit 2	Client Layers of the Optical Layer	
Component 2	Unit 3	Broadcast and Select & Wavelength Routing Networks	
	Unit 4	Optical Access Networks	

6. Text Book: "Optical Networks" by R. Ramaswami, Kumar N. Sivarajan, Galen H. Sasaki

7. References:

1. "*WDM Optical Networks : Concept, Design and Algorithms*" by C. Siva Ram Moorthy and Mohan Gurusamy, Prentice Hall of India, Ist Edition, 2002.
2. "*Fiber Optic Networks*" by P.E. Green, Jr., Prentice Hall, NJ, 1993.
3. "*Optical WDM Networks*" by Biswanath Mukherjee, Springer, 2006.
4. "*Optical Switching Networks*" by Mayer & Martin, Cambridge University Press, 2008.

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. Name of the Course: Robust Control Systems

2. LTP structure of the course: 3-1-0

3. Objective of the course: To expose students to different real time robust control system they see in their daily life. How they can build any of these. What are the basic principles involved in this.

4. Outcome of the course: Acquire and apply the knowledge of domain engineering for system modeling, analysis and problem solving. Design control for various systems. Use simulation software and tools for analysis and implementing controller.

5. Course Plan: As per the below format only

Component	Unit	Topics for Coverage	Chapter No.(Optional)
Component 1	Unit 1	Linear Quadratic Regulators: return ratio & difference, sensitivity function.	
	Unit 2	Kalman's optimality condition. Gain/phase margins, robustness to time delay and nonlinearity.	
Component 2	Unit 3	Characterization of sensitivity. Kharitonov theorem robustness.	
	Unit 4	Singular values - properties, application in stability, robustness and sensitivity. Robustness of discrete time LQR systems.	

6. Text Books/References:

1. Kemin Zhou," ESSENTIALS OF ROBUST CONTROL", Pearson,1997.
2. *Sigurd Skogestad* and *Ian Postlethwaite, " MULTIVARIABLE FEEDBACK CONTROL: Analysis and design"* Wiley-Interscience; 2 edition (November 4, 2005)
3. *Kemin Zhou, John C. Doyle, Keith Glover, "Robust and Optimal Control 1st Edition"*Pearson; 1 edition (August 17, 1995)

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. **Name of the Course**: Thin-Film Science and Technology

2. **LTP structure of the course**: 3-1-0

3. **Objective of the course**: The course is aimed at teaching the basics of thin film science and technology, which is one of the important form of materials preparation covering the necessary basics from thermodynamics, electrodynamics, quantum mechanics, and solid state physics relevant to thin film science.

4. **Outcome of the course**: The students are expected to have a broad understanding of the status of thin film technology.

5. Course Plan:

Component	Unit	Topics for Coverage	Chapter No.(Optional)
Component 1	Unit 1	Introduction to thin films – Physics and Engineering Perspective, Materials Science basics. Vacuum Technology: Film growth and Phenomenology: Symmetry, surfaces and interfaces,	
	Unit 2	Thin film Deposition Methods: Physical and Chemical deposition methods, Plasma based deposition methods.Characterization of films:– Methods and mechanisms.	
Component 2	Unit 3	Thin film properties: Thermodynamic and transport properties of thin films (Mechanical, Electrical, Thermal, Magnetic, Optical etc.)	
	Unit 4	Applications of Thin films: Electronic, optical, mechanical, thermal, and energy applications of thin filmtechnology. Emergent research activities in thin film science and technology	

6. Text Book:

Thin-film deposition: principles and practice. Smith, Donald Leonard. Vol. 108. New York: McGraw-hill, 1995. ISBN: 978-0070585027

7. References:

Materials science of thin films.Ohring, Milton. Academic press, 2001. ISBN: 978- 01252497517.

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. **Name of the Course**: High Speed Devices

2. **LTP structure of the course**: 3-1-0

3. **Objective of the course**: To let the first year M.Tech. students exposed to high speed devices.

4. **Outcome of the course**: The students will learn how to fundamentals of high speed devices.

5. **Course Plan:** As per the below format only

Component	**Unit**	**Topics for Coverage**	**Chapter No.(Optional)**
Component 1	Unit 1	Quantum Physics, Schrodinger's equation and problems, Kronig-Penny model, carrier density, scatterings, mobility.	
	Unit 2	MB statistics, Extensive doping, generation-recombination, diffusion and continuity equation	
Component 2	Unit 3	PN junction diodes, diffusion capacitance, varactor diode, PIN diode Schottky diode.	
	Unit 4	Semiconductor Heterojunction, BJT, 1st order model of BJT, Heterojunction FET	

6. Text Book:

S.M Sze, High Speed Semiconductor Devices, John Wiley, 1990.
C Y Chang and Francis Kai, GaAs High-Speed Devices: Physics, Technology and Circuit Applications,John Wiley, 1994

Indian Institute of Information Technology, Allahabad
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1. **Name of the Course:** Monolithic Microwave Integrated Circuits (MMIC)

2.**LTP structure of the course**: 3-1-0

3.**Objective of the course**: To let the M. Tech. (ECE) students exposed to analysis and design of RF integrated circuits and systems.

4.**Outcome of the course**:**Outcome of the course**: The students will get the exposure of various transmitter and receiver design, the effects of nonlinearity and noise, and design of RF building blocks like frequency synthesizer, power amplifier to minimize the components of off chip components.

5.**Course Plan:** As per the below format only

Component	**Unit**	**Topics for Coverage**	**Chapter No.(Optional)**
Component 1	Unit 1	**Basic concepts in RF Design:** Nonlinearity, sensitivity and dynamic range.	
	Unit 2	**Transreceiver architectures:** Receiver architecture and transmitter architecture.	
Component 2	Unit 3	**Frequency Synthesizers:** Phase Locked Loops, RF Synthesizer architecture.	
	Unit 4	**Power Amplifier:** Linear and Non-linear Power amplifiers, Classification of power amplifier, high efficiency PAs,	

6. Text Book:

1. BehzadRazavi**,** *RF Microelectronics*, Prentice Hall; 2 edition,2012.

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. Name of the Course: MIMO Radar Systems

2. LTP structure of the course: 3-1-0
3. Objective of the course: To acquire the fundamental concepts of MIMO Radar communications and its applications.

4. Outcome of the course: The students will understand the concepts of signal processing in MIMO Radar systems

5. Course Plan:

Component	**Unit**	**Topics for Coverage**	**Chapter No.(Optional)**
Component 1	Unit 1	Fundamentals of Radar, MIMO Radar: Concepts, Performance Enhancements,and Applications	
	Unit 2	Generalized MIMO Radar Ambiguity Functions, Target LocalizationUsing MIMO Radars	
Component 2	Unit 3	Adaptive Signal Design for MIMO Radars	
	Unit 4	MIMO Distributed Radar System	

6. Text Book/ References::
1. J. LI and P. Stoica, *MIMO RadarSignal Processing*, John Wiley and Sons, 2009

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. **Name of the Course**: Photonic Sensors

2. **LTP structure of the course**: 3-1-0

3. **Objective of the course**: The course is aimed at teaching the basics and advancements in the area of photonic sensors including various measurement techniques.

4. **Outcome of the course**: The students will be able to understand the principles and technologies behind the optic based sensors in modern industrial domain

5. Course Plan:

Component	Unit	Topics for Coverage	Chapter No.(Optional)
Component 1	Unit 1	Fibers and Integrated Optic Sensors, Microstructure Fiber Sensors, Fiber Bragg-Grating Sensors, Distributed Optical Fiber Sensors, Sensing based on Surface Plasmon Resonance	
	Unit 2	Infrared(IR) detectors, Transmission, Absorption and Scattering phenomenon, Detector types, Photovoltaic detectors, Photo diodes, MSM photo detectors, IR active and passive devices	
Component 2	Unit 3	Optical measurement principle and techniques: Optical waveguide sensors, Intensity measurement, Interferometric Measurement, Fluorescent Measurement, Surface Plasmon measurement,	
	Unit 4	Applications: Fiber optics,	

6. Text Book:

Handbook of Optical Sensors, Edited by Jose Luis Santos and FaramarzFarahi, CRC Prss, Taylor & Francis Group.

7. References:

1. Optical Sensors and Switches, by V. Ramamurthy and Kirk S. Schanze, Molecular and Supermolecular Photochemistry, Vol. 7.

2. Infrared Technology: Applications to Electrooptics, Photonic Devices, and Sensors, by A. R. Jha, Wiley

Indian Institute of Information Technology, Allahabad
Department of Electronics & Communication Engineering

1. Name of the Course: Digital Control Systems

2. LTP structure of the course: 3-1-0

3. Objective of the course: To expose students to different real time digital control system they see in their daily life. How they can build any of these. What are the basic principles involved in this.

4. Outcome of the course: Acquire and apply the knowledge of domain engineering for system modeling, analysis and problem solving. Design control for various systems. Use simulation software and tools for analysis and implementing controller.

5. Course Plan: As per the below format only

Component	**Unit**	**Topics for Coverage**	**Chapter No.(Optional)**
Component 1	Unit 1	Discrete-time signals and systems, Z-transform, pulse transfer functions.	
	Unit 2	Compensator design by root locus, error coefficients and frequency response.	
Component 2	Unit 3	State-space models of discrete time systems, controllability, observability, stability, state estimation,	
	Unit 4	Kalman filtering. Linear regulation. Parameter estimation.	

6. Text Books/References:

1. Gene F. Franklin, J. David Powell, Michael L. Workman, "Digital Control of Dynamic Systems(3rd Edition)" Addison-Wesley; 3 edition (December 29, 1997)
2. Katsuhiko Ogata (Author), "Discrete-Time Control Systems (2nd Edition) 2nd Edition" Pearson; 2 edition (January 19, 1995)

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