SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(An Autonomous Institution)

Department of Instrumentation and Control Engineering

Minutes of 4th BoS Meeting
(UG)

Venue   :   Seminar Hall,
Department of ICE,
Sri Manakula Vinayagar Engineering College

Date & Time   :   18th Febraury, 2022 at 10:00 A.M

SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE
(An Autonomous Institution)
(Approved by AICTE, New Delhi & Affiliated to Pondicherry University)
(Accredited by NBA-AICTE, New Delhi, ISO 9001:2000 Certified Institution &
Accredited by NAAC with "A" Grade)
Madagadipet, Puducherry - 605 107

Department of Instrumentation and Control Engineering

Minutes of Fourth Board of Studies

The Fourth Board of Studies meeting of the Department of Instrumentation and Control Engineering was held on 18th February 2022 at 10:00 A.M in the Seminar Hall, Department of ICE, Sri Manakula Vinayagar Engineering College with the Head of the Department in the Chair.

The following members were present for the BoS meeting

Sl. No	Name of the Member with Designation and official Address	Responsibility in the BoS
1	Dr. L. M. Varalakshmi Professor and Head Department of ICE,SMVEC	Chairman
2	Dr. P. A. Karthick, P.D.F. Professor Department of Instrumentation and Control Engineering National Institute of Technology, Tiruchirappalli	External Member Subject Expert
3	Dr. D. Manamalli Professor Department of Instrumentation Engineering, MIT Campus, Anna University	External Member Subject Expert
4	Dr.Anima Nanda Professor & Head/ BMI Director IQAC, Sathyabama University	External Member Subject Expert
5	Prof.T.Sudha Assistant Professor Department of ICE, SMVEC	Internal Member
6	Prof.J.Jeevanantham Assistant Professor Department of ICE, SMVEC	Internal Member
7	Dr. M. Rekha Associate Professor Department of ICE, SMVEC	Internal Member

8	Dr. D. Sivanandakumar Associate Professor Department of ICE, SMVEC	Internal Member
9	Dr. K. Naveenkumar Assistant Professor Department of ICE, SMVEC	Internal Member
10	Dr.S. Deepa Professor & Head Department of Chemistry, SMVEC	Internal Member
11	Dr. T. Gayathri Professor & Head Department of Mathematics, SMVEC	Internal Member
12	Dr. M. A. Ishrath Jahan Professor Department of English, SMVEC	Internal Member
13	Mrs. S.Geetha Assistant Professor Department of Physics, SMVEC	Internal Member
14	Mr. B. Murugan Senior Executive Engineer Biogenomonics	Co-opted Member Representative from Industry
15	Mr. S. Karthikeyan E-Beam Control Operator Siechem Technologies pvt. Ltd	Co-opted Member Alumni Member

Item No.: Agenda 1/BoS/4/2022/ICE/UG

Welcome Address and to confirm the minutes of the Third Board of Studies Meeting held on 25.8.2021.

Item No.: Agenda 2/BoS/4/2022/ICE/UG

To ratify the Curriculum and the syllabi of IV, V, VI semester under Autonomous Regulations R-2020 and approval of VII semester Syllabi of R-2020 for the B.Tech - Instrumentation and Control Engineering students.

Item No.: Agenda 3/BoS/4/2022/ICE/UG

To apprise the BoS members about the open elective course for the VI semester students admitted in the Academic Year 2019-20 of Regulation 2019.

Item No.: Agenda 4/BoS/4/2022/ICE/UG

To review the employability enhancement courses under Autonomous Regulations 2019 –VI semester and Autonomous Regulations 2020 –III semester.

Item No.: Agenda 5/BoS/4/2022/ICE/UG

To apprise the academic calendar for the even semester (Jan 2022 to May 2022) of academic year 2021-2022.

Item No.: Agenda 6/BoS/4/2022/ICE/UG

To apprise the Industry Institute Interactions of the department.

Item No.: Agenda 7/BoS/4/2022/ICE/UG

To apprise the AICTE sponsored International Conference on Emerging Innovative Technologies in Engineering (ICEITE- 22) to be held in July–2022.

Item No.: Agenda 8/BoS/4/2022/ICE/UG

To apprise the End Semester Examination conducted in offline mode in Nov-Dec 2021 and the publication of results.

Item No.: Agenda 9/BoS/4/2022/ICE/UG

To discuss and recommend the panel of examiners to the Academic Council.

Item No.: Agenda 10/BoS/4/2022/ICE/UG

Any other item with the permission of chair.

Dr.L. M. Varalakshmi, Chairman, BoS initiated the meeting by welcoming the external members, the internal and co-opted members and thanked them for the detailed deliberations on the agenda items that had been approved by the Chairman.

Item: Minutes 1/BoS/4/2022/ICE/UG	Chairman, BoS, apprised the minutes of third BoS, its implementation and confirmed with the approval for the incorporation of minor revisions needed for R-2020.
Item: Minutes 2/BoS/4/2022/ICE/UG	The Curriculum and the syllabi of IV, V, VI semester under Autonomous Regulations R-2020 for the B.Tech - Instrumentation and Control Engineering students was ratified and minor corrections were suggested.

Revision : (Annexure I)

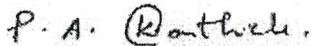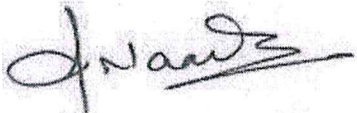| S. No.	Regulation	Semester	Subject Name with Code	Unit	Particulars
1	R-2020	IV	Microcontroller Based System Design U20ICT409	I	"Addressing modes, Instruction set" was included for 8085.
				IV	"Microcontroller 8051" is specifically mentioned for interfacing.
2	R-2020	V	Embedded System Design U20ICT511	V	"(Using LPC2148)" is specified.
3	R-2020	V	Embedded System Design Lab U20ICP506	IX expt	Grammatical Modification "and" to "in"
4	R-2020	VI	Biomedical Instrumentation Lab U20ICP609		The "Diagnostic and Therapeutic Equipments lab" is modified as "Biomedical Instrumentation Lab" and few more experiments are added. The "Internet of Things Lab" was replaced by "Computer Control of Processes Lab" in VII semester.
5	R-2020	VI	Virtual Instrumentation Lab U20ICP611		"Virtual Instrumentation Lab" is shifted to VI semester from VII semester
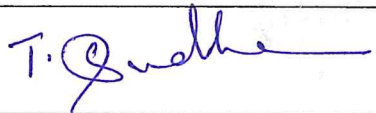
R 2020 – Curriculum
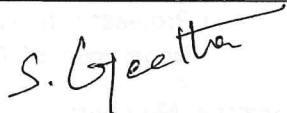
The curriculum under Autonomous Regulations R-2020 was reviewed and ratified with minor correction **(Annexure I)**.

	R-2020-Syllabi The syllabi for semesters VII under Autonomous Regulations 2020 were discussed elaborately and approved **(Annexure II)**.
Item: **Minutes** **3/BoS/4/20** **22/ICE/UG**	**R-2019–Open Elective-III** • The open elective course for the VI semester students admitted in the academic Year 2019-20 of Regulation 2019 was apprised to the BOS members. **Open Elective Course** **R-2019, VI semester** • **Graphics Designing (U19CSO65) (Annexure III)**

Item:
Minutes
4/BoS/4/20
22/ICE/UG
	The **Employability Enhancement Courses** chosen for III (R-2020) and VI (R-2019) semester students were apprised **(Annexure III)**
	
	Skill Development Course
	
	R-2020, III semester
	    • Skill Development Course 2: Troubleshooting of Electronic Equipments (U20ICS302)
	
	R-2019, VI semester
	    • Skill Development Course 7: Career and Professional Skill Development Program – I (U19ICS61)
	    • Skill Development Course 8: Technical Seminar (U19ICS62)
	    • Skill Development Course 9: NPTEL / MOOC – I (U19ICS63)
	Mandatory Courses
	    • Professional Ethics (U19ICM61) **(R-2019, VI semester)**
	    • Physical Education (U20ICM303) **(R-2020, III Semester)**
	Certification Courses
	    • Artificial Intelligence (U20ICC309) **(R-2020, III semester)**
	    • Industrial Automation (U19ICC66) **(R-2019, VI semester)**
	
	Certification courses are opted as per the expert's suggestion, Especially Artificial Intelligence course was insisted by the experts in the previous BOS meeting (BoS 3).

Item: **Minutes** **5/BoS/4/20** **22/ICE/UG**	The academic calendar for the even semester (Jan 2022 to May 2022) was apprised to the BOS members. **(Annexure- IV)**

Item:
Minutes
6/BoS/4/
2022/ICE/
UG
	• The Industry Institute Interaction of B. Tech Instrumentation and Control Engineering were apprised and the suggestions regarding the associations were deliberated.
	Internship
	    • Suggestions were given by BOS members to take up more internship in online / offline mode.
	    • Placement opportunities through the internship were discussed.

	Core Placement • More hands on to be provided to the students to gain exposure relevant to core placement. • Specifically, the evolving field of instrumentation like field bus, HART, P&ID diagram, Calibration of measurement was insisted to focus. • Involvement of Alumni to identify core placement opportunities. **Consultancy** • Every faculty should undertake a consultancy work with the nearby industries which improves the industry institute interaction. **Industrial Projects** • Experts suggested for more industrial projects to students.
Item: **Minutes** 7/BoS/4/2022/ICE/UG	The AICTE sponsored International Conference on Emerging Innovative Technologies in Engineering (ICEITE- 22) held on 16-18 March – 2022 was apprised.
Item: **Minutes** 8/BoS/4/2022/ICE/UG	The End Semester Examination conducted in offline mode (Nov-Dec 2021) and the publication of result was apprised.
Item: **Minutes** 9/BoS/4/2022/ICE/UG	The panel of examiners to the Academic Council was apprised and recommended **(Annexure- V)**
Item: **Minutes** 10/BoS/4/2022/ICE/UG	Student Exchange Program with abroad universities was suggested by the experts. Credits earned from NPTEL course can be exchanged with the credits of the regular papers.

The meeting was concluded at 1.00 PM with vote of thanks by **Dr. L. M. Varalakshmi**, Head of Department, Instrumentation and Control Engineering

Sl.No	Name of the Member with Designation and official Address	Responsibility in the BoS	Signature
1	Dr. L.M. Varalakshmi Professor and Head Department of ICE,SMVEC	Chairman	
External Members			
2	Dr. P. A. Karthick, P.D.F. Professor Department of Instrumentation and Control Engineering National Institute of Technology, Tiruchirappalli	External Member	P. A. Karthick.
3	Dr. D. Manamalli Professor Department of Instrumentation Engineering, MIT Campus, Anna University	External Member	
4	Dr. Anima Nanda Professor & Head/ BMI Director IQAC, Sathyabama University	External Member	
Internal Members			
5	Prof. T. Sudha Assistant Professor Department of ICE,SMVEC	Internal Member	T. Sudha
6	Prof. J. Jeevanantham Assistant Professor Department of ICE, SMVEC	Internal Member	
7	Dr. M. Rekha Associate Professor Department of ICE, SMVEC	Internal Member	
8	Dr. D. Sivanandakumar Associate Professor Department of ICE, SMVEC	Internal Member	
9	Prof. K. Naveenkumar Assistant Professor Department of ICE, SMVEC	Internal Member	
10	Dr. S. Deepa Professor & Head Department of Chemistry, SMVEC	Internal Member	

11	Dr. T. Gayathri Professor & Head Department of Mathematics, SMVEC	Internal Member	*T. Gay*
12	Dr. M.A. Ishrath Jahan Professor Department of English, SMVEC	Internal Member	*M. A Ishrath*
13	Mrs. S. Geetha Assistant Professor Department of Physics, SMVEC	Internal Member	*S. Geetha*
Co-opted Members			
14	Mr. B. Murugan Senior Executive Engineer Biogenomonics	Co-opted Member	*B. mur*
15	Mr. S. Karthikeyan E-Beam control Operator Siechem Technologies pvt. Ltd	Co-opted Member	*Karthi*

Chairman-BoS /Dept. of ICE
(Dr.L. M. Varalakshmi)

Annexure–I

(Revision of R-2020 IV, V, VI Sem Syllabi)

SEMESTER – VI

Sl. No	Course Code	Course Title	Category	Periods L	T	P	Credits	Max. Marks CAM	ESM	Total
Theory										
1	U20ICT613	Biomedical Instrumentation	PC	3	0	0	3	25	75	100
2	U20ICT614	Industrial Instrumentation - II	PC	3	0	0	3	25	75	100
3	U20ICT615	Internet of Things for automation	PC	3	0	0	3	25	75	100
4	U20ICT616	Process Control	PC	3	0	0	3	25	75	100
5	U20ICE6XX	Professional Elective - III #	PE	3	0	0	3	25	75	100
6	U20XXO6XX	Open Elective – III $	OE	3	0	0	3	25	75	100
Practical										
7	U20ICP609	Biomedical Instrumentation Lab	PC	0	0	2	1	50	50	100
8	U20ICP610	Process Control Lab	PC	0	0	2	1	50	50	100
9	U20ICP611	Virtual Instrumentation Lab	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
10	U20ICC6XX	Certification Course – VI **	EEC	0	0	4	-	100	-	100
11	U20ICS606	Skill Development Course 6: Foreign Language / IELTS – II	EEC	0	0	2	-	100	-	100
12	U20ICS607	Skill Development Course 7: Technical Seminar	EEC	0	0	2	-	100	-	100
13	U20ICS608	Skill Development Course 8: NPTEL / MOOC - I	EEC	0	0	0	-	100	-	100
Mandatory Course										
14	U20ICM606	Essence of Indian Traditional Knowledge	MC	2	0	0	-	100	-	100
							21	800	600	1400

SEMESTER – VII

Sl. No	Course Code	Course Title	Category	Periods L	T	P	Credits	Max. Marks CAM	ESM	Total
Theory										
1	U20ICT717	Computer Control of Processes	PC	3	0	0	3	25	75	100
2	U20ICT718	Process automation	PC	3	0	0	3	25	75	100
3	U20ICE7XX	Professional Elective – IV #	PE	3	0	0	3	25	75	100
4	U20XXO7XX	Open Elective – IV $	OE	3	0	0	3	25	75	100
Practical										
5	U20HSP703	Business Basics for Entrepreneur	HS	0	0	2	1	100	-	100
6	U20ICP712	Computer Control of Processes Lab	PC	0	0	2	1	50	50	100
7	U20ICP713	Process Automation Lab	PC	0	0	2	1	50	50	100
8	U20ICP714	Comprehensive Viva Voce	PC	0	0	2	1	50	50	100
Project Work										
9	U20ICW701	Project Phase – I	PW	0	0	4	2	50	50	100
10	U20ICW702	Internship / Inplant Training	PW	-	-	-	2	100	-	100
Mandatory Course										
11	U20ICM707	Professional Ethics	MC	2	0	0	-	100	-	100
							20	600	500	1100

U20ICT409	**MICROCONTROLLER BASED SYSTEM DESIGN**	**L**	**T**	**P**	**C**	**Hrs**
		3	0	0	3	45

Course Objectives
- To study architecture and programming of 8085 microprocessor
- To study architecture and programming of 8051 microcontroller
- To learn Arduino platform and hardware features
- To study the interfacing of hardware.
- To learn about design of real time microcontroller based systems

Course Outcomes

After completion of the course, the students will be able to

CO1- Elucidate the architecture and addressing modes of 8-bit microprocessor.**(K2)**

CO2-Elucidate the architecture and addressing modes of 8051 microcontroller.**(K2)**

CO3- Gain conceptual understanding of Arduino Platform.**(K3)**

CO4- Gain knowledge about hardware interfacing.**(K2)**

CO5- Learn about design of real time microcontroller based systems.**(K4)**

UNIT I 8085 MICROPROCESSOR (9 Hrs)

Evolution of microprocessor, Types of various architectures; Harvard and Von-Neumann, RISC and CISC,8085 microprocessor- Pin Functions, Architecture, Timing Diagrams, Addressing modes, Instruction set Interrupts, Programming Examples, Direct Memory Access, I/O Mapping.

UNIT II 8051 MICROCONTROLLER (9 Hrs)

Architecture – Memory Organization – Structure of Ports – Addressing modes – Instruction set – Timers – Serial Port – Interrupts- Power Saving Modes - Assembly Language Programming.

UNIT III INTRODUCTION TO ARDUINO (9 Hrs)

Introduction to Arduino platform- Hardware features – Types of Arduino boards – Features of Arduino Uno - pin details - Arduino IDE – configuration settings - basic sketch in Arduino – compiling and downloading sketches

UNIT IV HARDWARE INTERFACING (9 Hrs)

I/O Port programming, Bit manipulation, Interfacing to a LED, LCD, Keyboard, ADC, DAC, Stepper Motors, UART, and Sensors. (Using 8051)

UNIT V DESIGN OF MICROCONTROLLER BASED SYSTEMS (9 Hrs)

Study of temperature control system – Robotic system using DC motors – Ultrasonic Range system – Security system using sensors – weather monitoring system – Street light control system – GSM based systems – WiFi and Bluetooth based systems – PC based Measurement and Control

Text Books
1. Mohammed Ali Mazidi and Janice GillispieMazidi, "The 8051 Microcontroller and Embedded System", Pearson Education Asia, New Delhi, 2012.
2. Simon Monk, Programming Arduino Next Steps: Going Further with Sketches, McGraw Hill Education-2019.
3. Michael Margolis, ArduinoCookBook, O'reilly-2011.
4. Mark Geddes, Arduino Project Handbook: Volume one: Complete Guide to Creating with the Arduino, Sketch Publishing-2014.

Reference Books

1. N.Senthil Kumar, M.Saravanan and S.Jeevananthan, Microprocessor and Microcontrollers, OXFORD UNIVERSITY PRESS, November, 2010.
2. Jeremy Blum, Exploring Arduino, Wiley-2012.
3. Muhammad Ali Mazidi, Shujen Chen, EshraghGhaemi, Arduino Programming from Beginning to Advanced, MicroDigital-Ed-2018.
4. David E Simon, "An embedded software primer ", Pearson education Asia, 2001.
5. Raymond J.A. Bhur and Donald L.Bialey, " An Introduction to real time systems: Design to networking with C/C++ "Prentice Hall Inc. New Jersey, 2019

Web References

1. https://www.elprocus.com/8051-microcontroller-architecture-and-applications/
2. https://www.tutorialspoint.com/microprocessor/microcontrollers_8051_architecture.htm
3. https://www.arduino.cc/
4. https://nptel.ac.in/courses/108/105/108105102/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	2	-	-	-	-	-	-	-	-	-	2	2	2
2	2	1	2	-	-	-	-	-	-	-	-	-	2	2	2
3	2	1	2	-	-	-	-	-	-	-	-	-	2	2	2
4	2	1	2	-	-	-	-	-	-	-	-	-	2	2	2
5	2	1	2	-	-	-	-	-	-	-	-	-	2	2	2

Correlation Level: 1-Low, 2-Medium, 3- High

	L	**T**	**P**	**C**	**Hrs**

U20ICT511   **EMBEDDED SYSTEM DESIGN**   L T P C Hrs
                                                          3 0 0 3 45

Course Objectives
- To study the basics of the Embedded System.
- To explain the various development tools in the Embedded System.
- To acquire knowledge in Embedded Networking
- To study ARM Processor hardware features and internal peripherals
- To design simple embedded microcontroller based applications

Course Outcomes
After completion of the course, the students will be able to
CO1 -Understand the fundamentals and areas of applications for the Embedded System(**K1**)
CO2 - Analyse the various architectures for embedded software development.(**K2**)
CO3 -Classify and analyze the various standards and protocols used for embedded interfaces.(**K2**)
CO4 - Acquire Knowledge of ARM Processor hardware features and internal peripherals.(**K3**)
CO5 - Design simple embedded microcontroller based applications.(**K4**)

UNIT I INTRODUCTION TO EMBEDDED SYSTEM   (9 Hrs)
Embedded system- characteristics of embedded system- categories of embedded system- requirements of embedded systems- challenges and design issues of embedded system- trends in embedded system- system integration- hardware and software partition- applications of embedded system - control system and industrial automation-biomedical-data communication system-network information appliances- IVR systems- GPS systems.

UNIT II EMBEDDED SOFTWARE DEVELOPMENT AND TOOLS   (9 Hrs)
Software architectures, Round - Robin, Round-Robin with Interrupts, Function Queue Scheduling architecture, Introduction to assembler - Compiler -Cross compilers, Linker/ Locators, Simulators- Embedded Firmware Design Approaches and Development Languages.

UNIT III EMBEDDED NETWORKING   (9 Hrs)
Embedded Networking: Introduction, I/O Device Ports - Serial Bus communication protocols- RS232 standard- RS485 - CAN Bus - RS485 - Serial Peripheral Interface (SPI) - Inter-Integrated Circuits (I2C) - PC Parallel port communication Protocols - Bluetooth-network using ISA, PCI-. Interrupt service mechanism.

UNIT IV INTRODUCTION TO LPC2148 MICROCONTROLLER   (9 Hrs)
ARM 7 Architecture –LPC2148 microcontroller introduction – Internal memory map - Peripheral details – Implementation of GPIO, Timer/Counter, UART, Interrupt architecture – ADC and DAC. SPI, I2C and USB features of LPC2148.

UNIT V DESIGN OF SIMPLE EMBEDDED SYSTEMS   (9 Hrs)
Design of Simple I/O systems using Switches, LEDs, Buzzers , Current source and sink concepts,Interfacing Character and Graphical LCD Displays , DC Motor Speed Control System, Speed Measurement, Design of Digital Frequency meter , Stepper Motor Interfacing ,Relays, Keypads ,PC based Control systems. (Using LPC2148)

Text Books
1. Trevor Martin,"The Insider's Guide to the Philips ARM7-Based Microcontrollers", HitexPubications(UK)
2. KVKK Prasad, "Embedded / Real Time Systems", Dreamtech Press, 2005.
3. Raj Kamal, "Embedded system-Architecture, Programming, Design", Tata McGraw Hill, 2011
4. David E Simon, "An embedded software primer ", Pearson education Asia, 2001.

Reference Books

1. Steve Heath, "Embedded Systems Design", Second Edition, Elsevier India Pvt.Ltd., 2007
2. Wayne Wolf, "Computers as components", Morgan Kaufmann publishers, 2nd Edition, 2008
3. Jonartthan W. Valvano Brooks/cole "Embedded Microcomputer Systems. Real time Interfacing",Thomson learning 2001.
4. Grehan Moore, and Cyliax, "Real time Programming: A guide to 32 Bit Embedded Development. Reading" Addison Wesley-Longman, 1999.
5. Ajay V Deshmukh, "Microcontrollers: Theory and Applications", Tata McGraw-Hill, 2005.

Web References

1. https://www.tutorialspoint.com/embedded_systems/es_overview.htm
2. https://www.watelectronics.com/classification-of-embedded-systems/
3. https://nptel.ac.in/courses/108/102/108102045/
4. https://nptel.ac.in/courses/106/105/106105193/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	-	2	-	2	2	2	-	2	2	-	2	2	3	2
2	3	-	3	-	3	2	2	-	2	2	-	1	3	3	2
3	3	-	3	-	3	2	2	-	2	3	-	2	3	3	3
4	2	-	2	-	2	2	2	-	2	3	-	2	2	3	3
5	3	2	3	-	2	2	2	-	2	2	-	2	2	3	3

Correlation Level: 1 - Low, 2 – Medium, 3 - High

U20ICP506	**EMBEDDED SYSTEM DESIGN LAB**	**L**	**T**	**P**	**C**	**Hrs**
		0	0	2	1	30

Course Objectives
- To Design microcontroller based embedded systems.
- To introduce the embedded systems design tools and hardware programming.
- To equip the students skills in both simulation and practical implementation of the basic building blocks of a microcontroller including timers, counters, I/O techniques and requirements, A/D conversion, serial communications
- To develop firmware for the systems and to validate the same through functional simulation and hardware verification.
- To study the peripheral devices interfacing techniques

Course Outcomes
After completion of the course, the students will be able to
CO1 - Get exposure to the system design aspects of Microcontrollers.**(K1)**
CO2 - Design applications for customized requirements.**(K2)**
CO3 - Learn firmware development for microcontrollers.**(K2)**
CO4 -Interface various peripheral devices with ARM processor. **(K3)**
CO5 -Design embedded system based applications.**(K3)**

List of Experiments
1. Implementation of GPIO of ARM LPC2148
2. Interfacing Timer using ARM LPC2148.
3. Implementation of UART features of ARM LPC2148.
4. Implementation of ADC of ARM LPC2148.
5. Implementation of DAC of ARM LPC2148.
6. Seven segment display interface using LPC2148
7. Interfacing 4x4 matrix key with LPC2148
8. Interfacing buzzer with LPC2148
9. Real time clock implementation using LCD in ARM LPC2148

Reference Books
1. Steve Heath, "Embedded Systems Design", Second Edition, Elsevier India Pvt.Ltd., 2007
2. Wayne Wolf, "Computers as components", Morgan Kaufmann publishers, 2nd Edition, 2008
3. Jonartthan W. Valvano Brooks/cole "Embedded Microcomputer Systems. Real time Interfacing ",Thomson learning 2001.
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5. Ajay V Deshmukh, "Microcontrollers: Theory and Applications", Tata McGraw-Hill, 2005

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1. https://www.tutorialspoint.com/embedded_systems/es_overview.html
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3. https://nptel.ac.in/courses/108/102/108102045/
4. https://nptel.ac.in/courses/106/105/106105193/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	-	2	-	2	2	2	-	2	2	-	2	2	3	2
2	3	-	3	-	3	2	2	-	2	2	-	1	3	3	2
3	3	-	3	-	3	2	2	-	2	3	-	2	3	3	3
4	2	-	2	-	2	2	2	-	2	3	-	2	2	3	3
5	3	2	3	-	2	2	2	-	2	2	-	2	2	3	3

Correlation Level: 1 - Low, 2 – Medium, 3 - High

U20ICP609   BIOMEDICAL INSTRUMENTATION LAB

	L	T	P	C	Hrs
	0	0	2	1	30

Course Objectives
- To familiarize students with pulse oximeter, biotelemetry, ECG and EEG instruments.
- To illustrate students with the simulation of ECG signals.
- To impart knowledge on shortwave and ultrasonic diathermy.
- To describe the working of ventilators and pacemakers.
- To analyse the heart lung machine model.

Course Outcomes
After completion of the course, students shall have ability to,
CO1 - Experiment the analysis using pulse oximeter, biotelemetry, ECG and EEG instruments. **(K2)**
CO2 - Simulate ECG signals. **(K1)**
CO3 - Describe shortwave and ultrasonic diathermy **(K3)**
CO4 - Conduct investigation using ventilators and pacemakers **(K3)**
CO5 - Demonstrate the heart lung machine model. **(K2)**

LIST OF EXPERIMENTS
1. Measurement of blood pressure using sphygmomanometer.
2. Measurement of Respiratory system analysis using Pulse oximeter
3. Measurement of various physiological signals using biotelemetry
4. Design a frontal EEG wave analysis using simulator
5. ECG heart rate alarm system with HRV
6. Measurement of Real time monitoring of Echocardiography
7. Galvanic Skin Resistance measurement
8. Design of EOG amplifier to detect eye blink
9. Working of different types of Diathermy equipment's – study
a) Shortwave Diathermy
b) Ultrasound Diathermy
c) Surgical Diathermy
10. Study of Ventilators and pacemaker
11. Study of ultrasound scanners
12. Study of heart lung machine model

Text Books
1. John G. Webster, Bioinstrumentation", John Willey and sons, New York, 2004

Reference Books
1. "Handbook of Biomedical Instrumentation", Khandpur R.S, Tata McGraw- Delhi, 2003.
2. Standard Handbook of Biomedical Engineering and Design – Myer Kutz McGraw-Hill Publisher, 2003

Web Resources
1. https://www.youtube.com/watch?v=plpGNnKHh1Q
2. https://www.youtube.com/watch?v=PUv7nxFd0XM

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	1	2	-	-	-	-	2	-	3	2	-	-
2	2	3	3	2	3	-	-	-	-	2	-	3	3	-	-
3	2	2	3	2	3	-	-	-	-	2	-	3	3	-	-
4	2	3	2	2	2	-	-	-	-	1	-	2	2	-	-
5	3	2	3	2	2	-	-	-	-	2	-	2	2	-	-

Correlation Level: 1-Low, 2-Medium, 3- High

U20ICP611	VIRTUAL INSTRUMENTATION LAB	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To provide knowledge on design of process control by using virtual instrumentation techniques
- To provide knowledge in process analysis by VI tools.
- To give basic knowledge in describing function analysis
- Get adequate knowledge VI tool sets
- Get adequate knowledge VI Data Acquisition.

Course Outcomes

After completion of the course, the students will be able to

CO1 - Get adequate knowledge on VI tool sets **(K1)**

CO2 - Describe the data acquisition. **(K1, K2)**

CO3 - Attain knowledge on VI programming techniques. **(K1, K2, K3)**

CO4 - Understand VI programming techniques. **(K1, K2)**

CO5 - Get an adequate knowledge on application of virtual instrumentation **(K1, K2)**

List of Experiments

1. Creating Virtual Instrumentation for simple applications.
2. Programming exercises for loops and charts
3. Programming exercises for clusters and graphs.
4. Programming exercises on case and sequence structures, file Input / Output.
5. Data acquisition through Virtual Instrumentation.
6. Developing voltmeter using DAQ cards.
7. Developing signal generator using DAQ cards.
8. Simulating reactor control using Virtual Instrumentation.
9. Real time temperature control using Virtual Instrumentation.
10. Real time sequential control of any batch process.

Reference Books

1. Sanjay Gupta, "Virtual Instrumentation using LABVIEW" Prentice Hall India Learning Private Limited 2010
2. Jeffrey Y Beyon," Hands-On Exercise Manual for LabVIEW Programming, Data Acquisition and Analysis", Prentice Hall 2000.
3. Saanjay Gupta and Joseph John,"Virtual Instrumentation using LAbVIEW",Tata Mc Graw Hill 2006.
4. S.Sumathi,P.Surekha,"LabVIEW Based Advanced Instrumentation Systems",Springer,2007.
5. JovithaJerome,"Virtual Instrumentation using LAbVIEW",Prentice Hall India Learning Private Limited 2010

Web Resources

1. https://www.ni.com
2. https://www.sciencedirect.com/topics/engineering/virtual-instrument
3.http://jjackson.eng.ua.edu/courses/ece380/assignments/373363c.pdf

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes(PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	3	1	2	3	-	-	-	2	2	3	2	1	2
2	2	2	3	2	3	3	-	-	-	2	2	3	3	1	2
3	2	2	3	2	3	2	-	-	-	3	2	3	3	1	2
4	2	3	2	2	2	2	-	-	-	3	2	3	2	1	3
5	3	2	3	3	2	2	-	-	-	2	2	2	2	1	3

Correlation Level: 1-Low, 2-Medium, 3- High

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U20ICE612	VIRTUAL INSTRUMENTATION	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives
- To Introduce the evolution, block diagram and architecture of VI.
- To get knowledge on basic Programming by using virtual instrumentation.
- To provide knowledge in programming Structure by VI tools.
- To provide knowledge in Different types of Arrays and Clusters by VI tools.
- To provide knowledge in Hardware Interfacing by VI tools.

Course Outcomes
After completion of the course, the students will be able to

CO1 - Understand the evolution, architecture, applications of visual instrumentation. **(K1)**
CO2 - Study about the basics of Programming by using virtual instrumentation. **(K1, K2)**
CO3 - Acquiring knowledge on VI programming Structure by VI tools. **(K1, K3)**
CO4 - Study about the different types of Arrays and Clusters by VI tools. **(K1)**
CO5 - Understanding the concept of instrument interfacing by VI tools. **(K1, K2)**

UNIT I   INTRODUCTION   (9 Hrs)
Evolutions of VI, advantages, block diagram and architecture of a virtual instrument-Graphical programming, and comparison with conventional programming.

UNIT II VI PROGRAMMING   (9 Hrs)
Controls and indicators- Labels and Text –Shape, size and color- – Data type, Format, Precision and representation – Data types – Data flow programming-Editing – Debugging and Running a Virtual Instrument –Concept of sub VI.

UNIT III PROGRAMMING STRUCTURE   (9 Hrs)
FOR Loops, WHILE Loops, CASE Structure, Formula nodes, Sequence structures- Attribute modes Local and Global variables.

UNIT IV ARRAYS AND CLUSTERS   (9 Hrs)
Arrays and Clusters– Array Operations – Bundle – Bundle/Unbundle by name, graphs and charts – String and file I/O.

UNIT V HARDWARE INTERFACING   (9 Hrs)
DAQ – Block diagram – Description - basic system components of a signal conditioning system- Interfacing with LabVIEW- Introduction to my RIO

Text Books
1. Gupta , Virtual Instrumentation Using Lab view 2nd Edition, Tata McGraw-Hill Education, 2010
2. Jovitha Jerome, Virtual Instrumentation using LabVIEW, PHI Learning Pvt. Ltd., 2010

Reference Books
1. Gary Jonson, "Labview Graphical Programming", Fourth Edition, McGraw Hill, New York, 2012
2. Gupta.S., Gupta.J.P., "PC interfacing for Data Acquisition and Process Control", Second Edition, Instrument Society of America, 2012.
3. Sokoloff; "Basic concepts of Labview 4", Prentice Hall Inc., New Jersey 2013.

Web References
1. https://www.ni.com/
2. https://www.youtube.com/user/Labview/playlists

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COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes(PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	1	2	2	-	-	-	2	2	3	2	1	2
2	3	3	3	2	3	2	-	-	-	2	3	3	1	1	2
3	3	2	3	2	3	2	-	-	-	3	2	3	1	1	3
4	2	3	2	2	2	2	-	-	-	3	2	3	2	1	3
5	3	2	3	3	2	2	-	-	-	2	2	2	2	1	3

Correlation Level: 1-Low, 2-Medium, 3- High

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Annexure–II

(R-2020, VII Semester Syllabi)

			Periods				Max. Marks		
Course Code	Course Title	Category	L	T	P	Credits	CAM	ESM	Total
SEMESTER – VII									
Theory									
U20ICT717	Computer Control of Processes	PC	3	0	0	3	25	75	100
U20ICT718	Process Automation	PC	3	0	0	3	25	75	100
U20ICE7XX	Professional Elective IV #	PE	3	0	0	3	25	75	100
U20XXO7XX	Open Elective IV $	OE	3	0	0	3	25	75	100
Practical									
U20HSP703	Business Basics for Entrepreneur	HS	0	0	2	1	100	-	100
U20ICP712	Computer Control of Processes Lab	PC	0	0	2	1	50	50	100
U20ICP713	Process Automation Lab	PC	0	0	2	1	50	50	100
U20ICP714	Comprehensive Viva Voce	PC	0	0	2	1	50	50	100
Project Work									
U20ICW701	Project Phase I	PW	0	0	4	2	50	50	100
U20ICW702	Internship / Inplant Training	PW	-	-	-	2	100	-	100
Mandatory Course									
U20ICM707	Professional Ethics	MC	2	0	0	-	100	-	100
						20	600	500	1100

U20ICT717	**COMPUTER CONTROL OF PROCESSES**	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives
- To introduce analysis of discrete time systems in state variable form.
- To introduce system identification techniques
- To Design Digital Controllers
- To educate on various process loops and its control.
- To Design Multi-loop and Multivariable Controllers for multivariable system

Course Outcomes
After completion of the course, the students will be able to
CO1 - Analyse the discrete time systems. **(K1)**
CO2 - Analyse transient and steady state behaviours of linear discrete time control systems **(K1,K2)**
CO3 - Design a digital controller. **(K1,K2, K3)**
CO4 - Design multi-loop controller. **(K1,K2, K3)**
CO5 - Design multivariable controller for multivariable system. **(K1,K2, K3)**

UNIT I   DISCRETE STATE-VARIABLE TECHNIQUE   (9 Hrs)
State equation of discrete data system with sample and hold – State transition equation – Methods of computing the state transition matrix – Decomposition of discrete data transfer functions – State diagrams of discrete data systems – System with zero-order hold – Controllability and observability of linear time invariant discrete data system–Stability tests of discrete-data system – State Observer - State Feedback Control.

UNIT II SYSTEM MODELING AND IDENTIFICATION   (9 Hrs)
Mathematical model for processes – first order. Second order processes without and with pure delay higher order systems – process modeling form step test data – pulse testing for process identification – time – domain identification – linear least square algorithm.

UNIT III   DIGITAL CONTROLLER DESIGN   (9 Hrs)
Review of z-transform – Modified of z-transform – Pulse transfer function – Digital PID controller – Dead-beat control and Dahlin's control – Smith predictor – Digital Feed-forward controller – IMC State Feedback Controller - LQG Control

UNIT IV   MULTI-LOOP REGULATORY CONTROL   (9 Hrs)
Multi-loop Control - Introduction – Process Interaction – Pairing of Inputs and Outputs -The Relative Gain Array (RGA) – Properties and Application of RGA – Multi – loop PID Controller– Biggest Log Modulus Tuning Method – De coupler

UNIT V   MULTIVARIABLE REGULATORY CONTROL   (9 Hrs)
Introduction to Multivariable control –Multivariable PID Controller -Multivariable IMC– Multivariable Dynamic Matrix Controller – Multivariable Model Predictive Control – Generalized Predictive Controller – Implementation Issues.

Text Books
1. Gopal,M.,"DigitalControlandStateVariableMethods",TataMcGrawHill,Fourth Edition,2017
2. Bequette,B.W.,"ProcessControlModeling,DesignandSimulation",PrenticeHallof India,2015
3. M. Chidambaram , Computer control of process, Narosa publishing house,2015

Reference Books
1. Stephanopoulos, G., "Chemical Process Control -An Introduction to Theory and Practice", Prentice Hall

of India, 2015.
2. John Lavigne, Instrumentation Applications for the Pulp and Paper Industry (A Pulp and paper book), Books,1988
3. E. Ikonen and K.Najim, "Advanced Process Identification and Control", Marcel Dekker, Inc. Newyork, 2002.

Web Resources
1. https://nptel.ac.in/courses/112/105/112105211/
2. https://www.youtube.com/watch?v=ImtSsDLgAaI&feature=emb_logo

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes(PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	1	2	2	2	-	-	2	-	3	2	3	2
2	3	3	3	2	3	2	2	-	-	2	-	3	3	3	2
3	3	2	3	2	3	2	2	-	-	3	-	3	3	3	3
4	2	3	2	2	2	2	2	-	-	3	-	3	2	3	3
5	3	2	3	3	2	2	2	-	-	2	-	2	2	3	3

Correlation Level: 1-Low, 2-Medium, 3- High

U20ICT718	PROCESS AUTOMATION	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives
- To know about the design of a system using PLC introduced in details.
- To study about PLC Programming
- To study Industrial DCS.
- To have an exposure to HART and Field bus.
- To know about advanced topics in automation.

Course Outcomes
After completion of the course, the students will be able to

CO1 - Understand working of PLC, I/O modules of PLC, automation and applications in industry. **(K1)**

CO2 - Acquire knowledge on the design of systems using PLC and PLC programming. **(K1, K2, K3)**

CO3 -Gain knowledge about the SCADA architecture, communication in SCADA, develop any application based on SCADA along with GUI using SCADA software. **(K1, K2)**

CO4 - Understand the fundamentals of DCS and its importance. **(K1)**

CO5 - Study the fundamentals of advanced Automation. **(K1)**

UNIT I PLC ARCHITECTURE AND INTERFACE MODULES   (9 Hrs)
Introduction - Principles of operation – PLC Architecture and specifications – PLC hardware components Analog and digital I/O modules, CPU and memory module – Programming devices -comparative study of industrial PLC's.

UNIT II PLC PROGRAMMING   (9 Hrs)
Ladder logic -PLC ladder diagram, Converting simple relay ladder diagram into PLC relay ladder diagram. PLC programming Simple instructions - Latching relays - sequential function instruction set-program counter, data manipulation, chart Arithmetic, shift registers and sequencers – Structured Text Programming.

UNIT III APPLICATION OF PLC AND INTRODUCTION OF SCADA   (9 Hrs)
Application of PLC –Simple materials handling application, Automatic control of warehouse door, Motor control, Bottle Label detection and process control application. SCADA:- Hardware and software, Remote terminal units, Master station, Communication architectures and Open SCADA protocols.

UNIT IV DISTRIBUTED CONTROL SYSTEM   (9 Hrs)
Evolution – Different architecture – Local control unit functions – Operator Interface – LLOI and HLOI - redundancy concepts – Displays – Communication networks and communications standards in DCS – Engineering Interface – Factors to be considered in selecting a DCS.

UNIT V ADVANCED TOPICS IN AUTOMATION   (9 Hrs)
Introduction To networked control systems- Plant wide control - Internet of Things- Cloud based Automation-OLE for process control - Safety PLC - Case studies: PLC - SCADA - DCS.

Text Books
1. Frank. D.Petrezuella, Programmable logic controllers, McGrewhill, Third edition, 2010
2. Lucas. M.P., Distributed control systems,VanNostrand and Reinholdcompany, NY,1986.
3. Hughes. T.Programmable controllers, ISA Press, 2000.

Reference Books
1. McMillan, G. K. , Process Industrial Instrument and controls handbook, McGraw Hill, Newyork, 1999.
2. Berge.J., Field buses for process control: Engineering, operation and maintenance, ISA Press, 2004.

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3. Clarke, G., Reynders, D. and Wright, E., "Practical Modern SCADA Protocols: DNP 3,
4. Mikel P. Grover , et. Al. "Industrial Robots – Technology Programming and Applications", McGraw Hill, 1980.
5. Behrouz A. Forouzan, "Data communication and Networking", Tata McGraw-Hill, 2004.

Web References

1. https://nptel.ac.in/courses/108105063/
2. https://www.google.com/amp/s/controlstation.com/what-is-a-distributed-control-system/amp/
3. https://nptel.ac.in/courses/108/105/108105088/
4. https://onlinecourses.nptel.ac.in/noc20_me39/preview
5. https://nptel.ac.in/content/syllabus_pdf/108105088.pdf.

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes(PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	-	1	1	2	-	1	-	1	1	2	2	2	2	2
2	2	2	3	2	2	1	-	-	2	3	2	1	3	2	1
3	2	2	2	2	1	2	-	-	2	2	1	1	2	2	1
4	-	-	2	2	2	1	1	-	1	1	2	2	1	1	2
5	1	1	-	-	1	1	-	-	-	1	1	1	1	1	1

Correlation Level: 1-Low, 2-Medium, 3- High

U20HSP703   BUSINESS BASICS FOR ENTREPRENEUR

L	T	P	C	Hrs
0	0	2	1	30

Course Objectives
- To develop a clear understanding on Business Plans and their significance.
- To be familiar with various forms of business appropriate for an individual entrepreneur
- To understand various ways of judging a successful opportunity for an entrepreneur
- To know the ways to formulate a successful Operation Plan
- To be aware of things to know to prepare effective financial and marketing plans

Course Outcomes
After completion of the course, the students will be able to
CO1 - Impact comprehensive knowledge of an entrepreneurial ecosystem. **(K6)**
CO2 - Understand the need and significance of Business Plan in the success of an Enterprise **(K2)**
CO3 - Understand the ways to judge the economic and business viability of proposed venture. **(K2)**
CO4 - Utilize the elements of success of entrepreneurial ventures. **(K3)**
CO5 - Evaluate the effectiveness of different entrepreneurial strategies **(K5)**

UNIT I: THE ENTREPRENEURIAL PERSPECTIVE   (6 Hrs)
Entrepreneurship and Family Business Management, Entrepreneurship theory and practice, The Nature and Importance of Entrepreneurs, The Entrepreneurial and Intrapreneurial Mind, The Individual Entrepreneur, International Entrepreneurship Opportunities

UNIT II: CREATING AND STARTING THE VENTURE   (6 Hrs)
Creativity and the Business Idea, Legal Issues for the Entrepreneur, the Business Plan, the Marketing Plan, the Financial Plan, the Organizational Plan

UNIT III: FINANCING THE VENTURE   (6 Hrs)
Raising Finance, scaling up the venture, NDA'S and term sheet, Sources of the Capital, Informal Risk Capital and Venture Capital

Report Submission:
- Grooming Entrepreneurial Mind-set
- Interaction with Business Leaders/Bankers/Venture Capitalists
- Finding and evaluating an idea
- Develop a business plan
- Financing for a company start-up
- Setting up a company-legal entity
- Entrepreneurial development and employment creation
- Effects of creativity and innovation on the entrepreneurial performance of family business

Text Books
1. Friend, G., and Zehle, S. (2004). *Guide to business planning*. Profile Books Limited.
2. Lasher, W. (2010). *The Perfect Business Plan Made Simple: The best guide to writing a plan that will secure financial backing for your business*. Broadway Books.
3. Arjun Kakkar. (2009). *Small Business Management: Concepts and Techniques for improving Decisions*. Global India Publications.

Reference Books
1. Alexander Osterwalder and Yves Pigneur – Business Model Generation.
2. Arthur R. DeThomas – Writing a Convincing Business Plan.
3. Ben Horowitz – The Hard Thing About Hard Things.
4. Guy Kawasaki – The Art of Start 2.0
5. Hal Shelton – The Secrets to Writing a Successful Business Plan.

Web References

1. https://www.waveapps.com/blog/entrepreneurship/importance-of-a-business-plan
2. https://www.entrepreneur.com/article/200516
3. https://smallbusinessbc.ca/article/how-to-use-viability-to-test-if-you-should-invest-in-your-business/
4. https://www.infoentrepreneurs.org/en/guides/strategic-planning/
5. http://www.marketingmo.com/strategic-planning/marketing-plans-budgets/
6. https://www.mbda.gov/page/loan-documentation

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes(PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	2	1	2	1	1	3	3	2	3	1	2	1	2	1
2	1	2	2	2	2	2	3	3	3	2	1	2	2	2	1
3	1	2	2	1	2	2	3	3	3	3	2	3	1	2	3
4	1	3	2	2	2	2	3	3	3	3	2	3	1	2	2
5	1	3	2	2	2	2	3	3	3	2	2	3	1	3	2

Correlation Level: 1-Low, 2-Medium, 3- High

U20ICP712	COMPUTER CONTROL OF PROCESS LAB	L	T	P	C	Hrs
		0	0	2	1	30

Course Objectives

- To understand the advanced control strategies
- To get adequate knowledge about practical issues of various digital controllers.
- To get adequate knowledge about practical issues of closed loop control of processes Using Digital Controllers
- To impart design knowledge of controller, control valve and transmitter.
- To get adequate knowledge about practical issues of calibration of Process instruments

Course Outcomes

After completion of the course, the students will be able to

CO1 - Design, test and calibrate the industrial instruments. **(K1)**

CO2 - Understand design of signal conditioning circuits and instrumentation systems.**(K2)**

CO3 - Calibrate different instruments used in industries.**(K3)**

CO4 - Design the multi-channel data acquisition system and transmitter. **(K3)**

CO5 - Design and implement computer based control schemes for different processes. **(K2)**

List of Experiments

1. Design and simulation of digital controller using Dahlin's algorithm
2. Design and simulation of digital controller using Dead beat algorithm.
3. Design and simulation of digital controller using Kalman's algorithm
4. Parameter estimation of process from input output data
5. Design of PID Controller and Auto tuning of PID Controller
6. PC based PID Control of 4th order electronic process using C program
7. Analysis of Multi-input Multi-output System(Four-tank System)
8. Design of Multi-Loop PID Controller and Multivariable PID Controller.
9. Design of Gain scheduling controller
10. Design of Self-Tuning Controller

Reference Books

1. Jacob Fraden, "Handbook of Modern Sensors Physics, design and Applications", springer publication, 4th edition 2010.
2. Ganji Vasu, "Design of Controller for Higher Order Discrete Systems", LAP Lambert Academic Publishing, 26 November 2012.
3. D. Patranabis, "Principles of Industrial Instrumentation", Tata McGraw Hill Publishing Ltd., New Delhi, 1999.
4. A.K. Sawhney, "A course in Electrical and Electronic Measurement and Instrumentation", Dhanpat Rai and Sons, New Delhi, 1999.

Web References

1. https://dl.acm.org/doi/book/10.5555/269184.
2. https://nptel.ac.in/courses/108/105/108105064/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes(PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	1	2	2	2	-	-	2	-	3	2	3	2
2	3	3	3	2	3	2	2	-	-	2	-	3	3	3	2
3	3	2	3	2	3	2	2	-	-	3	-	3	3	3	3
4	2	3	2	2	2	2	2	-	-	3	-	3	2	3	3
5	3	2	3	3	2	2	2	-	-	2	-	2	2	3	3

Correlation Level: 1-Low, 2-Medium, 3- High

    PROCESS AUTOMATION LAB

L	T	P	C	Hrs
0	0	2	1	30

Course Objectives

- To understand practical issues of applications of PLC hardware.
- To get adequate knowledge about practical issues of implementations of PLC and DCS.
- To impart practical skills in Programming of PLC.
- To impart practical skills in Sensor data acquisition, data processing and visualization.
- To impart practical skills in Interfacing the various field devices with PLC.

Course Outcomes

After completion of the course, the students will be able to

CO1 - Understand the fundamentals and Programming of PLC. **(K1)**
CO2 - Work with industrial automation systems. **(K1)**
CO3 - Design and implement control schemes in PLC. **(K1,K2, K3)**
CO4 - Interface field devices with PLC. **(K1, K2, K3)**
CO5 - Design and implement computer based control schemes for different processes. **(K1, K3)**

List of Experiments

1. Study of PLC field device interface modules (AI,AO,DI,DO modules)
2. Programming Logic Gates Function in PLC
3. Implementing Mathematical Operations, Timer, Counter operation using PLC
4. Programming Jump-to-subroutine and return operations in PLC
5. PLC Exercises: 1. Traffic Light Control and Filling/Draining Control Operation
6. PLC Exercises: 1. Reversal of DC Motor Direction 2. ON/OFF Controller for Thermal Process
7. Annunciator design using PLC
8. PLC based control of batch Process.
9. Study of Foundation Field bus /IOT/Wireless HART Enabled Transmitter.
10. Case study SCADA

Reference Books

1. Frank. D.Petruzella , Programmable logic controllers, McGraw hill, Third edition.
2. Lucas. M.P., Distributed control systems, Van Nostrand and Reinhold company, NY,1986.
3. Hughes. T. Programmable controllers, ISA Press, 2000
4. M. Chidambaram, Computer control of process, Narosa publishing house.

Web References

1. https://nptel.ac.in/courses/108/105/108105063/.
2. https://nptel.ac.in/courses/112/102/112102011/.
3. https://www.youtube.com/playlist?list=PL874F91C0180417C3

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes(PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	1	2	1	2	2	1	-	-	2	-	1	2	1	2
2	1	1	1	2	1	2	2	-	-	2	-	2	2	1	2
3	1	2	2	2	3	2	2	-	-	2	-	1	2	2	1
4	2	3	2	2	2	2	2	-	-	2	-	1	2	1	1
5	2	2	1	1	2	2	2	1	-	2	-	2	2	1	1

Correlation Level: 1-Low, 2-Medium, 3- High

U20ICP714	COMPREHENSIVE VIVA VOCE	L	T	P	C	Hrs
		0	0	2	1	30

The student will be tested for his understanding of basic principles of the core engineering subjects. The internal assessment for a total of 50 marks will be made by an internal assessment committee. The committee will conduct two written examinations of objective or short questions type from the all the core subjects. The external university examination, which carries a total of 50 marks, will be a Viva Voce examination conducted by a committee of one external examiner and one internal examiner appointed by the University.

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U20ICW701	PROJECT PHASE-I	L	T	P	C	Hrs
		0	0	4	2	60

Every student shall be required to undertake a suitable project in industry / research organization / department in consultation with the Head of the Department and the guide and submit the project report thereon at the end of the semesters in which the student registered, on dates announced by the College/Department. A student shall register for the Mini-Project / Project Work (Phase – I) respectively in 7th semester

U20ICW702	INTERNSHIP / IN-PLANT TRAINING	L	T	P	C
		0	0	4	2

Student should enrol in internship programme / In-plant training for a duration of 60 hours, the concern company will be approved by the department committee comprising of HoD, Programme Academic Coordinator, Class Advisor and Subject Experts. Students have to complete the course successfully. The committee will monitor the progress of the student and recommend the grade (100% Continuous Assessment pattern) based on the completion of course. The marks attained for this course is not considered for CGPA calculation.

U20ICM707	PROFESSIONAL ETHICS	L	T	P	C	Hrs
		2	0	0	-	30

Course Objectives
- To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

Course Outcomes
After completion of the course, the students will be able to
- Apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society

UNIT I HUMAN VALUES   (6 Hrs)
Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Livingpeacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT II ENGINEERING ETHICS   (6 Hrs)
Senses of „Engineering Ethics" — Variety of moral issues — Types of inquiry — Moral dilemmas — Moral Autonomy – Kohlberg"s theory – Gilligan"s theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION   (6 Hrs)
Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS SAFETY   (6 Hrs)
and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights –Employee Rights – Intellectual Property Rights (IPR) – Discrimination

UNIT V GLOBAL ISSUES   (6 Hrs)
Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development– Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Codeof Conduct — Corporate Social Responsibility

Reference Books
1. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.
3. Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.
4. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics –Concepts and Cases", Cengage Learning, 2009
5. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003
6. Edmund G Seebauer and Robert L Barry, "Fundametals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001
7. Laura P. Hartman and Joe Desjardins, "Business Ethics: Decision Making for Personal

Web References

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org

U20ICE716	POWER PLANT INSTRUMENTATION	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To provide an overview on power generation through various methods.
- To educate on the important power plant measurements and devices.
- To educate on basic Boiler control techniques.
- To Learn about Piping and Instrumentation diagrams and various instruments in Nuclear Power
- To study about the monitoring and control of turbines.

Course Outcomes

After completion of the course, the students will be able to

CO1 - Understand and analyze about the various Power Generation Methods. (K2)
CO2 - Analyze basic measurement in power plants. (K2)
CO3 - Recognize various analyzers for monitoring feed water impurity, flue gas etc. (K2)
CO4 - Learn about various Instruments used in nuclear power plants. (K2)
CO5 - Apply the knowledge to control and monitor the turbines. (K1)

UNIT I   OVERVIEW OF POWERGENERATION   (9 Hrs)

Survey of methods of power generation:– hydro, thermal, nuclear, solar and wind power– Importance of instrumentation in power generation – Thermal power plant – Building blocks - Combined Cycle System – Combined Heat and Power System – sub critical and supercritical boilers.

UNIT II   MEASUREMENTS IN POWER PLANTS   (9 Hrs)

Measurement of feed water flow, air flow, steam flow and coal flow - Drum level measurement - Steam pressure and temperature measurement - Turbine speed and vibration measurement - Flue gas analyzer - Fuel composition analyzer.

UNIT III   BOILER CONTROL   (9 Hrs)

Combustion of fuel and excess air - Firing rate demand - Steam temperature control - Control of deaerator - Drum level control - Single, two and three element control - Furnace draft control -implosion - flue gas dew point control - Trimming of combustion air - Soot blowing.

UNIT IV   INSTRUMENTATION IN NUCLEAR POWER PLANT   (9 Hrs)

Piping and instrumentation diagram of different types of nuclear power plants-radiation detection instruments-process sensors for nuclear power plants-spectrum analyzers-nuclear reactor control systems and allied instrumentation.

UNIT V   TURBINE MONITORING AND CONTROL   (9 Hrs)

Speed, vibration, shell temperature monitoring and control - Steam pressure control - Lubricant oil temperature control - Cooling system.

Text Books

1. Liptak B.G., Instrumentation in Process Industries, Chilton Book Company,2013.
2. P.K.Nag, Powerplant Engineering, Tata McGraw-Hill Education, 3rd edition,2011.
3. Power-plant Control and Instrumentation, The Control of Boilers and HRSG Systems, By David Lindsley, 2000.

Reference Books

1. Sam Dukelow, Control of Boilers, Instrument Society of America, 2012.
2. Jain R.K., Mechanical and Industrial Measurements, Khanna Publishers, New Delhi, 2012.
3. Power plant instrumentation, by k. Krishnaswamy, m. Ponnibala · 2013

Web References

1. www.ignou.ac.in/upload/Unit-2-58.pdf
2. http://www.powerplantinstrumentationcontrol.yolasite.com/
3. https://electrical-engineering-portal.com/download-center/books-and-guides/power-substations/power-plant-control

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	-	-	-	-	1	2	-	-	-	-	-	2	2	2
2	3	-	-	-	-	2	1	-	-	-	-	-	3	2	2
3	3	-	-	-	-	1	1	-	-	-	-	-	2	1	2
4	3	-	3	-	-	2	2	-	-	-	-	-	2	2	2
5	3	-	-	-	-	1	1	-	-	-	-	-	2	1	2

Correlation Level: 1-Low, 2-Medium, 3- High

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U20ICE717	AUTOMOTIVE INSTRUMENTATION SYSTEM	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives
- To impart knowledge on the automobile system, its subsystems and components.
- To expose the students to the concepts of various sensors used in automobile systems.
- To teach the basic and advanced controls in automotive systems.
- To learn the active and passive safety systems.
- To impart knowledge about the electronics and protocol involved in automotive systems.

Course Outcomes
After completion of the course, the students will be able to
CO1 - Identify the automotive system and its components. **(K1)**
CO2 - Attain knowledge of various sensors and conditioning circuits used in automotive systems. **(K1, K2)**
CO3 - Gain knowledge about various control strategies. **(K1, K2)**
CO4 - Acquaint the types of active and passive safety systems. **(K1)**
CO5 - Understand the automotive standards and protocols in the system. **(K1, K2)**

UNIT I INTRODUCTION OF AUTOMOBILE SYSTEM (9 Hrs)
Current trends in automobiles with emphasis on increasing role of electronics and software, overview of generic automotive control ECU functioning, overview of typical automotive subsystems and components, AUTOSAR.

UNIT II ENGINE MANAGEMENT SYSTEMS (9 Hrs)
Basic sensor arrangement, types of sensors such as oxygen sensors, crank angle position sensors, Fuel metering/ vehicle speed sensors, flow sensor, temperature, air mass flow sensors, throttle position sensor, solenoids etc., algorithms for engine control including open loop and closed loop control system, electronic ignition, EGR for exhaust emission control.

UNIT III VEHICLE POWERTRAIN AND MOTION CONTROL (9 Hrs)
Electronic transmission control, adaptive power Steering, adaptive cruise control, safety and comfort systems, anti-lock braking, traction control and electronic stability, active suspension control.

UNIT IV ACTIVE AND PASSIVE SAFETY SYSTEM (9 Hrs)
Body electronics including lighting control, remote keyless entry, immobilizers etc., electronic instrument clusters and dashboard electronics, aspects of hardware design for automotive including electro-magnetic interference suppression, electromagnetic compatibility etc., (ABS) antilock braking system, (ESP) electronic stability program, air bags.

UNIT V AUTOMOTIVE STANDARDS AND PROTOCOLS (9 Hrs)
Automotive standards like CAN protocol, LIN protocol, FLEX RAY, Head-Up Display (HUD), OBD-II, CAN FD, automotive Ethernet etc. Automotive standards like MISRA, functional safety standards (ISO 26262).
System design and energy management: BMS (battery management system), FCM (fuel control module), principles of system design, assembly process of automotives and instrumentation systems.

Text Books
1. William B. Ribbens, "Understanding Automotive Electronics", Butterworth-Heinemann publications, 7th Edition, 2012.

Reference Books

1. Young A.P., Griffiths L., "Automotive Electrical Equipment", ELBS and New Press, 2010.
2. Tom Weather Jr., Cland C. Hunter, "Automotive computers and control system", Prentice Hall Inc., New Jersey,2009.
3. Crouse W.H., "Automobile Electrical Equipment", McGraw Hill Co. Inc., New York, 2005.
4. Bechtold, "Understanding Automotive Electronic", SAE, 2010.
5. BOSCH, "Automotive Hand Book", Bentely Publishers, Germany, 9th Edition, 2014.

Web References

1. https://www.globalspec.com/reference/40076/203279/chapter-9-automotive-instrumentation-and-telematics
2. https://sites.google.com/site/sjredu/subje/instru-auto
3. https://www.gtvinc.com/advances-automotive-instrumentation/
4. https://www.kacsik.com/industries/automotive

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes(PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	1	-	-	2	2	2	-	-	-	1	3	-	2	2
2	1	1	-	-	3	2	2	-	-	-	2	3	-	3	2
3	3	2	3	-	3	3	3	-	-	-	3	3	-	3	3
4	2	1	-	-	2	3	3	-	-	-	1	3	-	2	3
5	1	2	-	-	2	2	2	-	-	-	-	2	-	2	1

Correlation Level: 1-Low, 2-Medium, 3- High

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U20ICE718	FAULT DETECTION AND DIAGNOSIS	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives
- To impart knowledge in fault detection and identification.
- To learn the concepts of analytical redundancy.
- To introduce different structure residual techniques for the fault identification.
- To introduce different directional residual techniques for the fault identification.
- To explore the advanced level issues.

Course Outcomes
After completion of the course, the students will be able to
CO1 - Identify the different types of faults occurring in a system.
CO2 - Apply mathematical technique to detect faults
CO3 - Elucidate the design of structured residuals
CO4 - Apply structured and directional techniques for FDD design
CO5 - Understand the advanced level issues and its robustness with suitable case study.

UNIT I INTRODUCTION TO FAULT DETECTION AND DIAGNOSIS   (9 Hrs)
Introduction to Fault Detection and Diagnosis: Scope of FDD: Types of faults and different tasks of Fault Diagnosis and Implementation - Different approaches to FDD: Model free and Model based approaches. Classification of Fault and Disturbances- Different issues involved in FDD- Typical applications

UNIT II ANALYTICAL REDUNDANCY CONCEPTS   (9 Hrs)
Analytical Redundancy Concepts: Introduction- Mathematical representation of Fault and Disturbances: Additive and Multiplicative types – Residual Generation: Detection, Isolation, Computational and stability properties – Design of Residual generator – Residual specification and Implementation.

UNIT III DESIGN OF STRUCTURED RESIDUALS   (9 Hrs)
Design of Structured Residuals: Introduction- Residual structure of single fault Isolation: Structural and Canonical structures- Residual structure of Multiple fault Isolation: Diagonal and Full Row canonical concepts – Introduction to parity equation implementation and alternative representation.

UNIT IV DESIGN OF DIRECTIONAL STRUCTURED RESIDUALS   (9 Hrs)
Design of Directional structured Residuals: Introduction – Directional Specifications: Directional specification with and without disturbances – Parity Equation Implementation – Linearly dependent column.

UNIT V ADVANCED LEVEL ISSUES AND DESIGN INVOLVED IN FDD   (9 Hrs)
Advanced level issues and design involved in FDD: Introduction of Residual generation of parametric fault – Robustness Issues –Statistical Testing of Residual generators – Application of Neural and Fuzzy logic schemes in FDD – Case study.

Text Books
1. Janos J. Gertler, "Fault Detection and Diagnosis in Engineering systems", Macel Dekker, 2nd Edition, 1998.
2. Rolf Isermann, "Fault-Diagnosis Systems an Introduction from Fault Detection to Fault Tolerance", Springer Verlag, 2006.

Reference Books
1. Sachin. *C.* Patwardhan, "Fault Detection and Diagnosis in Industrial Process – Lecture Notes", IIT Bombay, February 2005.
2. Rami S. Mangoubi, "Robust Estimation and Failure detection", Springer-Verlag-London 1998.

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3. Steven X. Ding, "Model based Fault Diagnosis Techniques: Schemes, Algorithms, and Tools", Springer Publication, 2012.
4. Hassan Noura, Didier Theilliol, Jean-Christophe Ponsart, Abbas Chamseddine, "FaultTolerant Control Systems: Design and Practical Applications", Springer Publication, 2009.
5. MogensBlanke, Michel Kinnaert, Jan Lunze, Marcel Staroswiecki., "Diagnosis and Fault-Tolerant Control", Springer, 2016.

Web References
1. https://www.enertiv.com/resources/faq/what-is-fault-detection-diagnostics
2. https://gregstanleyandassociates.com/whitepapers/FaultDiagnosis/faultdiagnosis.htm
3. https://www.facilitiesnet.com/buildingautomation/tip/Understanding-How-Fault-Detection-And-Diagnostics-FDD-Tool-Works--29830

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes(PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	-	-	2	2	2	-	-	-	1	3	-	2	2
2	2	2	-	-	2	2	2	-	-	-	2	3	-	3	2
3	3	2	-	-	2	2	2	-	-	-	3	3	-	3	3
4	2	2	-	-	2	2	2	-	-	-	1	3	-	2	3
5	2	2	-	-	2	2	2	-	-	-	-	2	-	2	1

Correlation Level: 1-Low, 2-Medium, 3- High

	MODERN ELECTRONIC	L	T	P	C	Hrs
U20ICE719	INSTRUMENTATION	3	0	0	3	45

Course Objectives
- To introduce the digital methods of measurements.
- To get knowledge on basic current trends in digital instrumentation.
- To provide knowledge in programming Structure by VI tools.
- To provide knowledge in Data Acquisition and VI Chassis Requirements by VI tools.
- To provide knowledge in VI Toolsets, Distributed I/O Modules.

Course Outcomes
After completion of the course, the students will be able to
CO1 - Understand the digital methods of measurements. **(K1)**
CO2 - Study about the basics current trends in digital instrumentation. **(K1)**
CO3 - Acquiring knowledge on programming Structure by VI tools. **(K1,K2)**
CO4 - Study about the Data Acquisition and VI Chassis Requirements by VI tools. **(K1)**
CO5 - Understanding the concept of instrument interfacing by VI tools. **(K1,K3)**

UNIT I DIGITAL METHODS OF MEASUREMENTS (9 Hrs)
Review of A/D, D/A techniques – F/V and V/F conversion techniques – Digital voltmeters and multimeters – Automation and accuracy of digital voltmeters and multimeters – Digital phase meters – Digital tachometers – Digital frequency, period and time measurements – Low frequency measurements – Automatic time and frequency scaling – Sources of error – Noise – Inherent error in digital meters, hidden errors in conventional ac measurements – RMS detector in digital multimeters – Mathematical aspects of RMS - Digital storage Oscilloscope.

UNIT II CURRENT TRENDS IN DIGITAL INSTRUMENTATION (9 Hrs)
Introduction to special function add on cards – Resistance card – Input and output cards –Digital equipment construction with modular designing; interfacing to microprocessor, micro controllers and computers - Computer aided software engineering tools (CASE) – Use of CASE tools in design and development of automated measuring systems – Interfacing IEEE cards – design of GPIB Systems - Intelligent and programmable instruments using computers-Data networks-CAN Bus, SMART/HART protocols

UNIT III VIRTUAL INSTRUMENTATION (9 Hrs)
Historical perspective, advantages, block diagram and architecture of a virtual instrument, data-flow techniques, graphical programming in data flow, comparison with conventional programming. Development of Virtual Instrument using GUI. VI programming techniques: VIS and sub-VIS, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, string and file I/O, Instrument Drivers, Publishing measurement data in the web.

UNIT IV DATA ACQUISITION AND VI CHASSIS REQUIREMENTS (9 Hrs)
Introduction to data acquisition on PC, Sampling fundamentals, Input/Output techniques and buses. ADC, DAC, Digital I/O, counters and timers, DMA, Software and hardware installation, Calibration, Resolution, Data acquisition interface requirements. Common Instrument Interfaces: Current loop, RS 232C/ RS485, GPIB. Bus Interfaces: USB, PCMCIA, VXI, SCSI, PCI, PXI, Firewire. PXI system controllers, Ethernet control of PXI. Networking basics for office and Industrial applications, VISA and IVI.

UNIT V VI TOOLSETS, DISTRIBUTED I/O MODULES (9 Hrs)
Application of Virtual Instrumentation: Instrument Control, Development of process database management system, Simulation of systems using VI, Development of Control system, Industrial Communication, Image acquisition and processing, Motion control.

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Textbooks

1. Bouwens, A.J., "Digital Instrumentation", McGraw Hill, 1984.
2. John Lenk, D., "Handbook of Micro computer based Instrumentation and Control", PHI, 1984.
3. Gary Johnson, LabVIEW Graphical Programming, Second edition, McGraw Hill, Newyork, 1997.
4. Lisa K. wells and Jeffrey Travis, LabVIEW for everyone, Prentice Hall, New Jersey, 1997.

References

1. Kevin James, PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control, Newnes, 2000.
2. Doebelin, 'Measurement System, Application and Design', IV Ed, McGraw-Hill, 1990.

Web Resources

1. https://www.ni.com/
2. https://www.youtube.com/user/Labview/playlists

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes(PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	2	-	2	2	-	-	-	2	3	3	2	1	2
2	3	3	3	-	3	2	-	-	-	2	3	3	1	1	2
3	3	2	3	-	3	2	-	-	-	3	2	3	1	1	3
4	2	3	2	-	2	2	-	-	-	3	2	3	2	1	3
5	3	2	3	-	2	2	-	-	-	2	2	2	2	1	3

Correlation Level: 1-Low, 2-Medium, 3- High

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U20ICE720	FIBER OPTICS AND LASER INSTRUMENTATION	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives
- To study in detail about optical fiber properties.
- To study in detail about optical fiber applications
- To study about lasers fundamentals and its properties.
- To study in detail about industrial applications of laser.
- To study about hologram and medical application of laser

Course Outcomes
After completion of the course, the students will be able to
CO1 - Understand the optical fiber and their properties **(K1)**
CO2 - Acquired knowledge of industrial application of optical fibres. **(K1)**
CO3 - Understand the laser fundamentals. **(K1)**
CO4 - Acquired knowledge of industrial application of lasers. **(K1, K2, K3)**
CO5 - Understand hologram and its medical applications. **(K1, K2, K3)**

UNIT I OPTICAL FIBRES AND THEIR PROPERTIES   (9 Hrs)
Principles of light propagation through a fibre - Different types of fibres and their properties, fibre characteristics -Absorption losses - Scattering losses - Dispersion - Connectors and Splices - Optical Sources - Optical detectors.

UNIT II INDUSTRIAL APPLICATIONS OF OPTICAL FIBRES   (9 Hrs)
Fibre Optic Sensors - Fibre Optic Instrumentation System – Electro optic, Acousto-optic and Travelling Wave Modulators - Interferometric Method of Measurement of Length – Moire fringes – Measurement of Pressure, Temperature, Current, Voltage, Liquid level and Strain.

UNIT III LASER FUNDAMENTALS   (9 Hrs)
Fundamental Characteristics of Lasers – Three level and Four level Lasers - Properties of Lasers - Laser Modes -Resonator Configuration – Q-Switching and Mode locking – Cavity dumping - Types of Lasers – Gas lasers, Solid lasers, Liquid lasers, Semiconductor lasers

UNIT IV INDUSTRIAL APPLICATIONS OF LASERS   (9 Hrs)
Laser for measurement of Distance, Length, Velocity, Acceleration, Current, Voltage and Atmospheric Effect - Material Processing - Laser heating,   Welding, Melting and Trimming of Material - Removal and Vaporization

UNIT V HOLOGRAM AND MEDICAL APPLICATIONS   (9 Hrs)
Holography - Basic Principle - Methods - Holographic interferometry and applications, Holography for non-destructive Testing - Medical Applications of Lasers, Lasers and Tissue interaction - Laser Instrumentations for surgery, Removal of Tumours of Vocal cords, Brain surgery, Plastic surgery.

Text Books
1. G.Keiser, Optical Fibre Communication, McGraw Hill, 2013.
2. Ajoyghatak K. Thyagarajan, Optical Electronics, Cambrige University Press, 2010.

Reference Books
1. J.M.Senior, OFC – Principles and Practice,PH1,2009
2. J.Wilson and J.F.Bhawkes, Introduction to Optical Electronics, PH1, 2001
3. Dr.Manjeet Singh, Lasers – Theory, Principles and Applications, VEI, Vayn Education India, 2011
4. Mr.Gupta, Fibre Optics Communication, PH1, 2004.

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5. R.P. Khare, —Fiber Optics and Optoelectronicsǁ, Oxford University Press, 2008.

Web References

1. https://nptel.ac.in/courses/108101093/
2. http://www.brainkart.com/subject/Fiber-optics-and-Laser-instruments_190
3. https://sites.google.com/site/smartice2015/my-forms/applied-soft-computing

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes(PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	-	2	-	-	-	-	2	-	3	2	1	2
2	3	3	3	-	3	-	-	-	-	2	-	3	1	1	2
3	3	2	3	-	3	-	-	-	-	3	-	3	1	1	3
4	2	3	2	-	2	-	-	-	-	3	-	3	2	1	3
5	3	2	3	-	2	-	-	-	-	2	-	2	2	1	3

Correlation Level: 1-Low, 2-Medium, 3- High

Annexure–III

(Employability Enhancement Course)

| U19CSO65 | **GRAPHICS DESIGNING** | L | T | P | C | Hrs |
| | (Common to EEE, ECE, ICE, CIVIL & BME) | 3 | 0 | 0 | 3 | 45 |

Course Objectives

- To develop basic skills using graphics and theory used in design process.
- Create computer-based projects using Adobe Photoshop.
- Understand, develop and employ visual hierarchy using images and text
- Use a computer to create and manipulate images and layers for use in various print and digital mediums.
- To acquire the knowledge of Animation

Course Outcomes
After the completion of the course, the students will be able to
CO1 – Develop the basic design elements of graphics. **(K3)**
CO2 – Apply the various photoshop tools. **(K3)**
CO3 – Modify the image size, selection and grids using tools. **(k3)**
CO4 – Create and Work with colored layers. **(K4)**
CO5 – Apply different methods for Animation & Panoramic Picture creation. **(K5)**

UNIT I BASIC CONCEPTS (9 Hrs)

Basic Concepts of Designing - Design Principles – Basics of design elements – Typography – Color theory - Introduction to Graphics - Introduction to Photoshop - Bitmap and Vector Images - Understanding Image Size and Resolution

UNIT II INTRODUCTION TO PHOTOSHOP (9 Hrs)
Introduction to Tools - Environment - layout of Photoshop - Design layout setup - color - resolution setting - using basic marquee - selection tools Usage of lasso tools - Using brushes - using and filling colors - layers Using text tool - free transform tool - Exercise: Designing Greeting card / Advertisement

UNIT III IMAGE SIZE, SELECTION, GRID AND GUIDES (9 Hrs)

Modifying Image Size - Resolution, Marquee - Lasso - Magic Wand - Selection Tools – Selecting – Saving - Crop tool - Coping Selection And Image - Grid and Guide Options – Masks – Channel - Painting and editing - Working with quick masks - Painting (Brush, and its effects) - Blending Modes, Color palettes – Editing - Background - Color - Touchup - Cleanup - Gradient tools - layer blending modes - all types of text tools - shape tools Exercise : Designing Magazine cover - Poster - Brochure

UNIT IV LAYERS (9 Hrs)
The layer Palette - Changing and controlling layer order - Editing layers - Adjustment layers - Layer Effects Filters - Actions - Automation - Extract - Filter Gallery - Liquefy , Pattern making - Vanishing point - Built in Bitmap Filters - 3rd party Plug-ins - Using predefined Actions - Creating and Recording Actions - Using built in automation - Learning Filter effects - managing the files with layers and layer effects - plugins Manipulation tools - Image control options – HUE - Levels - brightness control Using image – modifying - changing color Exercise : Converting black and white photo to color - designing a photo album

UNIT V ANIMATION & PANORAMIC PICTURE CREATION (9Hrs)
Creating product Packaging designs - CD cover - Book and magazine front cover - Envelope - Visiting card - Color correction and color channel management - Design automation theory and Practical's Samples and demos - guidelines for freelance work - website links - resource sharing - Preparing Image For Print and Web - Calculating Image size and Resolution, Changing Image Dimensions - Layout Preview - Color Separation - Optimizing Images for Web - File Formats - Creating Webpages - web photo galleries

Text Books
1. Adobe Creative Team, "Adobe Photoshop – Classroom in a Book", Adobe system incorporation, Adobe Press, 2010.
2. Katherine A.Hughes, "Graphic Design", Learn It,Do It,CRC Press 2019.

3. Ken Pender, "Digital color in Graphics Design", CRC Press 2012.

Reference Books
1. Mike Wooldridge , "Teach Yourself Visually Adobe Photoshop CS 5", Wiley Publishing , 2010
2. Lesa Snider, "Photoshop the missing Manual", O'Reilly Media, Inc, 2010.
3. Poppy Evans, Aaris Sherin, Irina Lee, "The Graphic Design", Rockport, 2013.
4. Peter Bauer, "Photoshop CC for Dummies", Wiley, 2013.
5. Scott Onstott, "Enhancing CAD Drawings with Photoshop", Wiley,2006

Web Resources
1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-831-user-interface-design-and-implementation-spring-2011/lecture-notes/MIT6_831S11_lec18.pdfhttp://www.moshplant.com/director/bezier/
2. https://www.cs.montana.edu/courses/spring2004/352/lectures/CS351-GUIDesign.pdf
3. https://www.university.youth4work.com/study-material/graphic-design-lecture
4. https://kmayeunhia.wordpress.com/lecture-notes/
5. https://nptel.ac.in/courses/106/106/106106090/

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	3	-	-	1	-	-	-	-	-	-	2	1	2
2	3	2	2	1	-	1	-	-	-	-	-	-	1	3	1
3	3	2	-	1	-	2	-	-	-	-	-	-	1	2	1
4	-	2	-	3	-	-	-	-	-	-	-	-	3	3	-
5	3	2	1	-	-	2	-	-	-	-	-	-	2	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 - High

U19ICS61	**SKILL DEVELOPMENT COURSE 7:**	L	T	P	C	Hrs
	Career and Professional Skill Development Program – I	0	0	2	-	30

1. BASIC APTITUDE & MATHEMATICAL SKILLS:

- Number System – Basics
- Number System – Advanced
- Surds & Indices
- Ratio & Proportion
- Problem On Ages & Partnership

2. APPLIED APTITUDE & MATHEMATICAL SKILLS:

- Average
- Alligations & Mixtures
- Profit & Loss, Discounts
- Percentage
- Time, Speed & Distance
- Problem On Trains
- Boats & Streams
- Time & Work
- Chain Rule
- Pipes & Cisterns
- Calendars

3. ENGINEERING APTITUDE SKILLS:

- Simple & Compound Interest
- Probability
- Permutation & Combination
- Mensuration
- Data Interpretation

Department of ICE-Fourth BoS Meeting

U19ICS62	SKILL DEVELOPMENT COURSE 8:	L	T	P	C	Hrs
	(Technical Seminar)	0	0	2	-	30

Course Objectives

- To encourage the students to study advanced engineering developments
- To prepare and present technical reports.
- To encourage the students to use various teaching aids such as over head projectors, power point presentation and demonstrative models.

Course Outcomes

After completion of the course, the students will be able to

CO1 - Review, prepare and present technological developments.

CO2 – Face the placement interviews.

Method of Evaluation:

- During the seminar session each student is expected to prepare and present a topic on engineering/technology, for duration of about 20minutes.
- In a session of three periods per week, 8 to10 students are expected to present the seminar.
- Each student is expected to present at least twice during the semester and the student is evaluated based on that.
- At the end of the semester, he /she can submit a report on his / her topic of seminar and marks are given based on the report.
- A Faculty guide is to be allotted and he/she will guide and monitor the progress of the student and maintain attendance also.
- Evaluation is 100%internal.Themarks attained for this course is not considered for CGPA calculation.

U19ICS63	SKILL DEVELOPMENT COURSE 9:	L	T	P	C	Hrs
	(NPTEL/MOOC-I)	0	0	2	-	30

Student should register online courses like MOOC/SWAYAM/NPTEL etc. approved by the Department committee comprising of HoD, Programme Academic Coordinator, Class advisor and Subject Experts. Students have to complete the relevant online courses successfully. The list of online courses is to be approved by Academic Council on the recommendation of HoD at the beginning of the semester if necessary, subject to ratification in the next Academic council meeting. The Committee will monitor the progress of the student and recommend the grade (100% Continuous Assessment pattern) based on the completion of course / marks secured in online examinations. The marks attained for this course is not considered for CGPA calculation.

U19ICM61	PROFESSIONAL ETHICS	L	T	P	C	Hrs
		2	0	0	-	30

Course Objectives

- To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moraland Social Values and Loyalty and to appreciate the rights of others.

Course Outcomes

After completion of the course, the students will be able to

Apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities andrights in the society

UNIT I HUMAN VALUES (6 Hrs)

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Livingpeacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT II ENGINEERING ETHICS (6 Hrs)

Senses of „Engineering Ethics" — Variety of moral issues — Types of inquiry — Moral dilemmas — Moral Autonomy – Kohlberg"s theory – Gilligan"s theory – Consensus and Controversy – Models of professional roles
- Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION (6 Hrs)

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A BalancedOutlook on Law.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS SAFETY (6 Hrs)

and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – Respect for Authority
– Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights –Employee Rights – Intellectual Property Rights (IPR) – Discrimination

UNIT V GLOBAL ISSUES (6 Hrs)

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development– Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Codeof Conduct — Corporate Social Responsibility

Reference Books

1. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi,2004.
3. Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.
4. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics – Concepts and Cases",Cengage Learning, 2009
5. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003
6. Edmund G Seebauer and Robert L Barry, "Fundametals of Ethics for Scientists and Engineers", OxfordUniversity Press, Oxford, 2001
7. Laura P. Hartman and Joe Desjardins, "Business Ethics: Decision Making for Personal

Web References

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org

U20ICS302	**SKILL DEVELOPMENT COURSE 2**	L	T	P	C	Hrs
	(Choose anyone of the below three courses)	0	0	2	-	30

1. TROUBLESHOOTING OF ELECTRONIC EQUIPMENTS

Course Content:
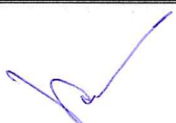
1. Reliability Aspects of Electronic Equipment.
2. Fundamental Troubleshooting Procedures.
3. Electronic Test Equipment.
4. Tools and Aids for Servicing and Maintenance.
5. PCB Testing and Soldering Techniques.
6. Power Supply and Subsystems Troubleshooting.
7. Mechanical and Electro-mechanical Components.
8. Passive Components and Their Testing.
9. Testing of Semiconductor Devices.
10. Troubleshooting Digital Circuits.
11. Troubleshooting Microprocessor-Based Systems.

Department of ICE-Fourth BoS Meeting

U20ICM303	PHYSICAL EDUCATION	L	T	P	C	Hrs
		0	0	2	-	30

Physical Education is compulsory for all the Undergraduate students and Pass in this course is mandatory for the award of degree. Physical Education activities will include games and sports/extension lectures. The student participation shall be for minimum period of 30 hours. Physical Education activities will be monitored by the Director of Physical Education. Pass/Fail will be determined on the basis of participation, attendance, performance and conduct. If a candidate fails, he/she has to repeat the course in the subsequent years.

Annexure–IV
(Academic calendar for the even semester (Jan 2022 to May 2022))

SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE

An Autonomous Institution

(Accredited by NBA-AICTE, New Delhi, NAAC with "A" Grade)

Madagadipet, Puducherry - 605 107

Academic Calendar

January 2022 to May 2022

Name :

Department :

Year / Sem : II Yr / III Sem & III Yr / VI Sem

திங்கள்

அன்பு செயபுரிநங்கள், பாருக்கும் அவலையானகாதிரிகள்;
இருக்கம் காட்டுங்கள், வெளிப்த்தும் ஏமாநிநுனிடாரிகள்;
பணிமெயர் போற்றுநங்கள், எந்த நிலையலேனும் கோலமைமையாகதிரிகள்;
கஷ்ணியபாக இருங்கள், எப்போனும் தேனம்பாடாரிகள்;
சிக்கனளாக வாழுநங்கள், கருமியபாக மாநாதிரிகள்;
வீரமாக இருங்கள், போளஷரிகவளாக மாநாதிரிகள்;
கருநுரியபாக இருங்கள், பநட்டம் அவடபாதிரிகள்;
பொருளைலாந் தேநிங்கள், பேரானசi படாரிகள்;
உலாழ்ல்லை நம்புநங்கள், உருய்பூநிநிகள்;
உல்லாலமலை நம்புநங்கள், உயர்வலைந்கிர்கள்

எல்லாம் நின்னமடி,
ஜ்ளிரங்கள்.

Online class

Period	Time
I hour	09.30a.m to 10.20a.m
Break	10.20a.m to 10.30a.m
II hour	10.30a.m to 11.20a.m
Break	11.20a.m to 11.30a.m
III hour	11.30a.m to 12.20p.m
IV hour	01.30p.m to 02.20p.m
Break	02.20p.m to 02.30p.m
V hour	02.30p.m to 03.20p.m
Break	03.20p.m to 03.30p.m
VI hour	03.30p.m to 04.20p.m

Lunch break 12.20 p.m. to 1.30 p.m.

Working hours — Regular class

Period	Time
I hour	09.00a.m to 09.50a.m
II hour	09.50a.m to 10.40a.m
Break	10.40a.m to 10.55a.m
III hour	10.55a.m to 11.45a.m
IV hour	11.45a.m to 12.35p.m
V hour	01.15p.m to 02.05p.m
VI hour	02.05a.m to 02.55p.m
VII hour	2.55 p.m to 03.45p.m
VIII hour	03.40p.m to 04.35p.m

Lunch break 12.35 p.m. to 1.15 p.m.

About Autonomous

Sri Manakula Vinayagar Engineering College has been conferred with Autonomous Status by the University Grants Commission on 26th September 2019 and the same was approved by Pondicherry University on 19th June 2020. SMVEC Autonomous Regulations R2019, will be followed for the students admitted in the Academic Year 2019-20 (present Third Year), SMVEC Autonomous Regulations R2020, will be followed for the students admitted from the Academic Year 2020-21 onwards (present first year & second year)

HIGHLIGHTS OF SMVEC AUTONOMOUS REGULATIONS 2019,2020 & CURRICULUM

❖ Industry 4.0 ready curriculum
❖ Curriculum towards skill development and to create more job opportunities
❖ Multidisciplinary curriculum
❖ Oriented towards entreprenurship development
❖ Choice to learn IELTS / Foreign Languages
❖ Department wise Gold Medals
❖ Results will be declared within a month after completion of examinations
❖ Supplementary Examination in 5th and 8th semester for the students having 2 arrears

❖ Ethnotech / Mandatory course
The Institute has Established 17 Center of Excellence to provide 75 International Certification courses from IBM, Google, Cisco, e Plan, Microsoft, Autodesk, Texas instruments, Festo, Bentley, Schneider Electric, Amazon web services, Siemens, Tally, DELL EMC², Harita Techserv, PTC, LN an Excellence in Technology & Didactic solutions. All students should enroll in certification course from semester-I to semester-VI.

❖ Industrial Training / Internship
Students may undergo training or internship during summer / winter vacation at Industry/ Research organization. Students are also permitted to undergo

2

Date	Day	June 2022 Schedule	Working day/ Holiday
1	Wed		
2	Thu		
3	Fri		
4	Sat		
5	Sun		Holiday
6	Mon		
7	Tue		
8	Wed		
9	Thu		
10	Fri		
11	Sat		
12	Sun		Holiday
13	Mon		
14	Tue		
15	Wed		
16	Thu		
17	Fri		
18	Sat		
19	Sun		Holiday
20	Mon		
21	Tue		
22	Wed		
23	Thu		
24	Fri		
25	Sat		
26	Sun		Holiday
27	Mon		
28	Tue		
29	Wed		
30	Thu		
		Total number of working days : -	
		Total number of holiday : -	

நீ வெற்றியடைவதைவிடை உன்னைத் தளிர், வேறு யாராலும் தடுக்க முடியாது – பெரியார்

April 2022

Date	Day	Schedule	Working day/Holiday
1	Fri		60
2	Sat		61
3	Sun		Holiday
4	Mon		62
5	Tue		63
6	Wed	Assignment – III	64
7	Thu	Feedback from the students & Analysis	65
8	Fri	QCM meeting - 3	66
9	Sat		67
10	Sun		Holiday
11	Mon	Model for II, III Year (5 units)	68
12	Tue		69
13	Wed		70
14	Thu	Tamil New Year	Holiday
15	Fri	Good Friday	Holiday
16	Sat		71
17	Sun		Holiday
18	Mon		72
19	Tue		73
20	Wed		74
21	Thu	Last working day for II, III Year	75
22	Fri	Model Result Analysis & Report Submission	
23	Sat	Submission of Attendance & Assessment - Term III	
24	Sun		Holiday
25	Mon	Tentative End Semester practical examination starts	
26	Tue		
27	Wed		
28	Thu		
29	Fri		
30	Sat	Tentative End Semester practical examination ends	

Total number of working days : 16
Total number of holiday : 6

வெற்றி என்பது, லட்சியத்தில் பழிபடியாகப் புரிந்து கொள்வது – குறட்டுங்கள்

Marks Distribution of Continuous Assessment Marks (CAM) and End Semester Examination Marks (ESM)

Scheme for Continuous Assessment Test(CAT)

S. No	Course Type	Test Marks	Average of pre/post test/ viva for each experiment	Average of marks for each experiment report for experiment	Model Exam / Report	Assignment	Review – 1	Review – 2	Review – 3	Attendance	Total
			Continues Assessment components								
1.	Theory	15	-	-	-	5	-	-	-	5	25
2	Practical	-	10	15	15	-	-	-	-	10	50
3.	Project work	-	-	-	-	-	10	10	20	-	40

The internal marks will be provided fully based on the continuous assessment tests (CAT 1 to 4)

Weightage of Assessment for Theory Course

S. No.	Test	Portion for Test	Test Marks	Duration of Test	Weightage for Internal
1	CAT 1	1½ Units	50	1 ½ hours	10
2	CAT 2	1½ Units	50	1 ½ hours	05
3	Model	5 Units	75	3 hours	15
		Continuous Assessment for Theory Course			

Question Paper Pattern

Question paper for CAT and ESE will be based on the patterns shown in Table (a) and (b)

Table (a) Question Paper pattern for CAT/Model Exam

Test Type	2 Marks	5 Marks	10 Marks	Total Marks
CAT 1 to 2	5(questions) (10 Marks)	4(questions) (20 Marks)	2 (questions) (20 Marks)	50
Model	End semester Examination Question Pattern			75

Table (b) Question paper pattern for End semester Examination(ESE)

2 Marks	5 Marks	10 Marks	Total Marks
10(20 Marks)	5 (25 Marks) (one questions from each unit)	3 (30 Marks) (out of 5 questions)	75

May 2022

Date	Day	Schedule	Working day/Holiday
1	Sun	Study holidays starts	Holiday
2	Mon		
3	Tue	Ramzan	Holiday
4	Wed		
5	Thu		
6	Fri		
7	Sat		
8	Sun	Study Holidays Ends	
9	Mon	Tentative End Semester Theory examination Starts	Holiday
10	Tue		
11	Wed		
12	Thu		
13	Fri		
14	Sat		
15	Sun		Holiday
16	Mon		
17	Tue		
18	Wed		
19	Thu		
20	Fri		
21	Sat	Tentative End Semester Theory examination ends	
22	Sun		Holiday
23	Mon		
24	Tue		
25	Wed	Tentative Commencement of next semester classes	
26	Thu		
27	Fri		
28	Sat		
29	Sun		Holiday
30	Mon		
31	Tue		

Total number of working days : -

Total number of holiday : -

நீ வெற்றியனடைவதை உலகனத் தமிழ், வேறு யாராலும் தடுக்க முடியாது – பாரதி

❖ **Supplementary Examinations**

Supplementary examination is an additional examination conducted within a month of time after declaring the results of end semester examination. In order to complete the program within 4 years, only the student with maximum of two arrears will be permitted to appear for supplementary examination. The supplementary examination will be conducted in fifth and eighth semester only. For supplementary examination, the continuous assessment marks of the last attempt will be considered.

Benefits

❖ More number of students will receive the degree within the stipulated time

❖ The industries prefers to recruit students with no standing arrear. If the supplementary examinations is conducted then more number of students will be eligible for the recruitment

❖ **Photo copy of answer book**

After the publication of the result, photocopy of the answer books shall be provided to the student on request with stipulated fee fixed by the College from time to time

Punctuality in Attendance

The students are requested to keep up punctuality in attending the college. The late comers will be losing their attendance and in turn the internal marks. Hence all the students are requested to attend the college in time. A student shall be permitted to appear for the End Semester Examination at the end of the semester only if he / she **secures not less than 75% of overall attendance.**

Redo Category

A student who secures overall attendance which is less than 60% has to repeat the course with the approval, when it is next offered.

Tutor Ward System

In the tutor ward system, 30 students are allotted to a tutor who will be taking care of these students. The students are requested to utilize the facility.

February 2022

Date	Day	Schedule	Working day/Holiday
1	Tue		9
2	Wed		10
3	Thu		11
4	Fri		12
5	Sat		13
6	Sun		Holiday
7	Mon		14
8	Tue		15
9	Wed	Assignment – I	16
10	Thu	Feedback from the students & Analysis	17
11	Fri	QCM meeting – 1	18
12	Sat		19
13	Sun		Holiday
14	Mon	CAT-I for II, III Year & IV Year (1 ½ units)	20
15	Tue		21
16	Wed		22
17	Thu		23
18	Fri		24
19	Sat		25
20	Sun		Holiday
21	Mon	CAT-I Result Analysis & Report Submission	26
22	Tue		27
23	Wed	Submission of Attendance & Assessment - Term I	28
24	Thu		29
25	Fri		30
26	Sat		31
27	Sun		Holiday
28	Mon		32

Total number of working days : 24
Total number of holiday : 04

அன்றாட வாழ்வின் சாதாரண விஷயங்களையும், அசாதாரண முறையில் செய்யும்போது
உலகின் கவனத்தை உன் மீது திரும்ப முடியும்.   - ஜார்ஜ்வாஷிங்டன்கார்வர்

Importance of Continuous Assessment Marks(CAM)

The continuous assessment marks once earned are carried over to the subsequent exams also. Hence the students are requested to work hard to get the maximum continous assessment marks. If the continuous assessment marks are lower, it will pull down chances of getting the first class, distinction, gold medals and ranks.

Importance of CAT-I/CAT-II/ Model Examination

Continuous assessment marks are awarded for the performance in the CAT-I, CAT-II & Model Exam, Hence all the students are requested to prepare well for each test / examination to earn the maximum continuous assessment marks.

Undertaking Minor / Major Projects

Each student is advised to take atleast one minor project. Involving in the project will be helping to understand the basics of the subject. Some of the minor / major project will also be benefiting the society. Moreover, the Management awards cash prizes for the best projects in each department.

Participation in the Curricular / Co-curricular / Extra curricular Activities

All the students are encouraged to participate in the curricular / co-curricular / extra curricular activities. Involvement in these activities will improve their knowledge level in the subject. If a student or a team gets cash prize / award in the technical event organized by the recognised institutions, then the management of this institution will also sanction an amount equivalent to the winning award / cash prize as a token of appreciation.

Leave Account Record

For each student, leave account record has been provided. The students are instructed to show the leave record to their parents and strictly adhere to the instructions given for availing the leave. The leave account record should be maintained properly and prior approval must be obtained for availing the leave. In exceptional cases, the students are permitted to get the approval after availing the leave.

Transport Facility

61 buses have been arranged for the students to reach the college from Puducherry, Kanagachettikulam, Villupuram, Neyveli, Panruti, Cuddalore, Nellikuppam, Madukarai, Tindivanam, Tiruvannamalai and virudhachalam covering almost all the areas. Separate transport facility has been arranged for the students who remain in the college after 5 p.m. for utilising computer lab, library and sports facilities. The students are requested to utilise the transport facility.

All the students are requested to avoid mobile phones and travel by two wheelers considering their safety and security.

March 2022

Date	Day	Schedule	Working day/ Holiday
1	Tue		33
2	Wed		34
3	Thu		35
4	Fri		36
5	Sat		37
6	Sun		Holiday
7	Mon		38
8	Tue		39
9	Wed	Assignment -II	40
10	Thu	Feedback from the students & Analysis	41
11	Fri	QCM meeting - 2	42
12	Sat		43
13	Sun		Holiday
14	Mon	CAT-II for II, III Year (1 ½ units)	44
15	Tue		45
16	Wed		46
17	Thu		47
18	Fri		48
19	Sat		49
20	Sun		Holiday
21	Mon	CAT-II Result Analysis & Report Submission	50
22	Tue	Submission of Attendance & Assessment - Term II	51
23	Wed		52
24	Thu		53
25	Fri		54
26	Sat		55
27	Sun		Holiday
28	Mon		56
29	Tue		57
30	Wed		58
31	Thu		59

Total number of working days : 27
Total number of holiday : 04

சனிக்கிழமைகள் ஒவ்வொரு வாரத்திலும் உள்ள ஆய்வகத்தை பார்க்கிறான்.
சனிதினங்கள் ஒவ்வொரு ஆய்வித்தும் உள்ள வாய்ப்பினைகளா பார்க்கிறான்.

Distribution of Attendance marks for theory : 5 marks

The distribution of 5 marks for theory class attendance is as follows :

5 marks for 95% attendance and above
4 marks for 90% attendance and above but below 95%
3 marks for 85% attendance and above but below 90%
2 marks for 80% attendance and above but below 85%
1 mark for 75% attendance and above but below 80%

Distribution of Attendance marks for practical : 10 marks

The distribution of 10 marks for practical class attendance is as follows :

10 marks for 95% attendance and above
8 marks for 90% attendance and above but below 95%
6 marks for 85% attendance and above but below 90%
4 marks for 80% attendance and above but below 85%
2 marks for 75% attendance and above but below 80%

Note :

Students should not be absent for the online classes/regular classes. Attendance for the online classes/regular classes are monitored regularly and it is recorded. Continuous assessment mark will be based on the performance of the students in the continuous assessment test, assignment and attendance percentage.

Assignments : 5 marks

Out of 25 continuous assessement marks, 5 marks will be awarded for the assignment. The assignment questions will be different for each and every student. The students have to submit 3 assignments in each subject. Best of 2 out of 3 assignments will be consider.

Important points for the kind attention of the Parents

Dear Parent

The III and VI semester classes commences on 21st January 2022. The above mentioned semester is a very short term, including working days meant for model exam. The students have to complete a lot of work within a short period. **Hence the parents are kindly requested not to permit their wards to avail frequent leave during this semester period for the following reasons.**

VI Semester (III Year), III Semester (II Year) : All the VI & III semester papers are considered as problematic (toughest) papers. Hence, regular attendance and more concentration are required to clear these semester papers.

Marks in the **continuous assessment test** decide the major part of the continuous assessment marks. So, availing leave for the continuous assessment test must be avoided at any cost as this would seriously affect the continuous assessment marks.

Practicals are very important not only to score more marks but also it will help to understand the theory part of the subject, hence advice your ward not to avail leaves during practical classes.

Please spare your valuable time to talk to your son/daughter every day **and try to understand what he/she is doing in respect of his/her studies.** Kindly extend all your support to your son/daughter which will help them to come out successfully. For any assistance from our side you may always feel free to contact the respective Coordinator / HOD any time during the working hours.

Gold Medals and Top Ten Ranks

Your seniors were sincere, hard working and got the Gold medals of the Pondicherry University and the top ten ranks in all the branches. The details of the University Goldmedals and Top Ten Ranks won by the students are given below.

Indicates the Gold medal and University First Rank.

For the Award of Gold Medal and ranks for each branch of study, the CGPA secured from 1st to 8th semester alone should be considered and it is mandatory that the candidate should have passed all the subjects from 1st to 8th semester in the first attempt. Rank certificates would be issued to the first five candidates in each branch of study.

Name of the Course	Year		
	2017	2018	2019
B.Tech EEE	2, 4, 6, 7		2,3,4,6,7,8,9,10
B.Tech ECE	2,3,4,5,6,7,8,9,10		3,4,5,6,7,9,10
B.Tech CSE	,2, 3, 4, 10		2,4,6,7,8,10
B.Tech IT	,2,3,4,5,6,7,8,9,10		2,3,5,6,8
B.Tech ICE	,2,3,4,5,6,7,8,9,10		2,3,4,5,6,7,8,9,10
B.Tech Mech	,4, 5, 7, 9, 10		3,7,8,10
B.Tech Civil	2, 3, 10		2,3,4,6,7,10
MCA	3, 4,7,9,10		2,6,7,8,9,10,11
MBA	,3,4,6,7,8		2,3,4,5,7,8,10
M.Tech CSE	2, 3, 4, 5, 7, 8, 9		,7
M.Tech ECE	2, 3, 6, 7, 8, 9		2,3,4,5
M.Tech PED			,2,3
M.Tech NW	2, 3, 4, 5, 7, 8, 9		,2,3
M.Tech(VLSI)			,2,3,4
M.Tech(MF)	,2		

January 2022

Date	Day	Schedule	Working day/ Holiday
1	Sat		
2	Sun		Holiday
3	Mon		
4	Tue		
5	Wed		
6	Thu		
7	Fri		
8	Sat		
9	Sun		Holiday
10	Mon		
11	Tue		
12	Wed		
13	Thu	Bogi Festival	Holiday
14	Fri	pongal	Holiday
15	Sat	Thiruvalluvar Day	Holiday
16	Sun	Uzhavar Thiruna	Holiday
17	Mon		
18	Tue		
19	Wed		
20	Thu		
21	Fri	Commencement of III & VI semester classes	1
22	Sat		2
23	Sun		Holiday
24	Mon		3
25	Tue		4
26	Wed	Republic day	Holiday
27	Thu		5
28	Fri		6
29	Sat		7
30	Sun		Holiday
31	Mon		8

Total number of working days : 08
Total number of holiday :03

நமராத இதயம் உள்ளவனுக்கு, இவ்வுலகில் பழுதாது என்று எதுவும் இல்லை
– புத்தன்

Placement and Training Division

The placement cell functions round the clock throughout the year to establish contact with reputed multinational companies, well established industrial organizations and plays an important role by providing training to the students for various job opportunities and placing large number of the students every year at these organizations.

Activities of the Training Division

✤ Arranges trainings for personality and interpersonal skill development.
✤ Assists the students to get in-plant training
✤ Arranges industrial visits
✤ Creates awareness on the opportunities open for higher studies.
✤ Arranges coaching classes for GATE, GRE, TOFEL, IELTS, IAS, IES etc.

Placement Record

Academic Year	Students Placed
2013-14	85%
2014-15	95%
2015-16	95%
2016-17	93%
2017-18	95%
2018-19	95%
2019-20	95%
2020-21	96%

Details of Placed Students : 2021 - 22

KAAR Technologies	27	DataMatrix	2
Virtusa	14	MicroChip Technologies	1
ZOHO	13	Oppo	2
TCS	146	Secure Cloud	6
Unisys	11	Support Studio	4
CTS	230		
Zucpi	1		
Embedur	1		
Econ	1		
Wipro	123		
Musigma	46	**Total**	*625

* till January 2022

Wi-Fi Campus

Our campus has been enabled by high speed uninterrupted Wi-Fi connectivity. The Computer Centre is open till 8.00 p.m. on all the working days except on the dates of University examinations.

Library Working Hours

8.30 a.m. to 8.30 p.m. (On all the working days)
8.30 a.m. to 10.00 p.m. (During the examination days)

Women Cell

For the benefit of the girl students, a Women Cell has been constituted in the college. The girl students may approach the Chairperson / members for assistance.

Grievance Redressal Cell

There is a Grievance Redressal Cell under the Chairmanship of the Director of the institution. Students are requested to approach the Chairman / members to redress their grievances. Mail ID : grievance@smvec.ac.in

SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE

An Autonomous Institution

(Accredited by NBA-AICTE, New Delhi, NAAC with "A" Grade)

Madagadipet, Puducherry - 605 107

Academic Calendar

January 2022 to May 2022

Name   :

Department   :

Year / Sem   : IV Yr / VIII Sem

நிபந்தனைகள்

அங்காசெயபாடுகள், பாடுக்கும் அஷ்வைபாகாதிரகள்;
இரக்கம் காட்டுங்கள், சுயாம் தரும் ஏவாந்துவிடரதிரகள்;
பணிவிலை போற்றுங்கள், எந்த நிலையிலும் கேவலையுமாகாதிரகள்;
கவலையைக் இருங்கள், எப்போதும் கேவாப்பட மாதிரகள்;
சிக்கனமாக வாழுங்கள், கருமியாக மாறாதிரகள்;
வீரமாக இருங்கள், போலிக்கிலைவார மாறாதிரகள்;
சுறுசுறுப்பாக இருங்கள், படாடம் அலை யாதிரகள்;
பொருவதை தேடுங்கள், பேராசைப்பட ஆதிரகள்;
உழைப்பை நம்புங்கள், உஷ்யறிகிஷ்கள்;
உண்மையை நம்புங்கள், உபாலை வீஷ்கள்

எங்கும் தமிழ் நல
இருங்கள்

Use of Cell Phones

It has been decided **not to permit cell phones inside the college campus**. If any student is found using the cell phone inside the college campus, it would be confiscated and will not be returned back on any circumstances. Hence the students are instructed not to attend the college with the mobile phones.

Dress Code

The students are requested to attend the college neatly dressed. While the male students should attend the college with the shirts neatly tucked in and with the shoes, the female students are permitted to come with churidar and dupatta properly pined. Students wearing full hand shirts should wear it as such without folding it to half etc. Casual wears like jeans, T-shirts etc., both for boys and girls are strictly prohibited inside the campus. Each department has prescribed uniforms for the labs. The students are requested to strictly adhere to the dress codes as well as the rules and regulations of the college.

Maintenance of Discipline

Discipline is an important factor that shapes one's personality. It is considered as a golden key capable of opening many doors. This institution expects each and every student to follow the rules and regulations in total. Maintaining discipline in the campus will promote a conducive environment for studies.

Online class			Working hours		Regular class		
I hour	09.30 a.m to	10.20 a.m	I hour	09.00 a.m to	09.50 a.m		
Break	10.20 a.m to	10.30 a.m	II hour	09.50 a.m to	10.40 a.m		
II hour	10.30 a.m to	11.20 a.m	Break	10.40 a.m to	10.55 a.m		
Break	11.20 a.m to	11.30 a.m	III hour	10.55 a.m to	11.45 a.m		
III hour	11.30 a.m to	12.20 p.m	IV hour	11.45 a.m to	12.35 p.m		
IV hour	01.30 p.m to	02.20 p.m	V hour	01.15 p.m to	02.05 p.m		
Break	02.20 p.m to	02.30 p.m	VI hour	02.05 a.m to	02.55 p.m		
V hour	02.30 p.m to	03.20 p.m	VII hour	2.55 p.m to	03.45 p.m		
Break	03.20 p.m to	03.30 p.m	VIII hour	03.40 p.m to	04.35 p.m		
VI hour	03.30 p.m to	04.20 p.m					
Lunch break 12.20 p.m. to 1.30 p.m.			Lunch break 12.35 p.m. to 1.15 p.m.				

About Autonomous

Sri Manakula Vinayagar Engineering College has been conferred with Autonomous Status by the University Grants Commission on 26th September 2019 and the same was approved by Pondicherry University on 19th June 2020. The Pondicherry University Regulations R2013 will be followed for the students admitted in the Academic Year 2018-19 (present Final year).

End semester examinations process i.e. question paper setting, answer script evaluation and result will be published by SMVEC College.

Punctuality in Attendance

The students are requested to keep up punctuality in attending the college. The late comers will be losing their attendance and in turn the internal marks. Hence all the students are requested to attend the college in time. A student shall be permitted to appear for the End Semester Examination at the end of the semester only if he/she **secures not less than 75% of overall attendance.**

Repeating the Course

A student who secures overall attendance which is less than 60% has to repeat the course with the approval of the University when it is next offered.

Tutor Ward System

In the tutor ward system, 30 students are allotted to a tutor who will be taking care of these students. The students are requested to utilize the facility.

Continuous Assessment Marks for Theory : 25 Marks

25 marks are allotted for continuous assessment for a theory paper. Out of 25 marks 20 marks are awarded for the continuous assessment tests based on the performance of the student in the CAT-I, II & III and the remaining five marks are awarded for class attendance. The distribution of 5 marks for class attendance and the details of distribution of 25 marks for continuous assessment are as follows:

CAT I, II & Model	20	marks
Attendance	5	marks
Total	25	marks

Best Two out of three test

5 marks for 95% attendance and above
4 marks for 90% attendance and above but below 95%
3 marks for 85% attendance and above but below 90%
2 marks for 80% attendance and above but below 85%
1 mark for 75% attendance and above but below 80%

Continuous Assessment Marks for Practical : 50 Marks

For a practical subject, where there is a end semester examination, 50 marks for external examination and 50 marks for continuous assessment are allocated. The distribution of 50 marks for Continuous assessment is as follows :

For practical class attendance	10	marks
For Model Exam/Report	15	marks
For average of marks for experiment report for each exp.	15	marks
For average of Pre/post-test/viva for each experiment	10	marks
Total	50	marks

Distribution of Attendance marks for theory : 5 marks

The distribution of 5 marks for theory class attendance is as follows :

5 marks for 95% attendance and above
4 marks for 90% attendance and above but below 95%
3 marks for 85% attendance and above but below 90%
2 marks for 80% attendance and above but below 85%
1 mark for 75% attendance and above but below 80%

Distribution of Attendance marks for practical : 10 marks

The distribution of 10 marks for practical class attendance is as follows :

10 marks for 95% attendance and above
8 marks for 90% attendance and above but below 95%
6 marks for 85% attendance and above but below 90%
4 marks for 80% attendance and above but below 85%
2 marks for 75% attendance and above but below 80%

Note :

Students should not be absent for the online classes/regular classes. Attendance for the online classes/regular classes are monitored regularly and it is recorded. Continuous assessment mark will be based on the performance of the students in the continuous assessment test, assignment and attendance percentage.

Assignments : 5 marks

Out of 25 continuous assessement marks, 5 marks will be awarded for the assignment. The assignment questions will be different for each and every student. The students have to submit 3 assignments in each subject. Best of 2 out of 3 assignments will be consider.

January 2022

Date	Day	Schedule	Working day/ Holiday
1	Sat		
2	Sun		
3	Mon		Holiday
4	Tue		
5	Wed		
6	Thu		
7	Fri		
8	Sat		
9	Sun		Holiday
10	Mon		
11	Tue		
12	Wed		
13	Thu	Bogi Festival	Holiday
14	Fri	pongal	Holiday
15	Sat	Thiruvalluvar Day	Holiday
16	Sun	Uzhavar Thiruna	Holiday
17	Mon		
18	Tue		
19	Wed		
20	Thu		
21	Fri		
22	Sat		
23	Sun		Holiday
24	Mon	Commencement of VIII semester classes	1
25	Tue		2
26	Wed	Republic day	Holiday
27	Thu		3
28	Fri		4
29	Sat		Holiday
30	Sun		Holiday
31	Mon		5

Total number of working days : 05
Total number of holiday :03

நமது இதயம் உணர்வதற்கு, இவ்வுலகில் முழுவது எது என்று எழுதுவதும் இல்லை
– புத்தகம்

February 2022

Date	Day	Schedule	Working day/ Holiday
1	Tue		6
2	Wed		7
3	Thu		8
4	Fri		9
5	Sat		Holiday
6	Sun		Holiday
7	Mon		10
8	Tue		11
9	Wed		12
10	Thu	Feedback from the students & Analysis (IV Year)	13
11	Fri	QCM meeting - 1 (IV Year) Phase II Zeroth review	14
12	Sat		Holiday
13	Sun		Holiday
14	Mon	CAT-I for Year & IV Year (1 ½ units)	15
15	Tue		16
16	Wed		17
17	Thu		18
18	Fri		19
19	Sat		Holiday
20	Sun		Holiday
21	Mon	CAT-I Result Analysis & Report Submission	20
22	Tue		21
23	Wed	Submission of Attendance & Assessment - Term I	22
24	Thu		23
25	Fri		24
26	Sat		Holiday
27	Sun		Holiday
28	Mon		25

Total number of working days : 24
Total number of holiday : 04

அன்றாட வாழ்வின் எதிர்பாலா விவகாரங்களையும், அதைத்தொடர்ந்த நிகழ்வில் செய்யும்போது உலகின் கவனத்தை உன் மீது திரும்ப வைக்கும்.
– ஜார்ஜ்வாஷிங்டன்கார்வெர்

Annexure–V

(Details of Examiners for Question Paper Setter and Evaluators)

SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE
(An Autonomous Institution)
(Approved by AICTE, New Delhi & Affiliated to Pondicherry University)
(Accredited by NBA-AICTE, New Delhi, ISO 9001:2000 Certified Institution &
Accredited by NAAC with "A" Grade)
Madagadipet, Puducherry - 605 107

DEPARTMENTOF INSTRUMENTATIONANDCONTROLENGINEERING

DETAILS OF EXAMINERS FOR QUESTION PAPER SETTER AND EVALUATORS

Sl.No	Name of the Examiner	Specialization	Designation, Department and Institution in which currently working	Contact number and mail id
1	Dr. G. Sakthivel	Embedded System, Process Control	Professor, Department of EIE, Annamalai university. Chidambaram-608401	9443270714 gsauei@gmail.com
2	Dr. S. Mourouga Prakash	Process Control	Asst prof/ EIE Pondicherry Engineering College	9894463366 smpragash@pec.edu
3	Dr. M. Manivannan	Process Control and Instrumentation	Department of EIE, Annamalai university. Chidambaram-608401	9442646555 Manivannan1978@gmail.com
4	Dr. P. A. Sridhar	Biomedical Instrumentation	Assistant Professor, Department of Electronics & Instrumentation Engineering, Kattankulathur Campus, SRM Institute of Science and Technology	7598227170 sridhara1@srmist.edu.in
5	Dr. Palanivel	Process Control, Transducer and Measurements	Associate Professor Dept of E&I Annamalai university, Annamalai Nagar, Chidambaram	9842565026 S_palanivel@yahoo.com
6	Dr.M. Jagannath	Biomedical Instrumentation	Assoc. Prof, School of Electronic Engineering, VIT, Chennai-600127	9884386262 jagan.faith@gmail.com
7	Dr.A. Saraswathi	Drives and Control	Assistant Professor / HOD University college of engineering, Villupuram-605103	9994549910 saraswathiask@gmail.com
8	Dr.P. Shanmugaraja	Medical Electronics Embedded Systems	Department of EIE Annamalai university. Chidambaram-608401.	9443275120 psraja70@gmail.com

9	Dr.S. Yazhinian	VLSI	Assoc. Prof/ECE /Sri Venkateshwara Engineering College and Technology	9751112057 yazhinian.s@gmail.com
10	Dr.P.Vijayakumar	Wireless Networks and Communications	Associate Professor, School of Electronics Engineering, Vellore Institute of Technology, Melakottaiyur, Chennai–600127	9894727271 vijayrgcet@gmail.com
11	Dr. D. Palani.	Image Processing	Assistant professor/dept of ECE. University college of engineering, Villupuram - 605103	8667377226 palani.dinesh@gmail.com
12	Dr. M. Phemina Selvi	Electronics and Communications	Assistant professor/dept of ECE. University college of engineering, Villupuram - 605103	9994267707 vm.femina@gmail.com
13	Dr.V.Devarajan	Wireless Communication	Professor & Head Department of ECE Dhanalakshmi Srinivasan College of Engineering and Technology, Mamallapuram.	9894040479 devarajan@live.fr
14	Dr.B.Karthik	Embedded System	Associate Professor, Department of ECE, Bharath Institute of Higher Education and Research. Chennai.	9842580740 karthikguru33@gmail.com
15	Dr.V.Ganesan	Electronics Circuits	Associate Professor, Department of ECE, Bharath University. Chennai.	9443723032 vganesh1711@gmail.com
16	Dr.A.Ashokan	Electronics Circuits	Department of ECE Government College of Engineering, Thanjavur.	9150376648