DEVI AHILYA VISHWAVIDYALAYA, INDORE

FACULTY OF ENGINEERING

SCHEME OF EXAMINATION
&
COURSE OF CONTENTS

BE IV Year Programme
(ELECTRONICS & INSTRUMENTATION ENGINEERING)

INSTITUTE OF ENGINEERING & TECHNOLOGY
(www.iet.dauniv.ac.in)

B E. IV YEAR ELECTRONICS & INSTRUMENTATION ENGINEERING
TH- Theory, CW – Class Work, SW – Sessional Work, PR – Practical

Semester VII

					Maximum Marks				
SNo	**Sub Code**	**Subject**	**L**	**P**	**TH**	**CW**	**SW**	**PR**	**TOTAL**
1.	**4EI301**	**Project-II**	**-**	**2**	**-**	**-**	**100**	**50**	**150**
2.	**4EI302**	**Sample Data and Non-Linear Control**	**4**	**2**	**100**	**50**	**50**	**50**	**250**
3.	**4EI303**	**Biomedical Instrumentation**	**4**	**2**	**100**	**50**	**50**	**50**	**250**
4.	**4EI304**	**Process Instrumentation**	**4**	**2**	**100**	**50**	**50**	**50**	**250**
5.		**Elective-I**	**4**	**-**	**100**	**50**	**-**	**-**	**150**
	TOTAL		**16**	**8**	**400**	**200**	**250**	**200**	**1050**

Semester VIII

					Maximum Marks				
SNo	**Sub Code**	**Subject**	**L**	**P**	**TH**	**CW**	**SW**	**PR**	**TOTAL**
1.	**4EI351**	**Circuit Design Using HDL**	**4**	**-**	**100**	**50**	**-**	**-**	**150**
2.	**4EI352**	**Power Electronics**	**4**	**2**	**100**	**50**	**50**	**50**	**250**
3.	**4EI353**	**IC Design Techniques**	**4**	**2**	**100**	**50**	**50**	**50**	**250**
4.	**4EI354**	**Analytical Instrumentation**	**4**	**2**	**100**	**50**	**50**	**50**	**250**
5.		**Elective-II**	**4**	**-**	**100**	**50**	**-**	**-**	**150**
	TOTAL		**20**	**6**	**500**	**250**	**150**	**150**	**1050**

List of Elective Subjects

Semester VII, Elective -I

S.No	**Sub Code**	**Subject Name**
1	**4EI305**	**Industrial Automation**
2	**4EI306**	**Wireless Communication**
3	**4EI307**	**Laser Instrumentation**
4	**4EI308**	**Embedded Systems**
5	**4EI309**	**Image Processing**

Semester VIII, Elective-II

S.No	**Sub Code**	**Subject Name**
1	**4EI355**	**Optical Communication**
2	**4EI356**	**Operating Systems**
3	**4EI357**	**Artificial Intelligence**
4	**4EI358**	**Telemetrics and ISDN**
5	**4EI359**	**Instrumentation in Processing Industries**

Devi Ahilya University, Indore, India Institute of Engineering & Technology				IV Year BE Branch Electronic & Instrumentation					
Subject Code & Name	**Instructions Hours per week**			**Marks**	**TH**	**CW**	**SW**	**Pr**	**Total**
4EI301 Project Phase-II	**L**	**T**	**P**	**Max**	**-**	**-**	**100**	**50**	**150**
Duration of Theory Paper: Pr	**-**	**-**	**2**	**Min**			**50**	**25**	**75**

Course Objective: To provide a comprehensive hands on experience to the students about the development of a complete project starting from analysis to testing. The students can also take a research project for innovating a new idea and its implementation.

The major emphasis (but not limited to) shall be given on Microcontroller,Microprocessors,Analog and Digital Electronics, Sensor & Transducers, VLSI and VHDL etc these are practice oriented areas of interest. The students shall be making the system, application or simulation packages depending upon the idea, technology chosen and expertise available. The architectural issues shall be important while the exposure to the technology needs to be gained by the students through thorough practice.

The students (in a batch) shall be required to be continuous interaction with the guide for the advice, guidance and facilities periodically and show the progress. They shall also be taking a certificate in the diary for satisfactory remarks or comments. Batch size shall be decided as per need and the quantum of the project.

The students shall make presentation and submit an originally drafted project reports periodically and at the end of the semester.

[1] Reference books and web links of the relevant material the must be consulted as advised by the guide.

Note: The requirement of relevant book may be submitted by the guide to the HOD/ Director for procurement.

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Subject Code & Name	**Instructions Hours per week**			**Marks**	**TH**	**CW**	**SW**	**Pr**	**Total**
4EI302 **Sample Data & Non-Linear Control**	**L**	**T**	**P**	**Max**	**100**	**50**	**50**	**50**	**250**
Duration of Theory Paper: 3 hrs	**4**	**-**	**2**	**Min**	**35**	**25**	**25**	**25**	**110**

Course Objective: The objective is to give students a clear understanding on characteristics of digital control systems from both frequency and time domain viewpoints.

Prerequisite: Knowledge of classical control methods & MATLAB control system toolbox

COURSE OF CONTENTS

Unit-I

Data conversion & quantization, Sampling process, mathematical analysis of sampling process, Reconstruction of sampled signal, zero order, first order hold Z-transform definition, evaluation of Z-transform, inverse Z-transform, pulse transfer function, limitations of Z transform, relationship between s-plane & z-plane.

Unit-II

Block diagram reduction for systems interconnected through samplers, Sampled Signal flow graphs Stability definition, Jury's test of stability, extension of Routh-Hurwitz criterion to discrete time systems, steady state error analysis.

Unit-III

Root Loci, Frequency domain analysis, Bode plots, Nyquist plots, Gain margin & phase margin Digital implementation of analog controllers: Forward difference, backward difference, bilinear Tustin, Tustin with pre-wraping. Digital controller Design: Classical methods, digital PID's, digital lead-lags, dead-beat controller

Unit-IV

State space representation of discrete time systems, Solution of state equation, Pulse transfer function from state equation, Response between sampling instant using state model, observability, controllability, useful transformation in state space, pole placement methods, controller implementations, State observers.

Unit-V

Introduction, General properties of linear and nonlinear systems, describing function analysis: Definition, limitations, use of describing function for stability analysis, describing function of ideal relay, relay with hystersis, dead zone, saturation, coulomb friction and backlash, Phase Plane Analysis, phase portrait of second order nonlinear systems, limit cycle, Equilibrium finding, Stability of Nonlinear Systems: Liapunov Theorems,

References:

[1] Kuo, *Digital Control System*, 2/e Oxford Press, 1992.
[2] Ogata, *Discrete – Time Control System*, 2/e PHI, 1995.
[3] G.F. Franklin , J.D. Powell, *Digital Control of Dynamic Systems*, Addison-Wesley, 1980.
[4] M Gopal, *Digital Control System*, TMH, 1997.
[5] H. K. Khalil, *Nonlinear Systems, 3/e*, Prentice Hall, 2002.

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Subject Code & Name	**Instructions Hours per week**			**Marks**	**TH**	**CW**	**SW**	**Pr**	**Total**
4EI303 Bio-Medical Instrumentation	**L**	**T**	**P**	**Max**	**100**	**50**	**50**	**50**	**250**
Duration of Theory Paper: 3 hrs	**4**	**-**	**2**	**Min**	**35**	**25**	**25**	**25**	**110**

Course Objective: To encompass students for understand linkages between medical sciences and engineering techniques So that to have a fair views of physiological system of the body along with the instrumentation essential for the detection, acquisition and quantification of the bio signals.

Prerequisite: Basic course in sensors & transducers and biology

COURSE OF CONTENTS

Unit I

Basic Medical Instrumentation system, General Constraints in design of medical instrumentation system, Biomedical Telemetry ,Patient Safety, Laser used in Biomedical Fields, Automated Drug Delivery Systems

Unit-II

Fundamental of Medical instrumentation, Type of Bioelectrical Signals, electrodes used for ECG,EEG,EMG, microelectrodes, electrode jellies and cream, Transducers used for Displacements, position, motion, pressure, body temperature, optical fiber sensor, biosensors, smart sensors, Biomedical recorders like ECG,PCG,VCG,EEG,EMG.

Unit III

Oximeters like Ear, Pulse and intravascular oximeter, Ultrasonic, NMR, LASER Doppler blood flow meter, Cardiac output measurement techniques like Dye dilution, Thermal Dilution, Ultrasound Method, Pulmonory Function Analysers,Respiratory gas anlysers,Blood pH,Blood pCO_2 measreument, Methods of Cell Counting, Pure tone, Speech Audiometers.

Unit IV

X-ray machines, Dental X-ray machines, Digital Radiography, Principles and, System components of Tomography, Principles of NMR, its components and biological effects. Ultrasonic & Thermal imaging systems.

Unit V

Cardiac Pacemakers like external, implantable pacemakers, implantable, DC, Pacer-cardioverter Defibrillators, Artificial Kidney, Dialyzers, Haemodialysis machine. Stone disease problem, lithotriptor systems, Anesthesia machine, Mechanism of artificial ventilation, Types of Ventilator

References:

[1].Cromwell,Weibull & Pfeiffer,*Biomedical instrumentation and Measruments,*2/e,PHI New Delhi-1999
[2].R.S.Khadpur,*Handbook o f Biomedical Instrumentation*,2/e,TMH Pub.Company,New Delhi
[3]. Nandini K. Jog, *Electronics in Medicine and Biomedical Instrumentation*, Prentice Hall
[4] Dr. A. Arumugam ,*Biomedical Instrumentation*, , Anuradha Agencies, Chennai.
[5] Domach,*Introduction to Biomedical Engineering*, Pearson Education
[6] C Raja Rao & S.K Guha *Principles of Medical Electronics & Biomedical Instrumentation,* , University Press.
[7] J.G. Webster,*Handbook of Medical Electronics,*

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Subject Code & Name	**Instructions Hours per week**			**Marks**	**TH**	**CW**	**SW**	**Pr**	**Total**
4EI304 Process Instrumentation	**L**	**T**	**P**	**Max**	**100**	**50**	**50**	**50**	**250**
Duration of Theory Paper: 3 hrs	**4**	**-**	**2**	**Min**	**35**	**25**	**25**	**25**	**110**

Course Objective: To enable students to understand the basic concept of process instrumentation applicable in various industries. It will also give in depth knowledge regarding different type of control strategies instrumentation and controller used in processing industries.

Prerequisite: Basics of control system, Digital design.

COURSE OF CONTENTS

Unit I

Objectives of Control, Process Characteristics: Process Equation, degrees of freedom, process and control lag, dead time, load disturbance and its effect on processes, analog control, digital control, Self regulating processes, final control elements, valves and actuators, their various characteristics.

Unit II

Basic Control action, two position, multi-position, floating Control modes, Continuous controller modes: Proportional, integral, derivative, composite controller modes-I, P-D, P-I-D, comparisons of these control actions, design of various kinds of analog controllers, Parameters Adjustment, Controller tuning methods,

Unit III

Modeling of simple systems-gas liquid and thermal systems, Concept of resistance and capacitance, Nozzle-flapper system, Pneumatic relays and amplifiers, Hydraulic systems, realization of various kinds of controllers for hydraulic and pneumatic applications.

Unit IV

Discrete state Control, Discrete state variables, Event sequence description, ladder diagram, relay sequencer,

Unit V

Cascade control, ratio control, feed-forward control, selective Control, Split range Control
Boiler Control: Combustion Control, Oxygen/CO trimming, Feedwater Control, Furnace Control, Steam temp. Control,
Distillation column control

References:

[1] D.P. Eckman ,*Automatic Process control*, Wiley Publication.
[2] Patranabies ,*Principles of Process control*, Tata Mc Graw Hill Pub, (2006)
[3] P. Harriott ,*Process control*, McGraw-Hill: New York, 1964
[4] Curtis Johnson ,*Process control Instrumentation Technology*, Prentice Hall, New Delhi (2005)
[5] B.G. Liptak ,*Hand Book of Process control*, Taylor & Francis Ltd
[6] Shinskey, *Process Control systems: Application, Design & Tuning*, 4/e McGraw Hill, Singapore (1996)

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Subject Code & Name	**Instructions Hours per week**			**Marks**	**TH**	**CW**	**SW**	**Pr**	**Total**
4EI305 Industrial Automation	**L**	**T**	**P**	**Max**	**100**	**50**			**150**
Duration of Theory Paper: 3 hrs	**4**	**-**	**-**	**Min**	**35**	**25**			**60**

Course Objective: The primary concern of this course is to provide the student with basic skills useful in identifying the concepts of automated machines and equipment and describe the terms and phrases associated with industrial automation. Students will be competence in maintaining and troubleshooting technology includes identifying, understanding, and performing preventative maintenance and service on technology;

Prerequisite: Computer Networks, Sensor and Transducers

COURSE OF CONTENTS

Unit I

Plant wide Control Systems & Strategy, Evolution of instrumentation & control, Role & Benefit of automation in industries, Automation strategy evolution, Control system audit, performance criteria, Safety Systems, Introduction to ISO systems for industrial automation. Industrial symbols, Industrial Block Flow Drawings, Process Flow Drawings (PFD), Piping and Instrument Drawings (P&ID), Electrical Schematics, Isometrics

Unit II

Instrumentation Standard Protocols: HART Protocol, Field bus H1, GPIB, CAN, Industrial Ethernet etc. introduction, frame structure, programming, implementation examples, Benefits, Advantages and Limitations,

Unit III

Applications of PLC and SCADA: applications for batch process using SFC, PLC interface to SCADA/DCS using communication links (RS232, RS485) and protocols (Modbus ASCII/RTU)

Unit IV

DCS introduction, functions, advantages and limitations, DCS Architecture of different makes, DCS detail engineering, specifications, configuration and programming, functions including database management, reporting, alarm management, communication, third party interface, control, display etc. Enhanced functions viz. Advance Process Control, Batch application, Historical Data Management, OPC supports, Security and Access Control etc.

Unit V

Robots classification, specifications, notation, Direct Kinematics, Co-ordinate frames, rotations, Homogeneous coordinates, the Arm equation, Inverse Kinematics problem, Tool configuration, Workspace analysis, trajectory planning, work envelopes of robots, the pick and place operation, Continuous path motion, interpolated motion, Straight line motion, Tool configuration, Jacobian matrix, Jacobian-Manipulator Dynamics, Dynamic model using Lagrange's Equation. Robot control problem, State equations like Single axis PID, PD, gravity control, Computed torque control, Variable Structure control, Impedance control.

References:

[1].Steve Mackey, Edwin Wright, *Practical Industrial Data Networks*, 1/e , Elsevier Publications,2004
[2].Richard.L.Shell,Ernest L. Hall,*Handbook of Industrial Automation*,1/e, Marcel Dekke, Publication,2000
[3]. David Bailey,Edwin Wright*, Practical SCADA for Industry*,1/e, Elseiver Publication,2003
[4]. Poppovik Bhatkar, *Distributed Computer Control for Industrial Automation*, Dekkar Publications.
[5]. Webb and Reis, *Programmable Logic Controllers: Principles and Applications*,PHI
[6]. S.K.Singh, *Computer Aided Process Control*, PHI
[7]. N.E.Battikha, *The Management of Control System: Justification and Technical Auditing*, ISA
[8]. Garry Dunning, *Introduction to Programmable Logic Controllers*, Thomson Learning.
[9]. Robert J Schilling,*Fundamentals of Robotics-Analysis and Control*, Pearson Education, Asia
[10]. C Roy Asfahl, *Robots and Manufacturing* Automation,John Wiley & Sons

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Subject Code & Name	**Instructions Hours per week**			**Marks**	**TH**	**CW**	**SW**	**Pr**	**Total**
4EI306 Wireless Communication	**L**	**T**	**P**	**Max**	**100**	**50**			**150**
Duration of Theory Paper: 3 hrs	**4**	**-**	**-**	**Min**	**35**	**25**			**60**

Course Objective: To provide the knowledge of different generation mobile communication system, cellular concept and the aspects of mobile radio environment this is very different than conventional communication system.

Prerequisite: It is expected to know the following concepts: Electromagnetic spectrum, analog and digital modulation techniques, channel coding, random variable and random process.

COURSE OF CONTENTS

Unit I

Introduction to wireless communication system, Concept of cellular mobile system, Frequency reuse, Channel assignment strategies, Handoff strategies, interference and system capacity, Trunking and grade of service improving coverage & capacity in cellular system.

Unit II

Multiple access techniques for wireless communications: FDMA, TDMA, CDMA. Packet radio protocols. Mobile radio propagation: Free space propagation model. Three basic propagation mechanisms: Reflection, Diffraction, Scattering, Brewster angle, ground reflection model, knife-edge diffraction model. Doppler effect.

Unit III

Wireless systems and standards: GSM: Mobile services, system architecture, radio interface, Protocols, localization and calling, handover, security, Frame structure, GSM channel types New data services: HSCSD, GPRS, EDGE, DECT: System architecture.

Unit IV

Spread spectrum System: Fundamental concept of spread spectrum systems (DSSS and FHSS), Pseudo noise sequences, CDMA Principles of operation, forward and reverse CDMA channel. Wireless systems and standards: IS-95, CDMA 2000, WCDMA. Modulation Techniques for mobile radio: GMSK, spread spectrum modulation techniques. Orthogonal frequency division multiplexing.Multi Carrier and spread spectrum: Multi-Carrier CDMA, Multi-Carrier -DS CDMA, Multi-Tone CDMA.

Unit V

Fundamentals of channel coding, Block codes, Convolution codes. Speech coding for wireless system applications: Introduction to DSP techniques in wireless telephone and broadcast system, speech coding techniques for audio and voice: Waveform coders and Vocoders, Channel vocoder, Formant vocoder, Voice-Excited vocoder, Cepstrum vocoder, Liner predictive coders (LPC), Multipulse Excited LPC, Code Excited LPC, Residual Excited LPC.

References:

[1]. Theodore S. Rappaport, *Wireless Communications principles and practice*, Prentice Hall of India, 2002.
[2]. Kamilo Feher, Wireless *Digital Communications*, PHI Private Limited.
[3]. Jochen H. Schiller, *Mobile Communication*, Pearson Education
[4]. William C.Y. Lee, *Wireless and Cellular Telecommunications*, Tata Mc-Graw Hill.
[5]. Vijay K. Garg, *Wireless Network Evolution 2G to 3G*, Pearson Education.

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Subject Code & Name	**Instructions Hours per Week**			**Marks**					
4EI351 **Circuit Design Using HDL**	**L**	**T**	**P**		**TH**	**CW**	**SW**	**PR**	**Total**
	4	**-**	**-**	**Max**	**100**	**50**	**-**	**-**	**150**
Duration of paper: 3 hrs				**Min**	**35**	**25**	**-**	**-**	**60**

Course Objective: To enable the students to translate a functional system description into appropriate digital blocks coded in VHDL. Perform synthesis, place, and route of a digital design into a target FPGA. Introduction of Analog and mixed signal design using VHDL-AMS

Prerequisite: Digital Design, C language**.**

COURSE OF CONTENTS

Unit I Introduction to VLSI and HDL

History of IC Design, IC Technology, Moore's Law, IC Design Constraints, Feature Size, VLSI Family, Programmable Logic Devices, Designing with Programmable Logic- Design Entry, Simulation, Synthesis, Implementation, Device Programming, EDA Tools, IP Cores, Gjeski's Y Chart.
Digital system design process, Hardware simulation, Levels of abstraction, VHDL requirements, Elements of VHDL Top down design, VHDL operators, Timing, Concurrency, Objects and classes.

Unit II Behavioral Modeling

Signal assignments ,Concurrent and sequential assignments., Entity Declaration, Architecture Body, Behavioral Modeling, Process statement, Loop control statements, Multiple Processes, Delay Models, Signal Drivers.

Unit III Dataflow and Structural Modeling Techniques

Data flow Modeling, Concurrent Assignment statements, Block statements, Resolution Functions, Structural Modeling, Component declaration and Instantiation, Generate statements.

Unit IV Advance Topics in VHDL

Generics and Configuration, Subprogram, Overloading, Packages and Libraries, Design Libraries, Attributes, Hardware Modeling Examples: Modeling of digital circuits used in communication, signal conditioning and Instrumentation blocks.

Unit V Design for Synthesis and Introduction to VHDL-AMS

Language directed view of synthesis, Inference from CSA statements, Inference from within Process, Inference using Signals v/s variables, Latch v/s Flip Flop Inference, Wait statements, Synthesis Hints, Synthesis for dataflow and structural models.
Introduction to VHDL-AMS, Free quantities, Terminal and Branch quantities, Attributes, Simultaneous statements, Analog structure description, Discontinuities and break statements, step specifications, Mixed signal description, Design Processing.

Refrences:

[1]. J. Bhasker, *VHDL* Primer, 3/e, Addison Wesley, 1999.
[2]. Sudhakar Yalamanchili, *Introductory VHDL-From Simulation to Synthesis*, Pearson Education, 3/e Indian Reprint.
[3]. Douglas Perry, *VHDL*, 3/e Edition, McGraw Hill 2001.
[4]. Peter.J.Ashenden, The Designer's Guide to *VHDL-AMS*,
[5]. Charles.H.Roth, *Digital system Design using VHDL*, Thompson Publishers, 2/e Edition, 2007.
[6]. Ben Cohen, *VHDL*-Coding style and Methodologies, Kluwer academic Publishers, 1995.
[7]. Volnei. A.Pedroni, *Circuit Design with VHDL*, *MIT* Press Cambridge, 2004.

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Subject Code & Name	**Instructions Hours per Week**			**Marks**					
4EI352 **Power Electronics**	**L**	**T**	**P**		**TH**	**CW**	**SW**	**PR**	**Total**
	4	**-**	**2**	**Max**	**100**	**50**	**50**	**50**	**250**
Duration of paper: 3 hrs				**Min**	**35**	**25**	**25**	**25**	**110**

Course Objective: Advancements in semiconductor devices creates a revolution in power transmission, distribution and utilization, This course helps students to understand the basic concepts of power semiconductor devices which make students to analyze and design switch mode power electronic converters for various applications including microprocessor power supplies, renewable energy systems, and motor drives.

Prerequisite: Basic Electronics.

COURSE OF CONTENTS

Unit I

power semiconductor diodes and Transistors , Thyristors, Characteristic ,turn on methods ,Switching ,Gate Characteristic , Ratings , Protection , Heating, Cooling, Mounting, Serial /Parallel operation, Introduction to other member of Thyristors family like PUT, SUS, SCS, SITHs, Diac, Triac, RCT, GTO, Firing Circuits of Thyristors, Pulse Transformer in firing circuits, Triac Firing circuit.

Unit II

Thyristors Commutation techniques, Phase Control Rectifiers, Principal of phase Control , Full-wave controlled Converters, Single-Phase Full-wave Converters, Single-Phase Two-pulse Converters with Discontinuous Load Current, Three Phase- Thyristors Converters circuits, Dual Converters, Types of AC voltage controllers, Integral Cycle Control, Single –phase Voltage Controllers, sequence control of AC voltage controllers

Unit III

Choppers: Principle of Chopper Operation, Control Strategies, Step-up/down Choppers, Different types of Choppers circuits, Thyristors Chopper circuit. Inverters: Single- phase voltage source inverters, Fourier Analysis of Single-phase Inverters, Force –commutated Thyristors Inverters, Three Phase Bridge Inverters, Voltage Control in Single – phase Inverters, Pulse – width Modulated Inverters.

Unit IV

Principle of Cycloconverter, Three Phase Half wave Cycloconverter, Output voltage equation for a Cycloconverter. SMPS, UPS, HVDC transmission, Static Switches, Circuit Breakers, Solid State Relays, Resonant Converters

Unit V

Concepts of Electric drive, DC drive, Choppers drives, AC drives, Induction- Motor Drives, Speed control of Three-Phase induction Motors, Synchronous Motor Drives,

References:

[1] .Muhamed H.Rashid, *Power Electronics Circuits, Devices and Applications*, 3/e. 2004, PHI.
[2]. Singh and Kanchandani, *Power Electronics*, TMH
[3] .Sen, *Power Electronics*, TMH,
[4]. Dubey, *Thyristorised power controllers*, Wiley Eastern
[5]. Vithayathil, *Power Electronics – Principles and applications* McGraw-Hill.
[6]. Lander, *Power Electronics*, 3/e, McGraw-Hill.
[7]. Dr.P.S.Bimbhra, *Power Electronics,* 3/e, Khanna Publishers, New Delhi

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Subject Code & Name	**Instructions Hours per Week**			**Marks**					
4EI353 **IC Design Techniques**	**L**	**T**	**P**		**TH**	**CW**	**SW**	**PR**	**Total**
	4	**-**	**2**	**Max**	**100**	**50**	**50**	**50**	**250**
Duration of paper: 3 hrs				**Min**	**35**	**25**	**25**	**25**	**110**

Course Objective: This course presents the fundamental of analog and Digital CMOS VLSI design with different VLSI design methodologies and combinational, sequential and semiconductor memory circuit design. It also covers the limitations of CMOS in NANO technology with introduction to the NANO Technology.

Prerequisite: Knowledge of semiconductor devices is required.

COURSE OF CONTENTS

Unit I

VLSI design flow, VLSI design style, introduction to the basic fabrication processes (wafer preparation, oxidation, diffusion, etching, metallization and lithography, etc.), Fabrication process Flow: basic Steps, the CMOS n-well Process. Metal oxide semiconductor (MOS) structure, Types of MOSFET: Enhancement and Depletion. Structure and operation of MOS transistor.

Unit II

Threshold voltage equation and energy band diagram of MOSFET, controlling of threshold voltage, MOSFET current – Voltage Characteristics. Transconductance, Drain conduction. Aspect ration, process parameters, second order effects, MOS small signal and Large signal model, MOS capacitances. Stick diagram rules for nMOS and CMOS technology, lambda based and micron based design rules. Layout design for CMOS inverter

Unit III

Analysis of different types of inverter circuit, CMOS inverter, transfer characteristic, calculation of propagation delay, rise time, fall time, noise margin and power dissipation for CMOS Inverter. Effect of threshold voltage and supply voltage on Delay and power dissipation. Limitations of CMOS in NANO scale circuit design.

Unit IV

CMOS logic**,** pseudo NMOS logic, passes transistor logic, Transmission Gate logic and Dynamic logic circuit design. Designing of Combinational logic circuit, sequential logic circuit design and semiconductor memory circuit.

Unit V

Basic concept of analog VLSI design, Common source stage, source follower, single ended and differential operation, common mode response, active current mirror, frequency response of amplifier, introduction to the operational amplifier.

References:

[1]. Sung-mo Kang, Yusuf Leblebici, *CMOS Digital Integrated Circuit analysis and Design, 3/e,* Tata McGrawHill.

[2]. Behzad razavi, *Design of Analog CMOS Integrated Circuit*, Tata McGraw Hill, 11th reprint, 2006.

[3]. R. Jacob Baker, Harry W. Li & David E. Boyce, *CMOS Circuit design, layout and Simulation*, PHI,IEEE press, Series Edition,

[4]. Yuan Taur, Tak H. Ning, *Fundamentals of Modern VLSI Devices*, Cambridge University Press, Special Edition, 1998

[5]. Neil H.E. Weste and Kamran Esharhian, *Principal of CMOS VLSI design*, 2/e ,PHI

[6]. Jan M. Rabaey, *Digital Integrated Circuit*, 2/e,PHI

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Subject Code & Name	**Instructions Hours per Week**			**Marks**					
4EI354	**L**	**T**	**P**		**TH**	**CW**	**SW**	**PR**	**Total**
Analytical Instrumentation	**4**	**-**	**2**	**Max**	**100**	**50**	**50**	**50**	**250**
Duration of paper: 3 hrs				**Min**	**35**	**25**	**25**	**25**	**110**

Course Objective: This course exposes the students to various instruments and techniques used in the analysis and Identification of elements and compounds

Prerequisite: Knowledge of basic Electronics and Fundamentals of Chemistry

COURSE OF CONTENTS

Unit I
Colorimeters, Visible-Ultraviolet Spectrometers, Infrared Spectrometers, Atomic Absorption Spectrometers

Unit II
Flourimeters, Phosphorimeters, Raman Spectrometer, Photo Acostic, Photothermal Spectrometers Mass Spectrometers

Unit III
Nuclear Magnetic Resonance Spectrometers, Electron Spin Resonance Spectrometers, Electron and Ion Spectroscopy, X-ray Spectrometers

Unit IV
Gas Chromatographs, Liquid Chromatograph, Thermo Analytical Methods

Unit V
PH Meters, Blood Gas Analyzer, Industrial Gas Analysers, Environmental Pollution Monitoring Instruments

References:

[1]. H. H. Williard, L. L. Merrit, J. A. Dean, and F. A. Settle, *Instrumental Methods of Analysis*, 7/e, CBS Publishers and Distributors, India, 1988
[2]. D. A. Skoog, F. J. Holler, and T. A. Nieman, *Principles of Instrumental Analysis*, 6/e., Thomson Learning, 1998
[3]. R. S. Khandpur, *Handbook of Analytical Instruments*, Tata McGraw Hill, New Delhi
[4]. R. K. Jain, *Mechanical and Industrial Measurements*, Khanna Publishers, Delhi, 1985
[5]. G. W. Ewing, *Instrumental Methods of Chemical Analysis*, 5/e., McGraw Hill, Singapore, 1992
[6]. R. E. Sherman and L. J. Rhodes (Eds), Analytical Instrumentation, ISA Press, New York, 1996
[7]. B. G. Liptak, *Process Measurement and Analysis*, 3rd ed., Chilton Book Company, Pennsylvania, 1995
[8]. Behrouz A.Forouzan , Data Communications and Networking ,4/E Tata McGraw-Hill, 2000

Devi Ahilya University, Indore, India Institute of Engineering & Technology				IV Year BE Branch Electronic & Instrumentation					
Subject Code & Name	**Instructions Hours per Week**			**Marks**					
4EI355 **Optical Communication**	**L**	**T**	**P**		**TH**	**CW**	**SW**	**PR**	**Total**
	4	**-**	**-**	**Max**	**100**	**50**	**-**	**-**	**150**
Duration of paper: 3 hrs				**Min**	**35**	**25**	**-**	**-**	**60**

Course Objective: To provide the fundamentals of optical communication systems and its various elements

Prerequisite: Knowledge of Electromagnetic fields & waves and basic concepts of Lasers and optical fiber

COURSE OF CONTENTS

Unit I

Introduction to optical fiber communication systems, Advantages of optical fiber communication over conventional electrical communication, review of optical fiber fundamentals, ray theory transmission, electromagnetic mode theory for optical propagation, cylindrical fiber; modes, mode coupling, step index fibers, graded index fibers, single mode fiber; cutoff wavelength, mode field diameter & spot size, effective refractive index.

Unit II

Transmission characteristics of optical fibers; attenuation, material absorption losses in silica glass fibers, linear scattering losses, nonlinear scattering losses, fiber bend loss, dispersion; intermodal dispersion, intra modal dispersion, modal noise, overall fiber dispersion, dispersion shifted fiber.

Unit III

Optical sources: Lasers & LEDs; review of basic concepts, semiconductor injection laser (injection laser diode), efficiency, injection laser characteristics; threshold current temperature dependence, dynamic response, frequency chirp, noise, reliability, comparison of LED & Lasers. Optical detectors: optical detection principle, absorption, quantum efficiency, responsivity, long wavelength cutoff, pin photodiode, avalanche photodiode, benefits and drawbacks with the avalanche photo diode.

Unit IV

Introduction to receiver, types of noise, receiver noise, p-n & p-i-n photodiode receiver, APD receiver. Optical Amplifiers; Semiconductor Optical Amplifiers (SOAs), Erbium doped fiber amplifiers, crosstalk in SOAs. Nonlinear effects; self phase modulation, cross phase modulation, four wave mixing, solitons.

Unit V

WDM concepts & components- overview of WDM, passive optical couplers; 2X2 fiber coupler, star couplers, Mach Zehender interferometer multiplexers, fiber grating filters, dielectric thin film filters.

References:

[1]. John M. Senior, *Optical Fiber Communications: Principles and Practice*, LPE, Pearson Education-2006.

[2]. Gerd Keiser, *Optical Fiber Communications,* Tata McGraw Hill Education Private Limited, New Delhi, 2008.

[3]. Joseph C. Palais, Fiber Optic Communication, PHI.

[4]. Gowar, Optical Communication Systems, PHI.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				IV Year BE Branch Electronic & Instrumentation					
Subject Code & Name	**Instructions Hours per Week**			**Marks**					
4EI356 **Operating System**	**L**	**T**	**P**		**TH**	**CW**	**SW**	**PR**	**Total**
	4	**-**	**-**	**Max**	**100**	**50**	**-**	**-**	**150**
Duration of paper: 3 hrs				**Min**	**35**	**25**	**-**	**-**	**60**

Course Objective: To provide an introduction to Operating System concepts and its design issues

Prerequisite: Computer Organization.

COURSE OF CONTENT

Unit I Introduction

Role of OS: Types of OS, Batch Systems; Multiprogramming; Time Sharing; Distributed & Real time OS. Computer structure and OS: System Architecture – I/O, Storage, Processors; System components- OS Services, System Calls , System Programs; System Design, Implementation and Generation.

Unit II Process Management

Concepts of process: Process status, Process description, Process model. Process Scheduling: Concepts, Scheduler organization, preemptive and non- preemptive scheduler strategies, scheduling algorithms: FCFS, SJN, Priority Scheduling, Round Robin Scheduling, Multiple Processor scheduling, Thread Concepts and Multiple threaded OS.

Unit III Process Synchronization and Deadlock

Process Co-operation, Concepts of Interprocess communication, Process Synchronization, Synchronization Issues, Critical Section problem, Mutual exclusion Primitives and Algorithms, Process Synchronization with semaphores. Concepts of Deadlock, Conditions for Deadlocks, Resource Concepts & Abstractions, Deadlock Prevention, Avoidance and Recovery, Banker Algorithms for Deadlock Avoidance.

Unit IV Memory Management

Swapping, Segmentation, Paging and Contiguous memory allocation. Virtual Memory: Demand Paging, Page replacement and Frame Allocation policies, Thrashing. File System: Concepts, Access Method, Directory Structure, and File System Management.

Unit V I/O management and other issues

Kernel, I/O hardware, I/O interfacing, I/O requesting and interrupts. Disk management: Disk Structure and Scheduling. Protection and Security. Linux: Kernel Organization, Process and resource management, Memory management, Introduction to Linux File System. Overview of Windows Operating System design.

References:

[1]. Silberschatz, Galvin and Gagne, *Operating System Principles*, 7th Ed. Addison Wesley.
[2]. Gary Nutt, *Operating Systems*, 3rd Ed. Pearson Education, India
[3]. Tanenbaum, *Modern Operating Systems*, PHI.
[4]. W. Stalling, *Operating Systems*, Macmillan.
[5]. H. M. Dietel , *Operating Systems*, Addison Wesley Longman.
[6]. Maurice J. Bach, *The design of Unix Operating system*, Pearson Education, India.
[7]. Sumitabha Das, *Unix Concepts & Applications: includes SCO Unix & Linux*, Tata McGraw Hill.

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Subject Code & Name	**Instructions Hours per Week**			**Marks**					
4EI357 **Artificial Intelligence**	**L**	**T**	**P**		**TH**	**CW**	**SW**	**PR**	**Total**
	4	**-**	**-**	**Max**	**100**	**50**	**-**	**-**	**150**
Duration of paper: 3 hrs				**Min**	**35**	**25**	**-**	**-**	**60**

Course Objective: To introduce the concepts of making computer systems intelligent through computational methods and techniques.

Prerequisite: Data Structure.

COURSE OF CONTENTS

Unit I
AI and AI Techniques; Problems, Problem space and Sate space; Production systems; Search techniques and algorithms.

Unit II
Knowledge Representation- Issues and Methods; Predicate logic- resolution and unification; Forward and backward Reasoning; Logic programming & Prolog.

Unit III
Symbolic computation- Uncertainty; Rule based systems; Statistical Reasoning; Fuzzy Logic; Expert systems; Decision support systems.

Unit IV
Semantic networks; Frames and Scripts; Conceptual Dependency; Game playing; Planning overview; Understating; Learning.

Unit V
Natural language processing- parsing, semantic analysis, ATN and RTNs; Connectionists models- neural networks; Speech and vision processing; Robotic actions.

References:
[1] E Rich, K Knight, Artificial Intelligence, 2/e, McGraw Hill, 1991.
[2] S Russell, P Norvig, Artificial Intelligence: A Modern Approach, 2/e, Pearson Education (PH), 2003.
[3] D W Patterson, Introduction to Artificial Intelligence and Expert Systems, PHI, 2007.
[4] P Winston, Artificial Intelligence, 3/e, Addison Wesley, 1992.

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Subject Code & Name	**Instructions Hours per Week**			**Marks**					
4EI358 **Telematics and ISDN**	**L**	**T**	**P**		**TH**	**CW**	**SW**	**PR**	**Total**
	4	**-**	**-**	**Max**	**100**	**50**	**-**	**-**	**150**
Duration of paper: 3 hrs				**Min**	**35**	**25**	**-**	**-**	**60**

Course Objective: The contents will provide overview of different types of communication Networks.

Prerequisite: Basic knowledge of digital transmission and computer networks.

COURSE OF CONTENTS

Unit I

Evolution of Telecommunication, telecommunications standards, introduction to OSI Model, various communication networks, basics of digital communication and transmission, introduction to sampling and pulse code modulation, speed digitization, concept of time division multiplexing, multiplexing hierarchy (T and E carriers), SONET/SDH, Overview of line coding and subscriber line technology.

Unit II

Switching Sub-systems- basics of switching systems, manual switching system, and strowger switching system, crossbar switching system, space division switching and time division switching. Types of switching, circuit switching, packet switching.

Unit III

Telephone Networks- subscriber end instruments, subscriber loop systems, transmission system, signaling system, trunk networks.

Telecommunication Traffic- unit of traffic, network traffic load and parameters, grade of service and blocking probability, modeling switching system, Markov processes, incoming traffic and service time characterization, blocking models and loss estimates.

Unit IV

Introduction to wireless networks- different types of wireless networks (WAN, WMAN, WLAN) Introduction to mobile radio communication- cellular network organization frequency reuse concepts, operation of cellular system, hand –off.

Introduction to IEEE WLAN, types, protocol architecture, applications. Introduction to Wi-MAX and its applications.

Unit V

Integrated Services Digital Networks- evolution, basic principles, architecture and reference points, various frame formats, protocol stack, ISDN services.

Broadband ISDN- architecture, protocol stack, cell format, BISDN services.

References:

[1]. Thiagrajan Viswanathan, *Telecommunications Switching Systems and Networks*, PHI, 1998.
[2]. J.E. Flood, *Telecommunications Switching Traffic and Networks*, Pearson Education, 2004.
[3]. Pete Movlton, *Telecommunications Survival Guide*, Pearson Education Asia, 2001.
[4]. W. Stallings, *Wireless Communication and Networks*, Pearson Education Asia, 2001.
[5]. W. Stallings, *ISDN* and Broad band *ISDN* with Frame Relay and *ATM*, Pearson Education, 2005.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				IV Year BE Branch Electronic & Instrumentation					
Subject Code & Name	**Instructions Hours per Week**			**Marks**					
4EI359 **Instrumentation in Processing Industries**	**L**	**T**	**P**		**TH**	**CW**	**SW**	**PR**	**Total**
	4	**-**	**-**	**Max**	**100**	**50**	**-**	**-**	**150**
Duration of paper: 3 hrs				**Min**	**35**	**25**	**-**	**-**	**60**

Course Objective: To get familiarize with the details of automation and control in various processing Industries.

Prerequisite: Process Instrumentation, Control system.

COURSE OF CONTENTS

Unit I Instrumentation in Brewing and Food Industries

Description of Process, Measurement hardware in brewing and food industries, Analyzers, valves, controllers and displays in brewing and food industries, Computer application and typical control schemes in brewing and food industries.

Unit II Instrumentation in Glass, Iron and Steel Industries

Glass and glass making process, Measurement hardware and techniques in glass industry, Automatic inspection of glass products, Final control elements, controllers and displays in glass industry, Computer application and typical control schemes in glass industry.

Description of Process, Blast Furnace, Measurement hardware, valves ,Analyzers, controllers in Iron and Steel industry, Computer application and typical control schemes in Iron and steel Industry.

Unit III Instrumentation in Pharmaceutical Industry

Description of Process, Measurement hardware, Analyzers, valves and controllers in Pharmaceutical Industry, Computer application and typical control schemes in Pharmaceutical Industry

Unit IV Instrumentation in Petrochemical Industry

Control of Chemical reactors, Computer control of batch reactors, Control of distillation column, Optimizing control of distillation column, Control of refrigeration units, steam boilers, furnaces, dryers, crystallizers, centrifuges, heat exchangers, pumps, compressors, evaporators, extruders, Effluent and water treatment controls, Analog and digital blending systems.

Unit V Instrumentation in Paper and Pulp Industry

Description of Process, Measurement hardware, Analyzers, valves and controllers in Paper and Pulp Industry, Computer application and typical control schemes in Paper and Pulp Industry

References:

1. Liptak B.G, Instrument Engineers Handbook, Clinton Book Company, (1982)
2. D.Patranabis, Principles of Industrial Instrumentation, Tata McGraw Hill Publishing Company Ltd.,New Delhi, 1999.
3. John G Webster, Measurement, Instrumentation and Sensors Handbook, CRC press.
4. Austin G.T. Shreeves, Chemical Process Industries, McGraw-Hill International student edition, Singapore, 1985.