RashtreeyaSikshanaSamithi Trust

R. V. COLLEGE OF ENGINEERING

(Autonomous Institution Affiliated to VTU, Belgavi)

R.V Vidyaniketan Post, Mysore Road

Bengaluru-560 059

Scheme & Syllabus

VII & VIII Semester B.E

Instrumentation Technology

(2012 Scheme)

VISION

Achieving academic excellence in Instrumentation Technology by adopting interdisciplinary research with a focus on sustainable and inclusive technologies.

MISSION

EIEM1: To create an environment for students to excel in domain areas and get motivated to involve in interdisciplinary research by utilizing state of the art infrastructure.

EIEM2: To impart technical knowledge, encourage experiential learning and develop future professional leaders.

EIEM3: To establish industry-academia networking and develop industry-ready students and future entrepreneurs, to meet societal & industrial challenges.

EIEM4: To motivate lifelong learning and research in sustainable technologies to find improved solutions for the betterment of society.

Program Educational Objectives (PEOs)

PEO1: Apply Instrumentation, Electronics, Controls and Automation concepts to develop technical solutions for industrial problems.

PEO2: Exhibit competency in adapting to various industrial challenges and work in inter-disciplinary projects with team spirit and professional ethics for achieving organizational goals.

PEO3: Pursue higher education in technology or management and achieve professional excellence by imbibing leadership qualities and communication skills.

PEO4: Become entrepreneurs with a focus on sustainable technologies and develop innovative solutions to meet industrial and societal needs.

Program Specific Outcomes (PSO)

PSO1: Design, analyze and practice the instrumentation, controls and automation concepts and techniques required for industrial and/or research pursuits resulting in product development, publications or patents.

PSO2: Demonstrate the knowledge of basic science, mathematics, electronic system design and programming for real-time applications, towards developing industrial solutions and become technology leaders of future.

Program Outcomes

PO1:	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and engineering specialization for the solution of complex engineering problem.
PO2:	**Problem analysis**: Identify, formulate, research, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO3:	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.
PO4:	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5:	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling to complex engineering activities, with an understanding of the limitations.
PO6:	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess Societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7:	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8:	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9:	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10:	**Communication:** Communicate effectively on complex engineering activities with engineering community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11:	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12:	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

SEVENTH SEMESTER								
Sl. No.	**Course Code**	**Course**	**BoS**	**Credit Allocation**				**Total Credits**
				L	**T**	**P**	**S**	
1	12IT71	**Automation Technology (Theory& Practice)**	IT	3	0	1	0	5
2	12IT72	**VLSI Design (Theory& Practice)**	IT	3	0	1	0	5
3	12HSC73	**Legal Studies & Professional Ethics for Engineers**	HSS	2	0	0	0	2
4	12IT74	**Minor Project**	IT	0	0	3	0	3
5	12IT7EX	**Elective E**	IT	4	0	0	0	4
6	12GF7XX	**Elective F (Other Elective)**	Respective BOS	4	0	0	0	4
5	12GG7XX	**Elective G (Other Elective)**	Respective BOS	3	0	0	0	3
Total Credits				21	00	5	0	26
No. of Hrs.				**21**	**00**	**09**	**0**	**29**

- Minor Project is conducted during the vacation between sixth and seventh semester and evaluated in seventh semester
- Legal studies and Professional Ethics is an audit subject for lateral entry students.

EIGHTH SEMESTER								
Sl. No.	**Course Code**	**Course**	**BoS**	**Credit Allocation**				**Total Credits**
				L	**T**	**P**	**S**	
1	12IT81	Project Work	IT	0	0	18	0	18
2	12ITS82	Technical Seminar	IT	0	0	1	0	1
3	12HSS83	Innovation and Social Skills	IT	0	0	1	0	1
Total Credits				0	0	20	0	**20**
No. of Hrs.				0	0	40	0	**40**

SEVENTH SEMESTER ELECTIVES

Elective-E	
Course Code	**Title of the Subject**
12IT7E1	Wireless Communication
12IT7E2	ARM Processor & Applications
12IT7E3	PLC 's and SCADA Systems
12IT7E4	MEMS & Nano Technology
Elective-F & Elective-G (Global)	
12GF77X	Virtual Instrumentation

12GG77X	Micro Electro-Mechanical Systems

VII SEMESTER Automation Technology		
Course Code: 12IT71		**CIE Marks: 100**
Hrs/Week: L:T:P:S : 4:0:1:0		**SEE Marks: 100**
Credits: 05		**SEE Duration: 3 Hrs**

Course Learning Objectives:

1. To remember the basics of process control and understand the basic concepts of Industrial Automation.
2. To apply the control system concepts to Special Intelligent control strategies.
3. To analyze and evaluate the concepts of DCS to different types of Industries.
4. Comprehensive coverage of communication protocols that are used in automation systems.

Unit – I	09 Hrs
Introduction: Concept and Scope of Industrial Automation, Goals, Types, Reasons for Automation, Current trends in Computer Control of Process Plants, Centralized Vs. Distributed Computer Control System. Expert Systems.	
Unit – II	**09 Hrs**
Advanced process control strategies: Introduction, Cascade control, Adaptive control, Intelligent Control & Artificial Intelligence, Optimal control and applications.	
Unit – III	**09 Hrs**
Distributed Digital Control System (DCS): History of DCS, Concept of DCS, Functional Requirements, Hardware and Software, DCS Structure, Process level, Unit, Group, Operational Control Levels, DCS Sub-Systems, Local Field Station. **Displays:** Normal, Continuous Process, Batch-Sequence Operation, Process Upset, Control System Mal-Function Displays.	
Unit – IV	**09 Hrs**
DCS: Industrial Applications: Introduction, Configuring DCS for Cement plant, Thermal Power, Steel Plants. **PLCs & PACs**: Introduction, Operation of PLC, Ladder Logic, Functional Block Diagram, Examples of realization using both techniques,, Process Automation Controllers, features and Applications.	
Unit – V	**09 Hrs**
Industrial Network Data Communications: Analog transmission, Hybrid and Digital Communications, Comparison Of Communication Protocols. **LANs:** OSI models, Characteristics, Types, Wireless LAN. **HART Communication**: Network Connection, Communication Nodes, Protocol Layers **Fieldbus:** Modbus**,** Profibus, Foundation Fieldbus, IEEE1394 for Industrial Automation	

Course Outcomes:

At the end of this course student will able to:

CO1: Understand the basic concepts of Industrial Automation systems.
CO2: Apply and Analyze the advanced control strategies for real time system
CO3: Evaluate the DCS systems and communication protocols used in automation industries.
CO4: Design the configuration of DCS & PLCs for industrial applications.

Reference Books:

1. Krishna Kant, "Computer based Industrial Control", PHI, 6th Edition, 2004, ISBN:1-203-11237.
2. Surekha Bhanot, "Process control - Principles & Applications", Oxford University Press, 3rd reprint, 2012, ISBN-13:978-0-19-569334-8.
3. S. K.Singh, "Computer - Aided Process Control", PHI, 3rd Reprint, 2004, ISBN:978-81-203-2282-7
4. N. Mathivanan, "PC-Based Instrumentation Concepts and Practice", PHI, 1st Edition, 2009, ISBN:978–81–203–23073–4.
5. Dr. KLS Sharma, "Overview of Industrial Process Automation", Elsevier, 1st Edition, 2011, ISBN:978-0-12-415779-8

Scheme of Continuous Internal Evaluation:

CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for Test) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation/Assignment etc. for 10 marks.

Scheme of Semester End Examination:

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five from Part B will have internal choice and one of the two have to be answered compulsorily.

VII SEMESTER VLSI DESIGN (Theory & Practice)		
Course Code: 12IT72		**CIE Marks: 100**
Hrs/Week: L:T:P:S:: 4:0:1:0		**SEE Marks: 100**
Credits : 05		**SEE Duration: 3 Hrs**

Course Learning Objectives:

1. To understand the evolution of VLSI technology& fabrication process of MOS Device and its characteristics.
2. To study the switching characteristics of CMOS and NMOS inverter.
3. To estimate CMOS inverter delay.
4. To discuss the combinational and sequential circuits
5. To describe the MOS circuit design processes and Low Power Design

Unit – I	09Hrs
Introduction: Evolution of VLSI Technology, Basic MOS Transistor operation in enhancement mode, and depletion mode, Fabrication process: NMOS, CMOS Technology, The p-well process, n-well CMOS process and twin well process. **MOS Device characteristics:** Introduction, static behavior of the MOS Transistor, current voltage relations, Dynamic behavior of MOS transistor, High frequency MOSFET model.	
Unit – II	**09Hrs**
CMOS Inverter: NMOS Inverter. Determination of pull-up to pull-down ratio for an NMOS inverter driven by another NMOS Inverter. Determination of pull-up to pull-down ratio of NMOS inverter driven through one or more passes transistors	
Unit – III	**09Hrs**
CMOS Inverter design: Introduction, CMOS inverter DC characteristics. Design parameters of CMOS inverter. Symmetric CMOS inverter. Switching characteristics of CMOS inverter. Estimation of CMOS inverter delay.	
Unit – IV	**09Hrs**
CMOS combinational logic: Static CMOS design, ratioed logic, passes transistor logic. Dynamic CMOS Design: Dynamic logic basic principle, speed and power dissipation of dynamic logic, signal integrity issues in dynamic design. Complex logic gates in CMOS. CMOS combinational sequential logic circuits Classification of memory elements. Static latches and registers. Dynamic latches and registers.	
Unit – V	**09Hrs**
MOS circuit design processes: Why design rules? MOS Layers, stick diagrams, stick layout using NMOS Design, .Stick layout using CMOS design. Lambda based design rules. CMOS Lambda based design rules. **Low Power VLSI Design:** Need for low power VLSI chips, Sources of power dissipation on Digital Integrated circuits. Emerging Low power approaches	

Laboratory Programs:

1. Design a CMOS inverter in schematic and simulate for transient characteristics.
2. Design and simulation of static characteristics of two input NAND, NOR, AND and OR
3. Design and simulation of static characteristics of CMOS inverter.
4. Realization and simulation of two input Exclusive OR gate.
5. Realization and simulation of one bit Full Adder in CMOS.
6. Realization and simulation of a given Boolean expression.
7. Realization and simulation of a Four to one multiplexer using transmission gates.
8. Realization and simulation of D, JK and T FF in CMOS.
9. Realization of a four bit asynchronous counter using T FF as a cell in schematic.
10. Realization and simulation of Arithmetic and logic unit.
11. Realization and simulation of Random Access Memory.

Course outcomes:

1. Understand the basic fundamentals of VLSI Design.
2. Apply the concepts to design a schematic and layout design.
3. Analyze and evaluate the different techniques to design a combinational and sequential circuit.
4. Design a combinational and sequential circuit with low power, area and timing

Reference Books:

1. Albert Raj,T.Latha, "VLSI DESIGN", PHI Learning, 1st Edition, 2008 ,ISBN:9788120334311.
2. Douglas A.Pucknell,KamranEsharghain "Basic VLSI Design", 3rdEdition, PHI,2005, ISBN: 978-81-203-0986-9
3. Dr.Sujata Pandey and Dr. Manoj Pandey, "VLSI Design", 3rd Edition, Dhanpat Rai & Co (p) Ltd, 2005, ISBN: 978-93-5014-198-4.
4. Sung-Mo Kang &Yusuf Leblebici, "CMOS Digital Integrated Circuits Analysis and Design", 3rdEdition, Tata McGraw Hill, 2004, ISBN:978-1-4020-7234-5.

Scheme of Continuous Internal Evaluation:

CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for Test) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation/Assignment etc. for 10 marks.

Scheme of Continuous Internal Evaluation for Practicals:

In the laboratory students must conduct all the above listed experiments, out of which two experiments will be asked during lab examination.
Split-up of Lab CIE Marks: 20 Marks will be awarded for regular conduction and viva, 30 Marks for lab Test.

Scheme of Semester End Examination:

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five from Part B will have internal choice and one of the two have to be answered compulsorily.

Scheme of Semester End Evaluation for Practical's:

In the lab exam the student is required to answer and perform two experiments.

VII SEMESTER
Legal Studies & Professional Ethics For Engineers

Course Code: 12HSC73		**CIE Marks: 50**
Hrs/week: L: T: P: S 2:0:0:0		**SEE Marks: 50**
Credits : 2		**SEE Duration: 3 Hrs**

Course Learning Objectives:

1. Apply the knowledge of the constitutional literacy to describe the fundamental rights and duties as Indian citizen
2. To acquire a basic knowledge of substantive Labour law and to develop skills in legal reasoning and statutory interpretation.
3. To make the student aware of consumer rights, responsibilities and socio-legal framework of protection of consumer interest
4. An understanding of ethical and legal aspects of advertising, consumer problem and their redressal, product and service standard, standardization and eco-friendly products
5. Define individual role, responsibilities and emphasize on professional/ engineering ethics in shaping professionals

UNIT – I	**06 Hrs**
Salient features of Indian Constitution: Preamble to the Constitution of India. Scope & Extent of Fundamental Rights under PartIII. Constitutional Provisions relating to Right to Education under Article 21-A: Right to Information Act with Case studies	
UNIT– II	**06 Hrs**
Significance of Directive Principles of State Policy under Part – IV. Executive of the Union and State, Parliament & State Legislature. Anti-defection law, Union Judiciary & State Judiciary, Ombudsman-concept and need, Lokpal and Lokayukta.	
UNIT – III	**04 Hrs**
Consumer protection law- concept, definition and scope, object of C P Act, 1986 ,Rights of Consumers .Unfair Trade Practice, Restriction Trade Practice, Defect in goods, Deficiency in service: Medical, Lawyering, Electricity, Housing, Postal services etc. Enforcement of Consumer Rights- Consumer Forum	
UNIT – IV	**04 Hrs**
Introduction to labour legislations- Industrial Relation, Labour Problem and Labour Policy in India, Labour Welfare-Factories Act, 1948**,** Hazardous process, Safety and Welfare, Working Hours of Adults, Employment of young persons, Industrial Dispute Act, 1947**,** Reference of Disputes to Boards, Courts or Tribunals	
UNIT – V	**04 Hrs**
Scope and aims of engineering ethics (NSPE Code of Ethics), Responsibility of Engineers, Impediments to responsibility. Honesty, Integrity and reliability, Risks, Safety and Liability in Engineering. Corporate Social Responsibility. Statutory Provision regarding prohibition and prevention of Ragging and Sexual Harassment	.

Course Outcome:

1. Building awareness on the legal framework of operation and increase legal literacy in the context of professional engineering education.
2. To be conversant regarding conflict management in legal perspective and judicial system pertaining to labour management relations.
3. To become an aware &responsible consumer in the market place society capable of& taking action as an aware citizen to defend his/her rights there by contributing towards the development of society, community & industry.
4. To learn on the ethical and moral analysis of decision making scenarios and inculcate ethical behavior as a trait in professional development
5. Enable engineering students to use the knowledge gained during their professionalcareer and protect the social fabric of the country.

References:

1. J. N Pandey, Constitutional Law of India, Central Law Agency, 44th Edition, 2010.
2. S.C. Srivastava: Industrial Relation and Labour ,Vikas Publishing House, ISBN:8125918310
3. S.N.Misra- Labour& Industrial Relation, Central Law Publications EAN: 9788190861311
4. R.K.Bangia, Consumer Protection Act, 2011, ISBN10: 8189530917 ISBN13: 9788189530914 Allahabad Law Agency
5. Avtar Singh: Law of Consumer Protection: Principles and Practice ,4th Edition Eastern Book Company, 2005 ,ISBN 8170128544, 9788170128540
6. Jr. Charles E Harris, Michael. S. Pritchard and Michael J Rabins, Engineering Ethics, Thompson Asia, 2003–08-05
7. Mike W Martin and Roland Schinzinger, Ethics in Engineering, 2005, 4th Edition, ISBN: 0-07-283115-4

Scheme of CIE: (50 Marks)

CIE consists of five components: two quizzes (30%), two written test (60%) and one Assignment (10%) The written test is aimed at evaluating the interim knowledge gained in the subject by the students. The quizzes are aimed at assisting faculty in checking the progress of the students in the subject. Assignment develops the writing skill and acquired knowledge with scientific background in a well-organized way.

Scheme of SEE: (50 Marks)

The question paper consists of Part A and Part B. Part A is for 20 marks covering the complete syllabus and is compulsory and of objective type. Part B is for 30 marks, 6 questions carrying 05 marks each.

VII SEMESTER **Mini Project**		
Course Code: 12IT74		**CIE Marks: 100**
Hrs/week: L: T: P: S:: 0:0:3:0		**SEE Marks: 100**
Credits : 3		**SEE Duration: 3 Hrs**

Course Learning Objectives:

1. Students will acquire the ability to do literature review, generate, develop and evaluate ideas and information so as to apply these skills to the project task.
2. Students will acquire collaborative skills through working in a team to achieve common goals.
3. Students will be able to work independently, analyze, evaluate and solve the given problem.
4. Students will acquire the skills to communicate effectively and to present ideas clearly and coherently to a specific audience in both the written and oral forms

Mini Project Guidelines:

1. Each project group will have four students.
2. Students can form their groups amongst their class.
3. Each group has to select a current topic in the field of Electronics & Instrumentation.
4. Guides will be allotted by the department based on the topic chosen.
5. Students have to do a literature survey of the topic selected from books, Journal Papers and Web resources.
6. The project should be demonstratable using the available resources in the college.
7. The evaluation will be done by the committee constituted by the department. The evaluation will be done for each student separately.
8. The final copy of the report should be submitted after incorporation of any modifications suggested by the evaluation committee

Guidelines for Evaluation:

CIE Assessment:

The following are the weightages given for the various stages of the project:

1. Selection of the topic and formulation of objectives: 10%
2. Design and Development of Project methodology: 30%
3. Execution of Project: 30%
4. Presentation, Demonstration and Discussion: 20%
5. Report Writing:10%

SEE Assessment:

The following are the weightages given during SEE Examination:

1. Written presentation of synopsis:10%
2. Presentation/Demonstration of the project: 30%
3. Methodology and Discussion: 30%
4. Technical Report: 10%
5. Viva Voce: 20%

Outcomes of Mini Project:

1. Review the literature on a chosen topic relevant to Electronics & Instrumentation and define a problem which can be conceived experimentally.
2. Execute experiments to address the defined problem.
3. Analyze and interpret the experimental results.
4. Prepare quality document of project work

VII SEMESTER
Wireless Communication
(Elective)

Course Code: 12IT7E1		**CIE Marks: 100**
Hrs/Week: L:T:P:S : 4:0:0:0		**SEE Marks: 100**
Credits : 04		**SEE Duration: 3 Hrs**

Course Learning Objectives:

1.To impart concepts of wireless communication and their emerging technologies.
2.To give an insight on Global system for Mobile(GSM).
3.To highlight the features of Digital Cellular Technology.
4.To compare different IEEE standards used in wireless communication.

Unit I	**09 Hrs**
Evolution of wireless communication systems: Brief history, advantages, disadvantages, applications, examples of wireless communication: paging, cordless telephone systems, cellular telephone systems, comparison of wireless systems, challenges for research, evolution of next generation networks. Applications.	
Unit – II	**09 Hrs**
Principles of Cellular communication: Cellular terminology, Frequency reuse concept, channel assignment strategies, hand-off strategies, Interference and system capacity, Improving coverage and capacity in cellular system.	
Unit – III	**09 Hrs**
Global system for Mobile(GSM): GSM Network Architecture, GSM signaling Protocol Architecture, Identifiers used in GSM system, GSM channel, Frame structure, GSM call procedure, GSM Hand-off procedure, GSM services and Features.	
Unit – IV	**09 Hrs**
3G Digital Cellular Technology: 2.5G Evolution path Need for 3G cellular Networks, The IMT-2000 Global standards, UMTS Technology, W-CDMA Air Interface, TD-SCDMA Technology, CDMA2000 Cellular Technology.	
Unit – V	**09 Hrs**
Wireless Network Technologies: System and Protocol Architecture of WiFi, Bluetooth, Zigbee, WiPAN, WiMAX. Applications.	

Course outcomes:

At the end of this course the students would be able to:
CO1: Understand the basic fundamentals of wireless communication.
CO2: Analyze simple wireless networks in terms of coverage and capacity
CO3: Evaluate the performance of different wireless media.
CO4: Apply the wireless technology to build projects on communication.

Reference Books

1. Rappaport Thedore, “Wireless Communications“, Pearson Education, 2nd Edition, 2009,ISBN:81-7808-684-4.
2. T L Singal, “Wireless Communications”, Tata McGraw Hill, 2nd Edition, 2010, ISBN: 9780070681781.
3. D P Agarwal, “Wireless communication”, Thomson learning, 2nd Edition 2007, ISBN:978-1-4390-6205-0.
4. David Tse, PramodViswanath, “Fundamentals of Wireless Communication”, Cambridge,4th Edition,2005, ISBN:978-0521-845274.

Scheme of Continuous Internal Evaluation:

CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation/Assignment etc. for 10 marks**.**

Scheme of Semester End Examination:

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five from Part B will have internal choice and one of the two have to be answered compulsorily.

VII SEMESTER
Embedded system design using ARM
(Elective)

Course Code: 12IT7E2		**CIE Marks: 100**
Hrs/Week: L:T:P:S : 4:0:0:0		**SEE Marks: 100**
Credits: 04		**SEE Duration: 3 Hrs**

Course Learning Objectives:

1. To understand the ARM based embedded system and requirements of embedded system.
2. To analyze basic design aspects of the ARM RISC Core, Bus Architecture & Scan chain.
3. To evaluate ARM CPU performance for high end mobile embedded applications like cellphone.
4. Develop the ARM applications using Assembly &Embedded C language.

Unit – I	**09 Hrs**
Introduction To Embedded systems: Introduction, Processor embedded into a system, embedded hardware units and devices in a system, examples, SOC and use of VLSI, Complex systems design, formalization of system design, classification of embedded systems, skills required for an embedded system designer, processor and memory organization.	
Unit – II	**09 Hrs**
ARM Embedded Systems and ARM processor fundamentals: The RISC Design philosophy, The ARM Design philosophy, Embedded system hardware , Registers, Current program status register, pipeline, exceptions, interrupts and Vector table, Core extensions, Architecture revisions, ARM processor families.	
Unit – III	**09 Hrs**
Introduction to ARM instruction set: Data processing instructions, branch instructions, load-store instructions, software interrupts instruction, Program status register instructions, loading constants, ARMv5E extensions, conditional execution.	
Unit – IV	**09 Hrs**
Introduction to the thumb instruction set and Exception and interrupt handling: Thumb register usage, ARM-Thumb interworking, data processing instructions, Single & multiple-register Load-store instruction, stack instructions, software interrupt instruction, Exception handling, interrupts, interrupt handling schemes.	
Unit – V	**09 Hrs**
Interfacing of Peripherals: Salient features of LPC 2148,Block Diagram of LPC 2148,pin description of LPC 2148, Interfacing LED with LPC 2148 controller, Interfacing LCD with LPC 2148 controller, Interfacing Buzzer with LPC 2148 controller.	

Course outcomes:

The student should be able to:

1. Able to understand Architecture of ARM embedded systems, interfacing concepts.
2. Able to apply software /hardware concepts for real time applications
3. To analyze the performance of different systems and architectures
4. To design/develop an embedded system for real time application

Reference Books:

1. Andrew N Sloss, Dominic Symes and Chris Wright, "ARM system developers guide", Elsevier, Morgan Kaufman publishers, 1st Edition, 2008,ISBN:1558608745
2. David Seal, "ARM Architecture reference manual", Addison-Wesley, 2nd Edition, 2009, ISBN: 978-0201737196.
3. Furber.S, "ARM System on chip Architecture", Addison Wiley, 2nd Edition, 2008, ISBN: 978-0201675191.
4. Rajkamal,"Embedded Systems", Tata McGraw-Hill Publishers,2nd Edition, 2008, ISBN:0070494703.

Scheme of Continuous Internal Evaluation:

CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation/Assignment etc. for 10 marks**.**

Scheme of Semester End Examination:

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five from Part B will have internal choice and one of the two have to be answered compulsorily.

VII SEMESTER
PLC's& SCADA Systems
(Elective)

Course Code: 12IT7E3		**CIE Marks: 100**
Hrs/Week: L:T:P:S : 4:0:0:0		**SEE Marks: 100**
Credits: 04		**SEE Duration: 3 Hrs**

Course Learning Objectives:

1. To understand basic concept of PLC, SCADA and DCS Systems and their interfacing.
2. To impart knowledge about the working of timers, counters, sequencers; and the about PLC program flow instructions.
3. To provide an overview of applications of PLC, SCADA,and DCS Systems to industrial automation.
4. To develop anIndustrial Automation applications using PLC.

Unit – I	**09 Hrs**
Introduction: Definition of Automation, Types &Application of Automation to Industry processors, Basic Concepts of PLC, PLC in industry, Components, I/O Configuration, Introduction to PLC operation, Binary Data Representation, The input and output status files, Sixteen point I/O modules.	
Unit – II	**09 Hrs**
PLC Hardware: Input modules: Discrete input modules, Discrete AC and DC input & Output Modules: Discrete & solid state output module switching, relay output modules. PLC memory.	
Unit – III	**09 Hrs**
Basics of PLC Programming: Processor memory organization, The Program Scan, PLC Programming languages, Bit or Relay Instruction, OSR Instruction, Output latching instructions, Negated output Instruction, Internal Bit type Instruction, Modes of PLC operation interfacing start/stop Push button switch and Motor to PLC**.**	
Unit – IV	**09 Hrs**
Special programming Instructions: Timer and Counter Instructions: On delay and Off delay and retentive timer instructions, PLC Counter up and down instructions, combining counters and timers. **Program Control &Data manipulation Instructions**: Data handling instructions, Sequencer instructions, Programming sequence output instructions.	
Unit – V	**09 Hrs**
Case Studies: Temperature control, Valve Sequencing, Conveyor Belt control, Control of a Process, Material Sorting, and Elevator System Problems. **SCADA & DCS**: Introduction to Supervisory Control and Data Acquisition (SCADA), SCADA Hardware and Software, Introduction to Distributed control system (DCS), DCS Software.	

Course outcomes:

Students will be able to

1. Understand the basic concepts of PLC's and SCADA techniques.
2. Apply the programming concepts to interface peripheral.
3. Analyze and evaluate the automation techniques for industrial applications.
4. Develop a system for automation application

Reference Books:

1. Garry Dunning, "Introduction to Programmable Logic Controllers", CENGAGE Learning, 3rd edition, 2006. ISBN- 9-781-4018-8426-0
2. Bolton W., "Industrial Control and Instrumentation", Universities Press, 4th Edition, 2006. ISBN 9-780-7506-8112-4
3. Krishna Kant, "Computer Based Industrial control", PHI Publishers, 2nd Edition, 2006. ISBN-9-788-1203-3994-1
4. John W. Webb. Ronald A Reis "Programmable logic controllers" PHI Publishers, 5ndEdition, 2007, ISBN 9-788-1203-2308-7.

Scheme of Continuous Internal Evaluation:

CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation/Assignment etc. for 10 marks**.**

Scheme of Semester End Examination:

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five from Part B will have internal choice and one of the two have to be answered compulsorily.

VII SEMESTER MEMS &Nano Technology (Elective)		
Course Code: 12IT7E4		**CIE Marks: 100**
Hrs/Week: L:T:P:S : 4:0:0:0		**SEE Marks: 100**
Credits: 04		**SEE Duration: 3 Hrs**

Course Learning Objectives:

1. To learn the fundamentals and working principle of MEMSandNano Technology.
2. To impart the knowledge about the Multidisciplinary nature of Microsystems.
3. To understand the applications ofMEMSand Nano Technology.
4. To create awareness about the software's related to design and characterization of MEMS and Nano Technology.

Unit I	**09 Hrs**
Over view of MEMS & Microsystems and Working Principles of Microsystems: MEMS and Microsystems, Typical MEMS and Microsystem Products, Evolution of Microfabrication, Microsystems and Microelectronics, Multidisciplinary Nature of Microsystem, Design and Manufacture, Applications of Microsystems in Automotive, Health Care, Aerospace and other Industries. **Working Principle of Microsystems:** Biomedical & Biosensors. Microsensors: Acoustic, Chemical, Optical, Pressure, Thermal.	
Unit II	**09 Hrs**
Microactuation: Using Thermal forces, Shape Memory alloys, Piezoelectric Crystals and Electrostatic forces. MEMS with Microactuators: Microgrippers, Micromotors, Microvalves and Micropumps. Microaccelerometers, Microfluidics. Introduction to Thermofluid Engineering, Overview of the Basics of Fluid Mechanics in Macro and Mesoscales: Viscosity of fluids, Streamlines and Stream Tubes, Control Volumes and Control Surfaces, Flow Patterns and Reynolds Number. Basic Equations in Continum Fluid Dynamics: The Continuity Equation, The Momentum Equation and the Equation of motion.	
Unit III	**09 Hrs**
Laminar Fluid Flow in Circular Conduits, Computational Fluid Dynamics, Incompressible Fluid Flow in Microconduits, Fluid Flow in Submicrometer and Nanoscale, Heatconduction in Multilayered Thin Films. Introduction to Scaling, Scaling in Geometry, Scaling in Rigid-Body Dynamics, Scaling in Electrostatic Forces, Scaling in Electromagnetic Forces and Scaling in Fluid Mechanics.	
Unit IV	**09Hrs**
Materials for MEMS and Microsystems: Substrates and Wafers, Active Substrate Materials, Silicon as a Substrate Material, Silicon Compounds, Silicon Piezoresistors, Galium Arsenide, Quartz, Piezoelectric Crystals, Polymers and Packaging Materials. The three levels of Microsystem Packaging, Die level packaging, Device level packaging, System level packaging. Interfaces in microsystem Packaging. Essential Packaging Technologies: Die preparation, Surface Bonding, Wire Bonding, Sealing. Three dimensional Packaging.	
Unit – V	**09 Hrs**
Microsystem Fabrication Processes: Introduction to Microsystem Fabrication Process, Photolithography, Ion Implantation, Diffusion, Oxidation, Chemical Vapor Diposition (CVD), Physical Vapor Deposition-Sputtering, Deposition by Epitaxy, Etching, The LIGA Process: General Description of LIGA Process, Materials for Substrates and Photoresists, Electroplating and SLIGA Process.	

Course outcomes:

The students will be able to:

1. Understanding the basic fundamentals of MEMS and Nano Technology.
2. Apply the concepts to design the MEMS and Nano Technology.
3. Analyze and evaluate the sensors and actuators.
4. Design a system with MEMS sensors and actuators using various fabrication techniques.

Reference Books:

1. Tai-ran tsu, "MEMS & Microsystems: Design and manufacture", John Wiley and sons Inc, 2nd edition, 2008.,ISBN:978-0-470-08301-7
2. P.Rai-Choudhury, "MEMS and MOEMS Technology and Applications", PHI, 1st Edition, 2009.,ISBN:978-97-808-19437167
3. K.J.Vinoy,G.K.Ananthasuresh, S.Gopalakrishnan, K.N.Bhat, "Micro and Smart Systems" ,Wiley India , 2010, ISBN:978-8126-527-151
4. Stevens S. Saliterman. "Fundamentals of Bio MEMS and Medical and Micro devices", Wiley Interscience division, 1st Edition, 2006, ISBN:978-0-819-45770

Scheme of Continuous Internal Evaluation:

CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation/Assignment etc. for 10 marks**.**

Scheme of Semester End Examination:

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five from Part B will have internal choice and one of the two have to be answered compulsorily.

VII SEMESTER Virtual Instrumentation (Global Elective)		
Course Code: 12GF771		**CIE Marks: 100**
Hrs/Week: L:T:P:S : 4:0:0:0		**SEE Marks: 100**
Credits: 04		**SEE Duration: 3 Hrs**

Course Learning Objectives:

1. Understand the basic components and concepts of LabVIEW programming Language.
2. Apply the programming concepts to build virtual application.
3. Provide the concepts of interfacing Peripherals.
4. Create a virtual system for Real Time applications.

Unit I	09 Hrs
Fundamentals of Virtual Instrumentation: Historical perspective, advantages, blocks diagram and architecture of a virtual instrument, data-flow techniques, graphical programming in data flow, comparison with conventional programming. **Software Overview:** Lab VIEW , Graphical user interfaces - Controls and Indicators Data types - Data flow programming - Editing - Debugging and Running Virtual instrument - Graphical programming pallets - and their configuration VIs and sub-VIs Typical examples-VIs.	
Unit II	**09 Hrs**
Programming Structure: FOR loops, WHILE loop, CASE structure, formula node, Sequence structures **Introduction to Arrays and Clusters:** Array operations Cluster Functions, Graphs and charts, local and global variables.	
Unit III	**09 Hrs**
File Input/Output: Introduction, File Formats, File I/O Functions, Sample VIs to Demonstrate File WRITE and READ Function **String Handling:** Introduction, String Functions, LabVIEW String Formats, Typical examples.	
Unit IV	**09 Hrs**
Basics of Data Acquisition: Introduction to data acquisition Classification of Signals, Analog Interfacing Connecting signal to board , Analog Input/output techniques digital I/O. **DAQ Hardware configuration** Introduction, Measurement and Automation Explorer, DAQ Assistants, Analysis Assistants, Instrument Assistant.	
Unit V	**09 Hrs**
Interfacing Instruments: GPIB and RS232 : Introduction, RS232 Vs. GPIB, Handshaking, GPIB Interfacing, Standard commands for Programmable Instruments, VISA**.** **Use of analysis tools and application of VI:** Fourier transforms Power spectrum, Correlation methods, windowing & flittering.Inter-Process Communication, Notifier, Queue, Semaphore, Data Sockets, Programmatically Printing Front Panel.	

Course outcomes:

After going through this course the student will be able to

1. Understand the fundamentals of Virtual Instrumentation
2. Apply the concepts to realize the theoretical design.
3. Create a VI system to solve real time problems.
4. Analyze and evaluate the performance of Virtual System.

Reference Books:

1. Sanjay Gupta & Joseph John**,** Virtual Instrumentation Using Lab View, Tata Mc Graw Hill Publisher Ltd., 2nd Edition, New Delhi, 2010, ISBN : 978-0070700284
2. Lisa. K. Wills**, "**LabVIEW for Everyone**"** Prentice Hall of India, 2nd Edition, 2008, ISBN : 978-0132681940
3. Garry Johnson, Richard Jennings, LabVIEW Graphical Programming, McGraw Hill Professional, 4thEdition , 2006 ,ISBN: 978-1259005336.
4. Jovitha Jerome, "Virtual instrumentation Using LabVIEW", PHI Learning Pvt.Ltd.,4thEdition, 2010, ISBN: 978-8120340305.

Scheme of Continuous Internal Evaluation:

CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation/Assignment etc. for 10 marks**.**

Scheme of Semester End Examination:

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five from Part B will have internal choice and one of the two have to be answered compulsorily.

VII SEMESTER Micro Electromechanical Systems (Global Elective)		
Course Code: 12GG771		**CIE Marks: 100**
Hrs/Week: L:T:P:S : 3:0:0:0		**SEE Marks: 100**
Credits: 03		**SEE Duration: 3 Hrs**

Course Learning Objectives:

1. To learn the fundamentals and working principle of MEMS.
2. To impart the knowledge about the Multidisciplinary nature of Microsystems.
3. To understand the applications of MEMS.
4. To introduce software's related to design and characterization of MEMS.

Unit I	07 Hrs
Over view of MEMS & Microsystems and Working Principles of Microsystems: MEMS and Microsystems, Typical MEMS and Microsystem Products, Evolution of Microfabrication, Microsystems and Microelectronics, Multidisciplinary Nature of Microsystem, Design and Manufacture, Applications of Microsystems in Automotive, Health Care, Aerospace and other Industries. **Working Principle of Microsystems:** Biomedical & Biosensors. Microsensors: Acoustic, Chemical, Optical, Pressure, Thermal.	
Unit II	**07 Hrs**
Microactuation: Using Thermal forces, Shape Memory alloys, Piezoelectric Crystals and Electrostatic forces. MEMS with Microactuators: Microgrippers, Micromotors, Microvalves and Micropumps. Microaccelerometers, Microfluidics. Introduction to Thermofluid Engineering, Overview of the Basics of Fluid Mechanics in Macro and Mesoscales: Viscosity of fluids, Streamlines and Stream Tubes, Control Volumes and Control Surfaces, Flow Patterns and Reynolds Number. Basic Equations in Continum Fluid Dynamics: The Continuity Equation, The Momentum Equation and the Equation of motion.	
Unit III	**07 Hrs**
Laminar Fluid Flow in Circular Conduits, Computational Fluid Dynamics, Incompressible Fluid Flow in Microconduits, Fluid Flow in Submicrometer and Nanoscale, Heatconduction in Multilayered Thin Films. Introduction to Scaling, Scaling in Geometry, Scaling in Rigid-Body Dynamics, Scaling in Electrostatic Forces, Scaling in Electromagnetic Forces and Scaling in Fluid Mechanics.	
Unit IV	**07 Hrs**
Materials for MEMS and Microsystems: Substrates and Wafers, Active Substrate Materials, Silicon as a Substrate Material, Silicon Compounds, Silicon Piezoresistors, Galium Arsenide, Quartz, Piezoelectric Crystals, Polymers and Packaging Materials. The three levels of Microsystem Packaging, Die level packaging, Device level packaging, System level packaging. Interfaces in microsystem Packaging. **Essential Packaging Technologies:** Die preparation, Surface Bonding, Wire Bonding, Sealing. Three dimensional Packaging.	
Unit – V	**07 Hrs**

Microsystem Fabrication Processes: Introduction to Microsystem Fabrication Process, Photolithography, Ion Implantation, Diffusion, Oxidation, Chemical Vapor Diposition (CVD), Physical Vapor Deposition-Sputtering, Deposition by Epitaxy, Etching, The LIGA Process: General Description of LIGA Process, Materials for Substrates and Photoresists, Electroplating and SLIGA Process.	

Course outcomes:

1. Understanding the basic fundamentals of MEMs and Microsystems.
2. Apply the concepts to design the MEMs sensors and actuators.
3. Analysis and Evaluate the MEMs sensors and actuators
4. Design a system with MEMs sensors and actuators using various fabrication techniques.

Reference Books

1. Tai-ran tsu, "MEMS & Microsystems: Design and manufacture", John Wiley and sons Inc, 2nd edition, 2008.,ISBN:978-0-470-08301-7
2. P.Rai-Choudhury, "MEMS and MOEMS Technology and Applications", PHI, 1st Edition, 2009.,ISBN:978-97-808-19437167
3. K.J.Vinoy,G.K.Ananthasuresh, S.Gopalakrishnan, K.N.Bhat, "Micro and Smart Systems" ,Wiley India , 2010, ISBN:978-8126-527-151
4. Stevens S. Saliterman. "Fundamentals of Bio MEMS and Medical and Micro devices", Wiley Interscience division, 1st Edition, 2006, ISBN:978-0-819-45770

Scheme of Continuous Internal Evaluation:

CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation/Assignment etc. for 10 marks**.**

Scheme of Semester End Examination:

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five from Part B will have internal choice and one of the two have to be answered compulsorily.

VIII SEMESTER

Project Work

Course Code : 12IT81		**CIE Marks : 100**
Hrs/Week : L:T:P: 0+0+36		**SEE Marks : 100**
Credits :18		**SEE duration: 3 Hrs**

Course Learning Objectives:

1. ***Knowledge Application*** Students will acquire the ability to make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.
2. ***Communication*** Students will acquire the skills to communicate effectively and to present ideas clearly and coherently to a specific audience in both the written and oral forms.
3. ***Collaboration*** Students will acquire collaborative skills through working in a team to achieve common goals.
4. ***Independent Learning*** Students will be able to learn on their own, reflect on their learning and take appropriate action to improve it.

Guidelines

1. Students are required to form the project team(batch) before the end of 7th semester.
2. The Internal Guide allotment process will be done before the beginning of the 8th semester.
3. The project topic and title has to be finalized and to be submitted to their respective internal guide(s) before the beginning of the 8th semester.
4. The detailed Synopsis (approved by the department ***Project Review Committee***) has to be submitted during the 1st week after the commencement of 8th semester.

Batch Formation:

- Students are free to choose their project partners from any department, as interdisciplinary projects are allowed.
- Each student in the team must contribute towards the successful completion of the project. The project may be carried out In-house / Industry / R & D Institution.
- ***The project work is to be carried out by a team of two to four students , in exceptional cases like the student is placed in a company and offered an internship through the competitive process or student is selected for internship at national or international level through competitive process*** **in such cases ,** students can work independently. A reasonable inter disciplinary work is also acceptable.
- ***The students are allowed to do either a project for full 5 days in the industry or full 5 days in the college.***
- ***In case the project work is carried out outside Bangalore, such students must be available during Project Evaluation process scheduled by the respective departments and they must also interact with their guide regularly through Email / Webinar / Skype etc.***

Project Topic Selection:

The topics for project work must be in the ***field of respective program areas, in line with CoE's(Centre of Excellence) identified by the college*** or **List of project areas as given by industry/Faculty.**

Place of Project Work:

The project work should be carried out in the Industry, in case the project is given by the industry(***as internship, provided the department Project Review Committee has approved the project***) and the facilities for carrying out project work are not available in the college.

The project work should be carried out in the college, in case the project is given by or

suggested by the faculty. For any additional facilities required for testing etc., students are permitted to visit the research labs, where those facilities are available.

Attendance Requirement:

- Students are required to satisfy minimum attendance criteria as prescribed by the Institution, i.e. (85%).
- Students who are doing project work in the industries are required to go to the industry for full 5 days.
- Students who are doing project work in the college, are required to come to the college for full 5 days (Monday- Friday) and attendance is mandatory.
- Students are requested to adhere to the schedule of various phases of project work.

Project Evaluation:

- Continuous monitoring of project work will be carried out and cumulative evaluation will be done.
- **Weekly Activity Report** has to be maintained by the project batch and the same has to be discussed with the Internal Guide regularly.
- In case of ***Industry project***, during the course of project work, the internal guides will be in constant touch with external guides and will visit the industry at least thrice, for assessment.
- The students are required to meet their internal guides once in a week to report their progress in project work.
- For CIE assessment the project groups must give a final seminar with the draft copy of the project report in place of synopsis.
- The presentation by each group will be for 30-40 minutes.
- The project team is required to submit Hard copies of the detailed Project Report in the prescribed format as well as Soft copy on a CD and will be checked for plagiarism.
- At least one publication in reputed journal/conference is a must.
- For CIE 50% weightage should be given to the project guide and 50% weightage to the project evaluation committee.
- The Project team is required to demonstrate the functioning of the modules and the integrated application along with a presentation on the details of the project carried out during the Semester End Examination (SEE) in the department.

CIE Assessment:

The following are the weightages given for the various stages of the project.

1. Selection of the topic and formulation of objectives 10%
2. Design and Development of Project methodology 25%
3. Execution of Project 25%
4. Presentation, Demonstration and Results Discussion 30%
5. Report Writing 10%

SEE Assessment:

The following are the weightages given during Viva Examination.

1. Written presentation of synopsis 10%
2. Presentation/Demonstration of the project 30%
3. Methodology and Experimental Results & Discussion 30%
4. Report 10%
5. Viva Voce 20%

Calendar of Events for the project Work:

Week	Event
Beginning of 7th Semester	Formation of group and approval by the department committee
7th Semester	Problem selection and literature survey
Last two weeks of 7th Semester	Finalization of project and guide allotment
II Week of 8th Semester	Synopsis submission and preliminary seminar
III Week	First visit of the internal guides to industry in case of industry offered projects
III to VI Week	Design and development of project methodology
VII to IX Week	Implementation of the project
X Week	Second visit by guide to industry in case of industry offered projects & submission of draft copy of the report
XI and XII Week	Third visit by guide to industry for demonstration. Final seminar for internal assessment

Evaluation Scheme for CIE and SEE

Scheme of Evaluation for CIE		Scheme of Evaluation for SEE	
Particulars	**%Marks**	**Particulars**	**%Marks**
Project Evaluation PhaseI	10%	Project Synopsis (Initial Write up)	10%
Project Evaluation Phase II	25%	Project Demo / Presentation	30%
Project Evaluation Phase III	25%	Methodology and ResultsDiscussion	30%
Project Evaluation Phase-IV (Submission of Draft Project Report for Verification)	30%	Project Work Report	10%
Project Evaluation Phase-V (Project Final Internal Evaluation)	10%	Viva-voce	20%
Total	100	Total	100

Project Work outcomes:

After the successful completion of the course, the students should be able to

1. Perform literature review and identify state of the art in that field to define the problem.
2. Apply the methodology to carry out the project work and select advanced tools / techniques for solving the problem.
3. Design Experiments scientifically / Perform Numerical Analysis / Develop Analytical

models.

4. Interpret the Experimental / Numerical / Analytical Results and prepare quality document of project work.

VIII SEMESTER

Technical Seminar

Subject Code : 12ITS82	**SEE Marks:50**
Hrs/Week : L:T:P: S 0:0:4:0	
Credits : 02	

Course Learning Objectives:

1. To enrich students for making a technical presentation based on research review on any contemporary area of modern Instrumentation.
2. To provide an opportunity for the students to interact with faculty and to inculcate the skills for good presentation.
3. To improve the technical report writing skills.

Seminar Mechanism:

1. A list of contemporary topics will be offered by the faculty members of the department in the interlude period between 7^{th} and 8^{th} semester.
2. Student can opt for a topic of their own choice and indicate their option to the department at the beginning of the 8^{th} semester.
3. Students have to do a literature survey of the selected topic from journals and web resources.
4. A draft copy of the report should be submitted one week before the presentation, to the seminar coordinator.
5. Students have to give a presentation in power point for about 45 minutes followed by the Q/A session.
6. The Evaluation will be done by committee constituted by the department.
7. The final copy of the report should be submitted after incorporating any modifications suggested by the evaluation committee.

Guidelines for Evaluation

The following are the weightages given for the various stages of the seminar:

1. Selection of the topic 05Marks (10%)
2. Literature survey 15Marks (30%)
3. Understanding and presentation of the given topic 15 Marks (30%)
4. Reporting and Documentation. 15 Marks (30%)

Course Outcome:

1. Understand and interpret latest advancement through different technical papers, report, Journals, datasheets, books, etc
2. To communicate his/her idea peers as audience which will enhance both oral and return communication skills
3. Learnt to manage resource effectively
4. Create to interest to peruse lifelong learning