SCHOOL OF ENGINEERING
SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES
Outcome based Curriculum for
Undergraduate Degree Courses in Engineering & Technology Department of Electronics and Instrumentation Engineering

Opto-Electronic Instrumentation
EIA-701

EIA-701	**Opto-Electronic Instrumentation**	**3L:0T:P**	**3 credits**	**3Hrs/Week**

Course Preambles:

1.To expose to the students on the basics of optical sources and detectors, optical fiber and fiber optic sensors.
2.To impart knowledge on the characteristics of optical sources and detectors.
3.To introduce about the Industrial applications of fiber optic sensor and laser

Course Outcomes

1. Describe the properties, construction & classification of Lasers.
2. Explain operation & applications of Laser instruments with their safety measures.
3. Analyse operation & transmission in Optical fiber with their modulation techniques.
4. Express a fiber optic instrument to measure Electrical & Non Electrical parameters.
5. Analyse various optoelectronic sensors and display devices

UNIT-I (10H)

Laser fundamentals: Mechanisms Properties of Laser Generations, Optical Feedback, And Classification of LASER: Solid, Liquid, Gas, Lasers and their Respective Enginery Level Diagrams. Construction of Dye,Nd-YAG, Argon and carbon dioxide lasers, Characteristics of stabilization Q- switching and mode locking.

UNIT-II (10H)

Laser Instruments: Laser interferometers, laser strain gauges, pulse echo technique, Beam modulation telemetry. Laser welding, Laser machining and Laser spectroscopy, Line shape function, lasing threshold, Application of lasers in Engineering and Medicine, safety with lasers.

UNIT- III (10H)

Optical fibers Fundamentals: Introduction to optical fibers, Fundamentals of Transmission theory, Fiber Fabrication and Manufacturing techniques, fiber Splicing, Connectors and Jointing Technique, Electro-Optic, Mechano - Optic and Acousto-optic Modulation techniques, Losses in Optical fibers.

UNIT-IV (6H)

Fiber Optic Instrumentation: Classification and Principle of fibers optic sensors. Optical time Domain Reflectometer. Multimode passive and active fibers sensors phase modulated sensors. Measurements of currents, Voltage, pressure, Temperature, Displacement, Acceleration, and Fluid level using optical fibers.

UNIT- V (6H)
Optoelectronic Devices and Components: Photo diodes, LDRs, PIN diodes, Solar cells, LED, S phototransistors LCD, plasma Display, Opt isolators, Photo Couplers.

Reference Book:
1. Wilson & J.F.B. Hawkers, Optoelectronics- An Introduction Prentice Hall of India 2nd Edtions
2. Amar K. Ganguly, Optical & Opto Electronic Instrumentation, Narosa Publishing House.
3. Shukbir Kumar Sarkar, Optical Fibers and fiber Optics Instrumentation, 2nd edition.S. Chand &Company
4. R.P. Khara Fibre optics & Optical Commecam

EIA-701	**Opto-Electronic Instrumentation**	**0L:0T:2P**	**1credits**	**2Hrs/Week**

LIST OF EXPERIMENTS

1. Setting up Fiber Optic Analog Link and Digital Link
2. Study of Intensity Modulation Technique using Analog input signal
3. Pulse Width Modulation in Fiber Optic Link.
4. Measurement of propagation or attenuation loss in optical fiber.
5. Measurement of bending loss in optical fiber.
6. Numerical Aperture (NA) of the fiber.
7. Study of Diffraction gratings.
8. Study of Michelson Interferometer.
9. Study of Reflection Holography.
10. Study of Transmission Holography

SCHOOL OF ENGINEERING

SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES

Outcome based Curriculum for

Undergraduate Degree Courses in Engineering & Technology Department of Electronics and Instrumentation Engineering

Analytical Instrumentation
EIA-702

EIA-702	**Analytical Instrumentation**	**3L:0T:0P**	**3 Credit**	**3Hrs/Week**

Course Preambles:

1. To make the students equipped about the analysis of materials as it is an important requirement of process control and quality control in industry.
2. To expose the students to principles of various analytical methods.
3. To impart the knowledge on various instruments used in the analysis of materials.

Course Outcomes

1. Acquire knowledge of electromagnetic radiation with matter and apply analytical techniques.
2. Describe the relevance of material sampling and analysis in process control and quality control in industry.
3. Apply the knowledge of chromatography to separate the constituents from a complex mixture.
4. Identify the physical principles behind the various widely used analytical methods in the industry.
5. Select an appropriate analyser for an industrial requirement

UNIT-I (10H)

Review of basic components of analytical instrumentation, Calorimeter and Spectrophotometers, Electromagnetic radiation, Beer –Lamberts Law, Absorption instruments, Calorimeters, Spectrophotometers sources of error and calibration.

UNIT-II (10H)

Infra –red Spectrophotometers infra-red Spectroscopy, Basic Components types of IR Spectrometry, sample handling techniques, FT-IR Spectroscopy, Calibration, Mass Spectrometers, Basic mass Spectrometer, types, Components, Resolution and application of Mass Spectroscopy.

UNIT-III (10H)

NMR, Principle of NMR Spectroscopy, Different types of NMR Spectrometers, Chromatography, Basic of Gas Chromatography, Methods of measurement of peak areas, Liquid chromatography, types of amino acid analysers.

UNIT-IV(6H)

Electro- Mechanical instruments, Electro-Chemical cell, Types of electrodes, potentiometers, conductivity meters, polar – graphs, PH-meters, Principle of measurements, Electrodes, Selective lon electrode, chemically sensitive semiconductor devices, Bio- Sensors.

UNIT-V(6H)

Industrial gas Analysers, Types, Para–magnetic Oxygen analyser, Magnetic wind instruments, Infra-red gas analyser, Thermal conductivity analyser, Analyser based on gas density, Methods based on ionization. Environmental pollution monitoring instruments: Air pollution monitoring instruments, Co-$S0_2$ –No wet Chemical air analysis, Water pollution monitoring instruments.

Reference Book

1. H.M Willard, L.L. Merit, J. A. Dean, Instrumental Methods of Analysis CBS Publishers, Delhi.
3. R.S. Khandpur, Analytical instruments, Tata McGraw Hills1989.

EIA-702	**Analytical Instrumentation**	**0L:0T:2P**	**1 Credit**	**2 Hrs/Week**

LIST OF EXPERIMENTS

1. Study of Gas chromatograph
2. Study of X-Ray Spectrometer
3. Study of Ultraviolet & Visible Spectrophotometer
4. Study of Mass spectrometer
5. Viscosity measurement
6. Turbidity measurement

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Program Elective-IV
EIA-703(A)
Non-Conventional
Energy Sources

EIA-703(A)	**Non-Conventional Energy Sources**	**3L:0T:0P**	**3 Credit**	**3Hrs/Week**

Course Preambles

1.To impart the knowledge of basics of different non-conventional types of power generation & power plants in detail so that it helps them in understanding the need and role of Non-Conventional Energy sources particularly when the conventional sources are scarce in nature

Course Outcomes
1. Understand the different nonconventional sources and the power generation techniques to generate electrical power.
2. Understand the Solar energy power development and different applications.
3. Understand different wind energy power generation techniques and applications.
4. Design a prescribed engineering sub-system
5. Recognize the need and ability to engage in lifelong learning for further developments in this field

UNIT-I (10H)

Review of Conventional and Non-Conventional energy sources - Need for non-conventional energy sources Types of Non- conventional energy sources - Fuel Cells - Principle of operation with special reference to H2 °2 Cell - Classification and Block diagram of fuel cell systems - Ion exchange membrane cell – Molten carbonate cells - Solid oxide electrolyte cells - Regenerative system- Regenerative Fuel Cell - Advantages and disadvantages of Fuel Cells-Polarization - Conversion efficiency and Applications of Fuel Cells.

UNIT-II (10H)

Solar energy - Solar radiation and its measurements - Solar Energy collectors -Solar Energy storage systems - Solar Pond - Application of Solar Pond - Applications of solar energy.

UNIT-III (10H)

Wind energy- Principles of wind energy conversion systems - Nature of wind - Power in the Wind-Basic components of WECS -Classification of WECS -Site selection considerations -Advantages and disadvantages of WECS -Wind energy collectors -Wind electric generating and control systems - Applications of Wind energy -Environmental aspects.

UNIT- IV (6H)

Energy from the Oceans - Ocean Thermal Electric Conversion (OTEC) methods - Principles of tidal power generation -Advantages and limitations of tidal power generation -Ocean waves - Wave energy conversion devices -Advantages and disadvantages of wave energy - Geo-Thermal Energy - Types of Geo-Thermal Energy Systems - Applications of Geo-Thermal Energy.

UNIT-V (6H)

Energy from Biomass - Biomass conversion technologies / processes - Photosynthesis - Photosynthetic efficiency - Biogas generation - Selection of site for Biogas plant - Classification of Biogas plants - Details of commonly used Biogas plants in India - Advantages and disadvantages of Biogas generation -Thermal gasification of biomass -Biomass gasifiers.

Reference Book

1. Rai G.D, Non-Conventional Sources of Energy, Khandala Publishers, New Delhi, 1999.
2. M.M. El-Wakil, Power Plant Technology. McGraw Hill, 1984.

SCHOOL OF ENGINEERING
SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES
Outcome based Curriculum for
Undergraduate Degree Courses in Engineering & Technology Department of Electronics and Instrumentation Engineering

Mixed Signal Design
EIA-703(B)

EIA-703(B)	**Mixed Signal Design**	**3L:0T:0P**	**3 Credit**	**3Hrs/Week**

Course Preambles

1. Importance of CMOS and Mixed Signal VLSI design in the field of Electronics and Telecommunication.
2. Underlying methodologies for analysis and design of fundamental CMOS Analog and Mixed signal Circuits like Current and Voltage references, Single stage Amplifiers, Operational Amplifiers, Data Converters.
3. The issues associated with high performance Mixed Signal VLSI Circuits

Course Outcomes:

1. Understand the practical situations where mixed signal analysis is required.
2. Analyze and handle the inter-conversions between signals.
3. Design systems involving mixed signals

UNIT-I (10H)

Analog and discrete-time signal processing, introduction to sampling theory; Analog continuous time filters: passive and active filters; Basics of analog discrete-time filters and Z-transform.

UNIT-II(10H)

Switched-capacitor filters- Non idealities in switched-capacitor filters; Switched-capacitor filter architectures; Switched-capacitor filter applications.

UNIT-III(10H)

Basics of data converters; Successive approximation ADCs, Dual slope ADCs ,Flash ADCs, Pipeline ADCs, Hybrid ADC structures, High-resolution ADCs, DACs.

UNIT-IV(6H)

Mixed-signal layout, Interconnects and data transmission; Voltage-mode signaling and data transmission; Current-mode signaling and data transmission.

UNIT-V(6H)

Introduction to frequency synthesizers and synchronization; Basics of PLL, Analog PLLs; Digital PLLs; DLLs.

Text/Reference Books:

1. R. Jacob Baker, CMOS mixed-signal circuit design, Wiley India, IEEE press, reprint 2008.
2. Behzad Razavi , Design of analog CMOS integrated circuits, McGraw-Hill, 2003.
3. R. Jacob Baker, CMOS circuit design, layout and simulation, Revised second edition, IEEE press, 2008.
4. Rudy V. dePlassche, CMOS Integrated ADCs and DACs, Springer, Indian edition, 2005.
5. Arthur B. Williams, Electronic Filter Design Handbook, McGraw-Hill, 1981.
6. R. Schauman, Design of analog filters by, Prentice-Hall 1990 (or newer additions).
7. M. Burns et al., An introduction to mixed-signal IC test and measurement by, Oxford university press, first Indian edition, 2008

SCHOOL OF ENGINEERING
SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES
Outcome based Curriculum for
Undergraduate Degree Courses in Engineering & Technology Department of Electronics and Instrumentation Engineering

Open Core Elective - III
EIA-704(A)
Road Safety Engineering

EIA-704(A)	**Road Safety Engineering**	**3L:0T:0P**	**3 Credit**	**3Hrs/Week**

Course Preambles

1. Introduction to various factors considered for road safety and management
2. Explain the road safety appurtenances and design elements
3. Discuss the various traffic management techniques

Course Outcomes

1. Prepare accident investigation reports and database
2. Apply design principles for roadway geometrics improvement with various types of traffic safety appurtenances/tools
3.Manage traffic including incident management

UNIT – I (10H)

Road Accidents: Causes, scientific investigations and data collection, Analysis of individual accidents to arrive at real causes, statistical methods of analysis of accident data, Basic concepts of Road accident statistics, Safety performance function: The empirical Bayes method Identification of Hazards road location. Application of computer analysis of accident data.

UNIT – II (10H)

Safety in Road Design: Operating the road network for safety, highway operation and counter measures, road safety audit, principles-procedures and practice, code of good practice and checklists, vehicle design factors & Driver characteristics influencing road safety.

UNIT – III (10H)

Road Signs and Traffic Signals: Classification, Location of Signs, measures of sign effectiveness, Types of visual perception, sign regulations, sign visibility, sign variables, Text versus symbols.

Road Marking: Role of Road markings, Classification, visibility. Traffic Signals: Need, Signal face. Illumination and location of Signals, Factors affecting signal design, pedestrians' safety, fixed and vehicle actuated signals. Design of signa1s, Area Traffic control. Delineators, Traffic Impact Attenuators, Road side rest areas, Safety Barriers, Traffic Aid Posts.

UNIT – IV (6H)

Traffic Management Techniques: Integrated safety improvement and Traffic Calming Schemes, Speed and load limit, Traffic lights, Safety cameras, Tests on driver and vehicles, pedestrian safety issues, Parking, Parking enforcement and its influence on Accidents. Travel Demand Management; Methods of Traffic management measures: Restriction of Turning Movements, One-way streets, Tidal Flow Operation Methods, Exclusive Bus Lanes and Closing Side-streets; Latest tools and techniques used for Road safety and traffic management. Road safety issues and various measures for road safety; Legislation, Enforcement, Education and Propaganda, Air quality, Noise and Energy Impacts; Cost of Road Accidents.

UNIT – V (6H)

Incident Management: Introduction, Characteristics of Traffic Incidents, Types of Incidents, Impacts, Incident management process, Incident traffic management; Applications of ITS: Motorist information, Equipment used; Planning effective Incident management program, Best practice in Incident management programs. National importance of survival of Transportation systems during and after all natural disasters especially cyclones, earthquakes, floods etc. and manmade disasters like sabotage, terrorism etc.

Reference Book

1. Guidelines on Design and Installation of Road Traffic Signals, IRC:93.
2. Specification for Road Traffic Signals, IS: 7537-1974.
3. Principles and Practice of Highway Engineering by L.R. Kadiyali and N.B. Lal.
4. Hand Book of T.E. Myer Kutz, Editor McGraw Hill, 2004.

SCHOOL OF ENGINEERING
SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES
Outcome based Curriculum for
Undergraduate Degree Courses in Engineering & Technology Department of Electronics and Instrumentation Engineering

EIA-704(B)
Principles of Electronic Communications

EIA-704(B)	**Principles of Electronic Communications**	**3L:0T:0P**	**3 Credit**	**3Hrs/Week**

Course Preambles

1. Provide an introduction to fundamental concepts in the understanding of communications systems.
2. Provide an introduction to network model and some of the network layers including physical layer, data link layer, network layer and transport layer.
3. Provide an introduction to the evolution of wireless systems and current wireless technologies.

Course Outcomes

1. Understand the working of analog and digital communication systems
2. Understand the OSI network model and the working of data transmission
3. Understand the evolution of communication technologies from traditional telephony systems to modern wireless communication systems.

UNIT – I (10H)

Introduction to communication systems: Electromagnetic Frequency Spectrum, Signal and its representation, Elements of Electronic Communications System, Types of Communication Channels.
Signal Transmission Concepts: Baseband transmission and Broadband transmission,
Communication Parameters: Transmitted power, Channel bandwidth and Noise, Need for modulation
Signal Radiation and Propagation: Principle of electromagnetic radiation, Types of Antennas, Antenna Parameters and Mechanisms of Propagation.

UNIT – II (10H)

Analog and Digital Communications: Amplitude modulation and demodulation, FM modulation and demodulation, Digital converters, Digital modulation schemes – ASK, FSK, PSK, QPSK, Digital demodulation.

UNIT – III (10H)

Data Communication and Networking: Network Models, OSI Model, Data Link Layer – Media Access control, Ethernet, Network Layer – Internet Protocol (IPv4/IPv6), Transport Layer – TCP, UDP.

UNIT – IV (10H)

Telecommunication Systems: Telephones, Telephone system, Paging systems, Internet Telephony.
Optical Communications: Optical Principles, Optical Communication Systems, Fiber –Optic Cables, Optical Transmitters & Receivers, Wavelength Division Multiplexing.

UNIT – V (10H)
Wireless Communications: Evolution of Wireless Systems: AMPS, GSM, CDMA, WCDMA, OFDM. Current Wireless Technologies: Wireless LAN, Bluetooth, PAN and ZigBee, Infrared wireless, RFID communication, UWB, Wireless mesh networks, Vehicular adhoc networks.

Reference Book
1. Principles of Electronic Communication Systems, Louis E. Frenzel, 3e, McGraw Hill, 2008.
2. Data Communications and Networking, Behrouz A. Forouzan, 5e TMH, 2012

SCHOOL OF ENGINEERING
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Project Stage-I
EIA-705

EIA -705	**Project-I**	**0L:0T:10P**	**5 credits**	**8Hrs/Week**

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Design and validate Electronics instrument algorithms for optimum solution
2. Analyze the dynamic response and the calibration of few instruments
3. Build projects as per industry and society demands.

Guidelines:

1. The Major-project is a team activity having 3-4 students in a team. This is electronic product design work with a focus on electronic circuit design.
2. The Major project may be a complete hardware or a combination of hardware and software.The software part in Minor project should be less than 50% of the total work.
3. Minor Project should cater to a small system required in laboratory or real life.
4. It should encompass components, devices, analog or digital ICs, micro controller with which functional familiarity is introduced.
5. After interactions with course coordinator and based on comprehensive literature survey/need analysis, the student shall identify the title and define the aim and Preambles of Minor project.
6. Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and submit the proposal within first week of the semester.
7. The student is expected to exert on design, development and testing of the proposed work as per the schedule.
8. Art work and Layout should be made using CAD based PCB simulation software. Due considerations should be given for power requirement of the system, mechanical aspects for enclosure and control panel design

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Self Study / GD/Seminar
EIA-706

EiA-706	**Self-Study/GD/Seminar**	**0L:0T:2P**	**1 credits**	**1Hrs/Week**

Course Preamble:

The main Preamble is to improve the mass communication and convincing/understanding skills of students .And to give the students an opportunity to exercise their rights to express themselves. The evaluation will be done based on their presentation work and group discussion.

Couse Outcomes:

In terms of **content**, students will be able to

Presentation Skills

They will be able to make use of visual, audio and audio-visual material to support their presentation, and will be able to speak cogently with or without notes. Students will present either in groups or as individuals.

Discussion Skills

Students will be able to judge when to speak and how much to say, speak clearly and audibly in a manner appropriate to the subject, ask appropriate questions, use evidence to support claims, respond to a range of questions, take part in meaningful discussion

Listening Skills

Students will demonstrate that they have paid close attention to what others say and can respond constructively. Through listening attentively, they will be able to build on discussion fruitfully, supporting and connecting with other discussants. They will be able to follow academic discussions, infer meanings that are not overt, and take notes from a discussion or presentation.

Argumentative Skills and Critical Thinking

Students will develop persuasive speech, present information in a compelling, well-structured, and logical sequence, respond respectfully to opposing ideas, show depth of knowledge of complex subjects, and develop their ability to synthesize, evaluate and reflect on information.

Questioning

Through asking appropriate questions, students will demonstrate their understanding of discussions and spark further discussion.

Interdisciplinary Inquiry

Students will be able to reach across diverse disciplines to apply theories, methods and knowledge bases from multiple fields to a single question or problem.

Engaging with Big Questions

Students will engage with important questions that stimulate discussion and debate.

Studying Major Works

Students will engage with works that are widely held to be significant in the field of study, while recognizing cultural diversity and the ever-changing nature of what is regarded as important