Dr. Vasantraodada Patil Shetkari Shikshan Mandal's

Padmabhooshan Vasantraodada Patil Institute of Technology,
Budhgaon, Sangli (MS) – 416304

(An Autonomous Institute)

Affiliated to

Dr. Babasaheb Ambedkar Technological University,
Lonere, Raigad

(Accredited by NAAC)

Department of Instrumentation and Control Engineering

Curriculum for Second Year Undergraduate Degree Programme

B. Tech. in Instrumentation and Control Engineering

In accordance with National Education Policy (NEP – 2020)

w. e. f.
Academic Year: 2026-27

Dr. Vasantraodada Patil Shetkari Shikshan Mandal's

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Department of Instrumentation and Control Engineering

Curriculum Structure and Evaluation Scheme

(Academic Year 2026-27 Onwards)

S.Y. B. Tech Semester III Instrumentation and Control Engineering

Course Code	Course Name	Teaching Scheme				Evaluation Scheme					TOTAL
							Theory		Practical		
		L	T	P	Credit	Scheme	Max	Minimum Marks for Passing	Max	Minimum Marks for Passing	
0ICESC201	Numerical Computational Methods	3	1	0	4	ISE 1	10	40*	-	-	100
						MSE	20				
						ISE 2	10				
						ESE	60				
0ICPCC202	Sensors and Transducers	3	0	0	3	ISE 1	10	40*	-	-	100
						MSE	20				
						ISE 2	10				
						ESE	60				
0ICPCC203	Analog Electronics	3	0	0	3	ISE 1	10	40*	-	-	100
						MSE	20				
						ISE 2	10				
						ESE	60				
0ICPCC204	Network Theory	3	0	0	3	ISE 1	10	40*	-	-	100
						MSE	20				
						ISE 2	10				
						ESE	60				
0ICMDM205	MDM -I	3	0	0	3	ISE 1	10	40*	-	-	100
						MSE	20				
						ISE 2	10				
						ESE	60				
0ICVEC206	Environmental studies	2	0	0	2	ISE	50	20	-	-	50
0ICHSSM207	Principles of Management	2	0	0	2	ISE	50	20	-	-	50
0ICPCC208	Sensors and Transducer Lab	0	0	2	1	ISE	-	-	50	20	50
						ESE	-	-	50	20	50
0ICPCC209	Analog Electronics Lab	0	0	2	1	ISE	-	-	50	20	50
						ESE			50	20	50
0ICCEP210	CEP	0	0	2	1	ISE	-	-	50	20	50
TOTAL		**19**	**1**	**6**	**23**	**TOTAL MARKS**					**850**
Total Contact Hours Per Week		**26**									

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Course Category	BSC	ESC	PCC	PEC	MDM	OE	VSEC	AEC	HSSM	IKS	VEC	RM	CEP	PR	OJT	CC	Total
Credit	-	4	11		3	-	-	-	2	-	2	-	1	-	-	-	23
Cumulative	**16**	**19**	**11**	**-**	**3**	**-**	**3**	**3**	**2**	**2**	**2**	**-**	**1**	**-**	**-**	**1**	**63**

Multidisciplinary Minor offered by Instrumentation and Control Engineering

MDM-I (SEM – III)	0ICMDM205	Measuring Instruments

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Department of Instrumentation and Control Engineering

Curriculum Structure and Evaluation Scheme

(Academic Year 2026-27 Onwards)

S.Y. B. Tech Semester IV Instrumentation and Control Engineering

Course Code	Course Name	Teaching Scheme				Evaluation Scheme					Total
							Theory		Practical		
		L	T	P	Credit	Scheme	Max	Minimum Marks for Passing	Max	Minimum Marks for Passing	
0ICPCC251	Feedback Control System	3	1	0	4	ISE 1	10	40*	-	-	100
						MSE	20				
						ISE 2	10				
						ESE	60				
0ICPCC252	Electrical and Electronics Measurement	3	0	0	3	ISE 1	10	40*	-	-	100
						MSE	20				
						ISE 2	10				
						ESE	60				
0ICPCC253	Digital Electronics	3	0	0	3	ISE 1	10	40*	-	-	100
						MSE	20				
						ISE 2	10				
						ESE	60				
0ICPCC254	Field Instruments	3	0	0	3	ISE 1	10	40*	-	-	100
						MSE	20				
						ISE 2	10				
						ESE	60				
0ICMDM255	MDM -II	3	0	0	3	ISE 1	10	40*	-	-	100
						MSE	20				
						ISE 2	10				
						ESE	60				
0ICOE256	Open Elective -I	2	0	0	2	ISE	50	20	-	-	50
0ICAEC257	Soft Skills	0	0	2	1	ISE	25	10	-	-	25
0ICVEC258	Universal Human Values	2	0	0	2	ISE	50	20	-	-	50
0ICVSEC 259	Computational Lab	0	0	2	1	ISE	-	-	25	10	25
0ICPCC260	Field Instruments Lab	0	0	2	1	ISE	-	-	50	20	50
						ESE	-	-	50	20	50
0ICPCC261	Digital Electronics Lab	0	0	2	1	ISE	-	-	50	20	50
						ESE	-	-	50	20	50
TOTAL		**19**	**1**	**8**	**24**	**TOTAL MARKS**					**850**
Total Contact Hours Per Week		**28**									

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Course Category	BSC	ESC	PCC	PEC	MDM	OE	VSEC	AEC	HSSM	IKS	VEC	RM	CEP	PR	OJT	CC	Total
Credit	-	-	15	-	3	2	1	1	-	-	2	-	-	-	-	-	24
Cumulative	**16**	**19**	**26**	**-**	**6**	**2**	**4**	**4**	**2**	**2**	**4**	**-**	**1**	**-**	**-**	**1**	**87**

Multidisciplinary Minor offered by Instrumentation and Control Engineering

MDM-II (SEM – IV)	0ICMDM255	Electrical and Electronics Measurement

Open Elective-I offered by Instrumentation and Control Engineering

OE-I (SEM – IV)	0ICOE256	Industrial Economics

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0ICESC201 NUMERICAL COMPUTATIONAL METHODS (SY-SEM-III)

Course Details:

Course Code and Course Title	0ICESC201 – Numerical Computational Methods			
Semester:	III			
Prerequisites	Engineering Mathematics – I and II			
Teaching Scheme: - Lecture/Tutorial/Practical	Lecture	Tutorial	Practical	
	3	1	-	
Credit	04			
Evaluation Scheme	ISE 1	MSE	ISE 2	ESE
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (CO) Upon successful completion of this course, the students will be able to:		Blooms Level
CO1	**Apply** Laplace and inverse Laplace transforms to solve linear differential equations with constant coefficients.	3
CO2	**Explain** properties of Z-transform and their significance.	2
CO3	**Apply** error analysis concepts and numerical methods to solve algebraic and transcendental equations.	3
CO4	**Apply** Fourier transform and its inverse for solving mathematical and engineering problems.	3
CO5	**Use** Interpolation Formula to estimate intermediate values of function.	3
CO6	**Apply** different numerical integration method to evaluate definite integral.	3

Course Contents

Unit No.	Contents	Hrs.
Unit 1	**Laplace Transform:** Definition, Transforms of elementary functions. Properties of Laplace transforms, Inverse Laplace transforms, Partial fraction method and Convolution Theorem, Applications to find the solutions of linear differential equations.	7
Unit 2	**Z-Transform:** Definition, Z- transform of standard functions, Properties of Z-transform, inverse Z transform, Application to difference equation	6
Unit 3	**Error Analysis and Roots of Equations:** Significant figures, round-off, precision and accuracy, approximate and true error, truncation error and Taylor series, error propagation. **Roots of Equations** Bracketing methods: Bisection methods, Secant Method, Open methods: Newton Raphson method, Engineering Applications.	7

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Unit No.	Contents	Hrs.
Unit 4	**Fourier Transform:** Definitions, Fourier sine and cosine integrals; Fourier sine and cosine transforms; Properties of Fourier transforms; Parseval's identity for Fourier Transforms.	6
Unit 5	**Interpolation and Approximation:** Lagrange's interpolation formula, forward and backward difference interpolation formula, Newton's divided difference interpolation formula, Hermite interpolation formula.	7
Unit 6	**Numerical Differentiation and Integration:** Numerical differentiation, Newton cotes methods, Numerical integration, Trapezoidal and Simpson's rule, Gaussian rule, Error estimates for trapezoidal and Simpson's rule.	6
	Total Hours	**39**

***Note Conduct a minimum 10 tutorials based on prescribed curriculum**

Text Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Higher Engineering Mathematics	H. K. Das and Er. Rajnish Verma	S. Chand & CO. Pvt. Ltd., New Delhi.	23	2024
2	Higher Engineering Mathematics	B. V. Ramana	Tata McGraw-Hill, New Delhi	3	2015
3	A Text Book of Applied Mathematics (Vol. I & II)	P. N. Wartikar and J. N. Wartikar	Vidyarthi Griha Prakashan, Pune	Revised Edition	2006
4	Introductory Methods of Numerical Analysis	S. S. Sastry	Prentice Hall of India (PHI Learning), New Delhi	5	2018

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Reference Book

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Advanced Engineering Mathematics	Erwin Kreyszig	John Wiley & Sons, New York	10	2011
2	A Textbook of Engineering Mathematics	Peter O'Neil	Thomson Asia Pte Ltd., Singapore	7	2012
3	Advanced Engineering Mathematics	C. R. Wylie and L. C. Barrett	Tata McGraw-Hill Publishing Company Ltd., New Delhi	6	1995
4	Advanced Engineering Mathematics	C. R. Wylie	Tata McGraw-Hill Publication	8	1999
5	Numerical Methods for Scientific and Engineering Computation	M. K. Jain, S. R. K. Iyengar, and R. K. Jain	New Age International Publishers, New Delhi	6	2012

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0ICPCC202 SENSORS AND TRANSDUCERS (SY- SEM-III)

Course Details:

Course Code and Course Title	**0ICPCC202 – Sensors and Transducers**			
Semester :	III			
Prerequisites	--			
Teaching Scheme:-	**Lecture**	**Tutorial**	**Practical**	
Lecture/Tutorial/Practical	3	-	-	
Credit	**03**			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (CO) Upon successful completion of this course, the students will be able to:		**Blooms Level**
CO1	**Describe** the operating principles of various transducers used in measurement systems.	**2**
CO2	**Explore** working principles and characteristics of sensors used in industrial applications.	**3**
CO3	**Compute** the performance characteristics of transducers used in engineering applications.	**3**
CO4	**Compare** different types of transducers used for measurement of physical parameters in industrial systems.	**4**
CO5	**Select** suitable transducers and sensors for specific engineering applications based on technical requirements and operating conditions.	**3**

Course Contents

Unit No.	**Contents**	**Hrs.**
Unit 1	**Introduction:** Definition of sensor and transducer, classification of transducers, performance characteristics, selection criteria, transducer specification, test and operating conditions, roll of sensors in industry. **Proximity Sensor:** Capacitive and Inductive.	**5**
Unit 2	**Displacement, Force & Torque Measurement:** **Linear Displacement**: Resistive potentiometer, capacitive displacement transducer, LVDT, Hall effect sensor. **Rotary Displacement:** Tachometer, rotary encoder, stroboscope, gyroscope. Force: Basic methods of force methods, Strain gauge **Torque:** Inductive torque transducers, digital method & magneto strictive torsion transducer.	**7**
Unit 3	**Temperature Measurement:** Temperature scales, classification of Temperature sensors, selection criteria of temperature sensors. **Thermometers:** classification & specification of thermometers. Resistive Temperature detectors: - Principle, types, configuration (2 wire, 3 wire & 4. wire), construction and working.	**7**

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Unit No.	Contents	Hrs.
	Thermistor: - Principle, types (NTC, PTC), construction & working, testing & applications. **Thermocouples**: – Principle, Terminology (Thermo electric, See beck, Peltier effect), types and characteristics, cold junction compensation methods. **Pyrometers:** Principle, construction & working of total radiation pyrometer and optical pyrometer, applications.	
Unit 4	**Flow Measurement:** Properties of fluid, types of fluid flow, Reynolds number, continuity equation, Bernoulli's equation, and Selection criteria of flow sensors. **Head Type Flow Meter:** Orifice, venturi, nozzle, pitot tube. **Variable Area Type Flow Meter:** Rota-meter Open Channel, Turbine, Target, Electro Magnetic, Ultrasonic, Vortex Shedding, anemometers. **Mass Flow Meter:** Coriolis, Thermal & solid flow meters	**7**
Unit 5	**Pressure Measurement:** Pressure scales, classification, selection criteria of pressure sensors. **Primary Pressure Sensors:** Elastic elements: - bourdon, diaphragm, bellows, types and properties, range and measurement. Non-elastic: Manometer **Secondary/ Electrical Pressure sensors:** Capacitive, LVDT, photoelectric, Photo emissive-cell. **Low Pressure:** Mc-Leod gauge, pirani gauge, ionization gauge. **High Pressure:** Bridgeman type, Bulk modulus cell. **Differential Pressure:** Force balance, DP cell.	**7**
Unit 6	**Level Measurement:** Basic level measurement principals, Need for level measurement, types and classification, selection criteria for level sensors. Capacitive, conductivity, Differential level sensor, Laser level sensor, microwave level switch, radar Laser, optical level devices, radiation level sensor, Ultrasonic level Detector. **pH, Humidity and Vibration Measurement:** **pH:** construction & working of pH sensor, temperature compensation. **Humidity:** Hygrometer (Hair, wire & electrolysis). **Vibration:** acceleration pick up, proximity probes.	**7**
	Total Hours	**40**

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Text Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Instrumentation Devices and Systems	C. S. Rangan, G. R. Sharma, and V. S. V. Mani	Tata McGraw-Hill Education, New Delhi	2	2010
2	Transducers and Instrumentation	D. V. S. Murthy	Prentice Hall of India (PHI Learning), New Delhi	2	2010
3	Electrical and Electronic Measurements and Instrumentation	A. K. Sawhney	Dhanpat Rai & Sons, New Delhi	Revised	2015
4	Instrumentation, Measurement and Analysis	B. C. Nakra and K. K. Chaudhry	Tata McGraw-Hill Education.	3	2016
5	Principles of Industrial Instrumentation	Patranabis (D. Patranabis)	Tata McGraw-Hill Education	3	2010

Reference Book:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Principles of Measurement and Instrumentation	A. J. Morris	Prentice Hall of India (PHI Learning)	2	2001
2	Introduction to Instrumentation and Control	A. K. Ghosh	Prentice Hall of India (PHI Learning)	3	2009
3	Sensors and Control Systems in Manufacturing	Sabrie Solomon	Tata McGraw-Hill Education	2	2010
4	Industrial Process Control Systems	D. R. Patrick and S. W. Fardo	Thomson Learning Inc., USA	2	2001
5	Measurement Systems: Application and Design	Ernest O. Doebelin	McGraw-Hill Education	5	2004
6	Process Measurement and Analysis	Bela G. Liptak	CRC Press, USA	4	2003

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0ICPCC203 ANALOG ELECTRONICS (SY- SEM-III)

Course Details:

Course Code and Course Title	**0ICPCC203 - Analog Electronics**			
Semester:	III			
Prerequisites	--			
Teaching Scheme: - Lecture/Tutorial/Practical	**Lecture**	**Tutorial**	**Practical**	
	3	-	-	
Credit	**03**			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (CO) Upon successful completion of this course, the students will be able to:		**Blooms Level**
CO1	**Describe** diode characteristics, types, and applications in rectifiers and voltage multipliers.	**2**
CO2	**Apply** transistor configurations, FET, UJT and MOSFET operation and applications.	**3**
CO3	**Analyse** power amplifiers, power converters, signal generators.	**4**
CO4	**Apply** knowledge of power converters, SMPS, voltage regulators circuits.	**3**
CO5	**Apply** knowledge of Op-Amp based circuits including amplifiers, converters, oscillators, signal conditioning systems for instrumentation applications.	**3**

Course Contents

Unit No.	**Contents**	**Hrs.**
Unit 1	**Semiconductor Diode** Basic review of diode theory & Types of diode & their applications, Rectifiers, Filters, Clippers, clampers, Voltage Multipliers- Doublers, Diode current equation	**6**
Unit 2	**Basic Review of Transistor Configuration** Transistor biasing & Thermal stabilization, Bias compensation, Thermal runaway, Load line, Q point, Transistor at low frequencies (h-parameter), Transistor at high frequencies (h-parameter), Darlington circuits, Frequency response of amplifier, single stage RC coupled and Two stage RC coupled amplifier.	**7**
Unit 3	**Basic Review of Field Effect Transistor** Small signal FET analysis & FET applications, Single stage amplifier, Analog switches, Voltage variable resistance, UJT & its application, MOSFET & its application, IGBT & its application.	**6**
Unit 4	**Power amplifiers, Signal Generators and filters** Power amplifiers: audio power amplifier, class A, class – B, class C, Push-pull.	**7**

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Unit No.	Contents	Hrs.
	Signal Generators and filters: Multi vibrators, triangular wave generator, saw tooth wave generator, square wave generator, sine wave generator, basic low pass filters, low pass and high pass Butterworth filters, band pass, band reject filters, applications of filters	
Unit 5	**Power Converters, Regulators** Power Converters: SMPS, working principles, performance parameters, DC-DC converters: types, applications. Voltage regulators, stability of regulators.	**6**
Unit 6	**Operational Amplifiers:** Op-Amp parameters, frequency response, effect of temperature on Op-Amp parameters, instrumentation amplifier, bridge amplifier, differentiator, integrator, Comparators, V to I and I to V Converters, Voltage controlled oscillators, Signal conditioning circuits for temperature transmitter using OP amps.	**7**
	Total Hours	**39**

Text Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	Applied Electronics	R. S. Sedha	S. Chand Publishing	Revised Edition	2013
02	Op-Amp and Linear Integrated Circuits	Ramakant Gaikwad	PHI	Fourth Edition	2000
03	Integrated Electronics	Jacob Millman, Christos C. Halkias	Tata McGraw-Hill	Third Edition	1991

Reference Book:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	Electronic Devices and Circuit Theory	Robert L. Boylestad and Louis Nashelsky	Pearson Education	Tenth Edition	2009
02	Power Electronics Circuit, Devices and Applications	M. Rashid	Pearson Education	Third Edition	2004
03	Electronic Devices and Circuits	David A. Bell	Oxford University Press	5th Edition	2008

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0ICPCC204 NETWORK THEORY (SY-SEM-III)

Course Details:

Course Code and Course Title	**0ICPCC204 – Network Theory**			
Semester :	III			
Prerequisites	Basic Electronics and Electrical Engineering			
Teaching Scheme:-	**Lecture**	**Tutorial**	**Practical**	
Lecture/Tutorial/Practical	3	-	-	
Credit	**03**			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (CO) : Upon successful completion of this course, the students will be able to:		**Blooms Level**
CO1	**Apply** fundamental circuit laws to find current and voltage in networks.	**3**
CO2	**Analyze** network theorems to determine optimal circuit parameters.	**4**
CO3	**Apply** mathematical interrelationships to solve for Z, Y, h, and transmission parameters in interconnected two-port networks	**3**
CO4	**Illustrate** the relationship between frequency, impedance, and voltage in resonant circuits.	**2**
CO5	**Determine** the performance characteristics of low-pass, high-pass, and band-pass filters.	**4**
CO6	**Compare** the transient and steady-state responses of R-L-C circuits.	**4**

Course Contents

Unit No.	**Contents**	**Hrs.**
Unit 1	**Basic circuit concept:** Active and passive circuit elements, Independent sources, dependent sources, current divider, source transformation, energy storage elements.	**7**
Unit 2	**Circuit Analysis and Network Theorems** series and parallel circuits, Node analysis, Mesh analysis, KVL,KCL, Linearity, Proportionality and superposition theorem, Reciprocity theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, delta-star transformation, Principle of duality, network solution by laplace transformation techniques	**7**
Unit 3	**Two port Networks:** Introduction, open-circuit impedance (Z) parameters, short circuit admittance (Y) parameters, hybrid parameters, transmission parameters, Inter relationships of different parameters, Inter connection of two port networks, lattice network.	**7**

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Unit No.	Contents	Hrs.
Unit 4	**Resonance**: series and parallel resonance, Impedance at resonance, current at resonance, variation of capacitor voltage and inductor voltage with frequency, Q – factor, bandwidth and selectivity.	6
Unit 5	**Filters:** Introduction, parameters of filters, decibel and neper, propagation constant, classification of filters, Low pass, high pass, band pass and band stop filters, characteristics of filters,	6
Unit 6	**Transient Response:** steady state and transient response, DC response of an R-L, R-C and R-L-C circuit, sinusoidal response of an R-L, R-C and R-L-C circuit.	6
	Total Hours	39

Text Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Network Theory	Dr. K. M. Soni	S.K. Kataria & Sons	4	2026
2	Network Analysis and Synthesis	Franklin F. Kuo	Wiley India	2	2022
3	Circuits and Networks: Analysis and Synthesis	A. Sudhakar, Shyammohan S. Palli	McGraw-Hill Education	6	2025
4	Engineering Circuit Analysis	William H. Hayt, Jack E. Kemmerly, Steven M. Durbin	McGraw-Hill Education	10	2024

Reference Book:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Fundamentals of Electric Circuits	Charles K. Alexander, Matthew N. O. Sadiku	McGraw Hill Education	7	2022
2	Network Analysis	M. E. Van Valkenburg	Pearson Education	3	2019
3	Basic Circuit Analysis	K. V. V. Murthy, M. S. Kamath	Jaico Publishing House	-	2014
4	Network Analysis	Mac E. Van Valkenburg	Prentice Hall / PHI Learning	3	2011

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0ICMDM205 MEASURING INSTRUMENTS (SY- SEM-III)

Course Details:

Course Code and Course Title	**0ICMDM205 – Measuring Instruments**			
Semester:	III			
Prerequisites	--			
Teaching Scheme: Lecture/Tutorial/Practical	**Lecture**	**Tutorial**	**Practical**	
	3	-	-	
Credit	**03**			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (CO) Upon successful completion of this course, the students will be able to:		**Blooms Level**
CO1	**Describe** the operating principles of various transducers used in measurement systems.	**2**
CO2	**Explore** working principles and characteristics of sensors used in industrial applications.	**3**
CO3	**Compute** the performance characteristics of transducers used in engineering applications.	**3**
CO4	**Compare** different types of transducers used for measurement of physical parameters in industrial systems.	**4**
CO5	**Select** suitable transducers and sensors for specific engineering applications based on technical requirements and operating conditions.	**3**

Course Contents

Unit No.	**Contents**	**Hrs.**
Unit 1	**Instrumentation System:** Definition of sensor and transducer, classification of transducers, performance characteristics, selection criteria, transducer specification, test and operating conditions, roll of sensors in industry.	**5**
Unit 2	**Displacement, Force & Torque Measurement:** **Linear Displacement**: Resistive potentiometer, capacitive displacement transducer, LVDT. **Rotary Displacement:** Tachometer, rotary encoder, stroboscope, gyroscope. Force: Basic methods of force methods, Strain gauge	**7**
Unit 3	**Temperature Measurement:** Temperature scales, classification of Temperature sensors, selection criteria of temperature sensors. **Thermometers:** classification & specification of thermometers. Resistive Temperature detectors. **Thermistor**: - Principle, types(NTC, PTC), construction & working, testing & applications. **Thermocouples**: – Principle, Terminology(Thermo electric, See beck, Peltier effect), and characteristics, cold junction compensation methods.	**7**

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Unit No.	Contents	Hrs.
Unit 4	**Flow Measurement:** Properties of fluid, types of fluid flow, Reynolds number, continuity equation, Bernoulli's equation, and Selection criteria of flow sensors. **Head Type Flow Meter:** Orifice, venturi. Electromagnetic flowmeter, turbine flow meter **Variable Area Type Flow Meter:** Rota-meter	7
Unit 5	**Pressure Measurement:** Pressure scales, classification, selection criteria of pressure sensors. **Primary Pressure Sensors:** Elastic elements:- bourdon, diaphragm, bellows, types and properties, range and measurement. Non elastic : Manometer	7
Unit 6	**Level Measurement:** Basic level measurement principals, Need for level measurement, types and classification. capacitive, conductivity, Differential level sensor, Laser level sensor, microwave level switch, radar Laser, optical level devices, radiation level sensor, Ultrasonic level Detector.	7
	Total Hours	**40**

Text Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Instrumentation Devices and Systems	C. S. Rangan, G. R. Sharma, and V. S. V. Mani	Tata McGraw-Hill Education, New Delhi	2	2010
2	Transducers and Instrumentation	D. V. S. Murthy	Prentice Hall of India (PHI Learning), New Delhi	2	2010
3	Electrical and Electronic Measurements and Instrumentation	A. K. Sawhney	Dhanpat Rai & Sons, New Delhi	Revised	2015
4	Instrumentation, Measurement and Analysis	B. C. Nakra and K. K. Chaudhry	Tata McGraw-Hill Education.	3	2016
5	Principles of Industrial Instrumentation	Patranabis (D. Patranabis)	Tata McGraw-Hill Education	3	2010

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Reference Book:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Principles of Measurement and Instrumentation	A. J. Morris	Prentice Hall of India (PHI Learning)	2	2001
2	Introduction to Instrumentation and Control	A. K. Ghosh	Prentice Hall of India (PHI Learning)	3	2009
3	Sensors and Control Systems in Manufacturing	Sabrie Solomon	Tata McGraw-Hill Education	2	2010
4	Industrial Process Control Systems	D. R. Patrick and S. W. Fardo	Thomson Learning Inc., USA	2	2001
5	Measurement Systems: Application and Design	Ernest O. Doebelin	McGraw-Hill Education	5	2004
6	Process Measurement and Analysis	Bela G. Liptak	CRC Press, USA	4	2003

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0ICVEC206 ENVIRONMENTAL STUDIES (SY-SEM-III)

Course Details:

Course Code & Course Title	0ICSVEC206 - Environmental studies		
Semester	IV		
Prerequisites	--		
Teaching Scheme	Lecture	Tutorial	Practical
	2	--	--
Credit	2		
Evaluation Scheme	ISE	MSE	ESE
	50	--	--

Course Outcomes (COs): Upon successful completion of this course, Student will be able to:		Blooms Level
CO1	**Explain** the components and importance of Environment, ecosystems and Bio-diversity	2
CO2	**Discuss** the various natural resources and strategies for their management	3
CO3	**Explain** the sources of pollution, effects and control measures	2
CO4	**Apply** the knowledge of EIA, EMS and Audits for the preparation of reports.	3

Course Contents

Unit No.	Contents	Hrs.
Unit 1	**Introduction to Environmental Studies:** Definition, scope and importance, Components of environment, Multidisciplinary nature of environmental studies. Ecosystems- Types, Structure and function, energy flow, food chains and food webs. Biodiversity- Types, Importance and conservation	6
Unit 2	**Natural resources and Management:** Natural resources- Forest, Water, Mineral food, Energy and Land. Energy resources- Renewable-Wind, Hydropower, Tidal, Ocean thermal, Solar, Biomass, Biogas, Geothermal and Hydrogen. Non-renewable- Coal Petroleum, Natural gas, Nuclear energy, Sustainable management of resources	6
Unit 3	**Environmental pollution and climate change:** Types of pollution- Water, Air, Solid waste, Soil and Noise, Sources, effects and control measures, Global effects of pollution	6
Unit 4	**EIA, EMS, Social issues and legislation:** Environmental Impact Assessment (EIA)- Purpose and process. Engineering Management Systems(EMS)-Principles and steps, Introduction to Environmental Audit and Green audit	6
	Total Hours	24

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Text/Reference Books

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Ecological and Environmental studies	S. K. Garg	Khanna publishers	1st	2006
2	Essentials of Environmental studies	Kurian Joseph and R. Nagendran	Pearson Education, Singapore	2nd	2004
3	Environmental studies	Dr. Suresh K. Dhameja	Katson books	4th	2012
4	Environmental studies	Dr. P. D. Raut	Shivaji University, Kolhapur	4th	2012

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0ICHSSM207 PRINCIPLES OF MANAGEMENT (SY-SEM-III)

Course Details:

Course Code & Course Title	0ICSHSSM207 - Principles of Management		
Semester	III		
Prerequisites	--		
Teaching Scheme	Lecture	Tutorial	Practical
	2	--	--
Credit	2		
Evaluation Scheme	ISE	MSE	ESE
	50	-	-

Course Outcomes (COs): Upon successful completion of this course, Student will be able to:		Blooms Level
CO1	**Develop** analytical and managerial abilities for solving organizational and workplace problems using management concepts and theories.	3
CO2	**Identify** and classify different types of plans such as policies, procedures, rules, programs, budgets, and strategies used in organizations.	3
CO3	**Describe** different types of organizational structures and evaluate their suitability in various business environments.	3
CO4	**Identify** and compare different leadership styles and major leadership theories used in management practices.	3

Course Contents

Unit No.	Contents	Hrs
Unit 1	**Introduction to Management:** Definition, nature, scope, and importance of management, Functions of management, Levels of management, Managerial roles and skills, Evolution of management thought ,Scientific Management – F.W. Taylor, Administrative Theory – Henri Fayol, Bureaucratic Theory – Max Weber, Human Relations Approach – Elton Mayo ,Management as science, art, and profession.	7
Unit 2	**Planning and Decision Making :** Nature and importance of planning. Types of plans, Planning process, Strategic planning, Forecasting techniques, Decision-making process, Types of decisions, Decision-making models, Problem-solving techniques, Management by Objectives (MBO).	5
Unit 3	**Organizing and Staffing:** Principles of organization, Organizational structure, Departmentation, Delegation and decentralization, Authority and responsibility ,Span of control, Line and staff organization, Staffing process, Recruitment and selection ,Training and development, Performance appraisal.	5

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Unit No.	Contents	Hrs
Unit 4	**Leadership, Motivation, and Communication:** Nature and importance of leadership, Leadership styles and theories, Motivation concepts, Maslow's Need Hierarchy Theory, Herzberg's Two-Factor Theory, McGregor's Theory X and Theory Y, Communication process, Types and barriers of communication, Team dynamics and conflict management, Emotional intelligence.	7
	Total Hours	**24**

Text Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Essentials of Management	Koontz, H. and Weihrich, H	McGraw Hill	12th Edition	2023
2	Management	Robbins, S.P. and Coulter, M.	Pearson	16th Global Edition	2024
3	Principles of Management	Gupta, C.B.	Sultan Chand & Sons	18th Revised Edition	2023
4	Principles and Practice of Management	Prasad, L.M.	Sultan Chand & Sons	10th Edition	2020
5	Principles of Management	Tripathi, P.C. and Reddy, P.N.	McGraw Hill	6th Edition	2017

Reference Book:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1.	The Practice of Management	Peter Drucker	Harper Business	Classic/Reissue	2006
2.	Organizational Behaviour	Fred Luthans	McGraw Hill	14th Edition	2021
3.	Management	Stoner, Freeman & Gilbert	Pearson / Prentice Hall	6th Edition	2018
4.	Organizational Behaviour	Stephen Robbins	Pearson	19th Global Edition	2023

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0ICPCC208 SENSORS AND TRANADUCERS LAB (SY-SEM-III)

Preamble:

This laboratory course provides hands-on experience in the operation, calibration, and analysis of various sensors and transducers used for measuring physical parameters such as displacement, temperature, pressure, flow, and level. It helps students develop skills in performing experiments, interpreting results, and selecting suitable measurement devices for industrial applications.

Course Details:

Course Code and Course Title	**0ICPCC208- Sensors and Transducers Lab**		
Semester:	IV		
Prerequisites	--		
Teaching Scheme: - Lecture/Tutorial/Practical	**Lecture**	**Tutorial**	**Practical**
	-	-	2
Credit	**01**		
Evaluation Scheme	**ISE**	**MSE**	**ESE**
	50 Marks	-	50 Marks

Course Outcomes (COs): Upon successful completion of this course, Student will be able to:		**Blooms Level**
CO1	**Perform** experiments to determine the characteristics of displacement, temperature, and force measurement transducers such as LVDT, capacitive transducer, strain gauge, thermocouple, RTD, and thermistor.	3
CO2	**Handle** measurement instruments such as dead weight tester and various flow and level transducers for accurate measurement of process variables.	3
CO3	**Analyze** the performance characteristics and experimental results of different sensors and transducers used for measurement of physical parameters	4
CO4	**Compare** different types of sensors for measurement of level, flow, temperature, and pressure based on application requirements.	2
CO5	**Select** appropriate sensors and transducers for specific industrial measurement applications considering technical specifications and operating conditions.	3

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Course Contents

Expt. No.	List of Experiment
1.	Perform an experiment to determine the characteristics of a Linear Variable Differential Transformer (LVDT).
2.	Perform an experiment to determine the characteristics of a capacitive displacement transducer.
3.	Demonstrate the measurement of speed using suitable sensors and instruments.
4.	Perform an experiment to determine the characteristics of a strain gauge.
5.	Perform an experiment to determine the characteristics of a thermocouple.
6.	Perform an experiment to determine the characteristics of RTD and thermistor.
7.	Calibrate a pressure gauge using a dead weight tester and interpret the results.
8.	Examine the operation and measurement of flow using a flow transducer.
9.	Examine the operation and measurement of level using a level transducer.
10.	Investigate the application of an LDR for displacement measurement.
11.	Explain important selection criteria of Level Sensors
12.	List selection criteria of Flow sensors
13.	Selection criteria of Temperature sensors
14.	Evaluate pressure sensors for suitable industrial applications using selection criteria.

***Note Conduct a minimum 10 experiments based on prescribed curriculum**

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0ICPCC209 ANALOG ELECTRONICS LAB (SY- SEM-III)

Preamble

This laboratory provides hands-on understanding of analog electronic devices and circuits. Students analyse JFET characteristics and implement key circuits such as rectifiers, clipping and clamping circuits, amplifiers, oscillators, and OPAMP applications. The course focuses on circuit design, testing, and performance analysis, helping bridge theoretical concepts with practical applications.

Course Details:

Course Code and Course Title	**0ICPCC209- Analog Electronics Lab**		
Semester:	III		
Prerequisites	--		
Teaching Scheme: - Lecture/Tutorial/Practical	**Lecture**	**Tutorial**	**Practical**
	-	-	2
Credit	**01**		
Evaluation Scheme	**ISE**	**MSE**	**ESE**
	50 Marks	-	50 Marks

Course Outcomes (CO) Upon successful completion of this course, the students will be able to:		**Blooms Level**
CO1	**Analyse** the operation of electronic circuits.	**3**
CO2	**Design** basic electronic circuits.	**4**
CO3	**Perform** the experiments to determine characteristics of diode, MOSFET, JFET and IGBT	**3**

Course Contents

Expt. No.	**Experiment List**
01	Analyse characteristics of Diode
02	Verify VI characteristics of IGBT
03	Analyse characteristics of JFET
04	Demonstrate clipping circuits.
05	Demonstrate clamping circuits.
06	Implement half wave rectifier.
07	Implement full wave rectifier.
08	Design of high pass filter.
09	Design of Low pass filter
10	Construct Phase Shift Oscillator.
11	Design and implementation of astable multivibrator and Monostable multivibrator
12	Design inverting and non-inverting amplifier using OPAMP
13	Verify VI characteristics of MOSFET

***Note Conduct a minimum 10 experiments based on prescribed curriculum**

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OICCEP210 COMMUNITY ENGAGEMENT PROGRAMME (SY SEM-III)

Course Details:

Course Code and Course Title	**0ICCEP210 – Community Engagement Programme**		
Semester :	III		
Prerequisites	--		
Teaching Scheme:- Lecture/Tutorial/Practical	**Lecture**	**Tutorial**	**Practical**
	-	-	2
Credit	**01**		
Evaluation Scheme	**ISE**	**MSE**	**ISE**
	50 Marks	-	-

Course Outcomes (COs): Upon successful completion of this course, Student will be able to:		**Blooms Level**
CO1	**Identify** a relevant problem statement related to a specific community.	**2**
CO2	**Apply** appropriate methods for data collection	**3**
CO3	**Analyze** the collected data using suitable techniques	**4**
CO4	**Communicate** the findings effectively to stakeholders through reports and presentations	**4**

Course Contents

Course Contents
In this course, students will identify a significant problem or challenge faced by a community and adopts a systematic approach to investigate it. They will conduct field visits to collect relevant data, analyse the data, and derive meaningful insights. The outcomes of the study will be compiled into a comprehensive report, which may be presented to the concerned stakeholders.
Pedagogy • **In-class Activities:** Group discussions, interactions with faculty mentor • **Out-of-class Activities:** Field visits, interaction with community, data collection

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0ICPCC251 FEEDBACK CONTROL SYSTEM (SY- SEM-IV)

Course Details:

Course Code and Course Title	**0ICPCC251- Feedback Control System**			
Semester:	IV			
Prerequisites	Engineering Mathamatics – I and II			
Teaching Scheme: - Lecture/Tutorial/Practical	**Lecture**	**Tutorial**	**Practical**	
	3	1	-	
Credit	**04**			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (CO) Upon successful completion of this course, the students will be able to:		**Blooms Level**
CO1	**Explain** the fundamental concepts of control systems, including open-loop and closed-loop systems, system classifications, and mathematical modelling of physical systems.	**2**
CO2	**Apply** the concept of transfer functions to find mathematical models of electrical and mechanical systems.	**3**
CO3	**Analyze** control systems using block diagram reduction techniques and signal flow graphs, and determine overall system transfer function using Mason's Gain Formula.	**4**
CO4	**Analyze** time-domain performance of control systems and determining system stability using Routh-Hurwitz criterion.	**4**
CO5	**Evaluate** system stability and performance using frequency domain techniques such as Bode plots, Nyquist criterion, and root locus methods.	**5**
CO6	**Develop** state-space models of control systems, check controllability and observability.	**4**

Course Contents

Unit No.	**Contents**	**Hrs.**
Unit 1	**Introduction:** Concept of open & closed loop control system, Types of Control ,Systems Servomechanism, Multivariable control system, Applications in non-engineering field a) Concept of system: physical system, Physical model, Linear and nonlinear Systems, Time variant and invariant system. b) Equations of physical systems (Mass-Spring-Dashpot system, R-L-C series & parallel circuit)	**6**

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Unit No.	Contents	Hrs.
Unit 2	**Transfer function:** Procedure of obtaining transfer function Control system, Terminology used in transfer function components: Derivation of transfer functions of following components a) DC servomotors (Armature and field control) b) AC servomotors c) Amplifying generators d) Synchro's e) DC and AC tacho generators f) Potentiometer error detectors	7
Unit 3	**Block diagrams and Signal flow graphs**: a) Block diagram algebra, Diagram Reduction, Numerical examples. b) Signal flow graph; Masons gain formula for deriving overall transfer function of systems. Feedback characteristics of control system: Concept of negative and positive feedback, Sensitivity of the system to parameter variation, using negative and positive feedback.	7
Unit 4	**Time domain analysis**: Typical test signals, Time domain specifications, Steady state response, Types of system, Steady state error constants and steady state error, (With different input), Numerical examples, transient response, Numerical, Concept of stability, Determination of stability by Routh - Hurwitz criterion	6
Unit 5	**Frequency domain analysis**: Introduction to frequency response, Advantages of frequency domain analysis, Polar plots, Numerical, Bode plots, Principle of argument, Nyquist criterion, Relative stability from Nyquist criterion, Numerical. Definition of Root Locus, Construction of root locus, Stability from root locus plots, Root counters, Effect of addition of poles & zeros on root locus Plots	7
Unit 6	**State Variable Technique:** Concept of State, State Variable & State Vector, State Variable Analysis: Different forms of state variable representations (Phase, Physical &Canonical form), Concept of Diagonalization, Obtaining State equations from Transfer Function representation and vice versa, Solution of State Equations, State Transition Matrix (STM), Methods of finding STM, Power Series Method, Laplace Transform Method, Calay Hamilton Method, Controllability & Observability of linear system, Kalman's test.	7
	Total Hours	40

***Note Conduct a minimum 10 tutorials based on prescribed curriculum**

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Text Book:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Feedback Control Theory	John C. Doyle, Bruce A. Francis, Allen R. Tannenbaum	Dover Publications	-	2009
2	Feedback Control Systems	Charles L. Phillips, Royce D. Harbor	Prentice Hall	4th Edition	2000
3	Control Systems: Theory & Applications	|Smarajit Ghosh	Pearson	1	2004

Reference Book:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Modern Control Engineering	K. Ogata	Prentice Hall of India	5	2010
2	Automatic Control Systems	B. C. Kuo	Prentice Hall of India	9	2014
3	Control System Engineering	I. J. Nagarath, M. Gopal	Wiley Eastern	5	2008
4	Control Systems Engineering	Norman S. Nise	Wiley	7	2015
5	Control Systems	M. Gopal	Prentice Hall of India	3	2009

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0ICPCC252 ELECTRICAL AND ELECTRONICS MEASUREMENT (SY- SEM-IV)

Course Details:

Course Code and Course Title	**0ICPCC252- Electrical and Electronics Measurement**			
Semester :	IV			
Prerequisites	Basic Electrical and Electronics Engineering			
Teaching Scheme:- Lecture/Tutorial/Practical	**Lecture**	**Tutorial**	**Practical**	
	3	-	-	
Credit	**03**			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (CO) Upon successful completion of this course, the students will be able to:		**Blooms Level**
CO1	**Describe** the basic concepts of measurement systems, classification of instruments, and static & dynamic characteristics.	**2**
CO2	**Apply** the working principles of analog and digital instruments such as galvanometers, PMMC, PMMI, and digital meters to measure electrical quantities.	**3**
CO3	**Analyze** the operation and applications of electrical measurement instruments including current transformers, potential transformers, wattmeters, energy meters, and frequency meters.	**4**
CO4	**Analyze** various DC and AC bridge circuits for precise measurement of resistance, inductance, and capacitance, including identification of errors and their minimization.	**4**
CO5	**Use** of oscilloscopes and signal generators for measurement of voltage, frequency, phase, and other electrical parameters.	**3**
CO6	Use recording and display devices such as analog/digital displays and recorders for monitoring and visualization of signals.	**3**

Course Contents

Unit No.	**Contents**	**Hrs.**
Unit 1	**Theory of Measurement And instrumentation** Block diagram of Instrumentation system, Classification of measurement instruments Primary B) Secondary-Indicating, integrating, and recording analog /Digital. **Static Characteristics**-Accuracy, Precision, error, linearity, resolution, sensitivity, dead zone, drift, hysteresis. **Dynamic Characteristics** -Error, Speed Response, fidelity, lag, dynamic error. Instrument specification and factors affecting on instruments.	**6**

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Unit No.	Contents	Hrs.
Unit 2	**Analog and digital Meters** D'arsonval, Ballistic galvanometer, working principle and application disvantages and disadvantages PMMC, PMMI , Ohmmeter, Digital Meters-1) Integrating and non integrating type voltmeter 2)Frequency, time, and phase measurement	6
Unit 3	**Electrical Measurement and techniques** Current Transformer, Potential transformer, power factor meter, Synchro-scope, Energy meter, Wattmeter, frequency meter, max. Grounding and Isolation and use in measurement.	6
Unit 4	**Measurement of R,L,C** D.C. Bridges- D.C. bridge: whetstone bridge, Kelvin's bridge, Kelvin's double bridge (principle, working, advantage &disadvantage) A.C. bridges- **Measurement of inductance** : Maxwell's bridge, Andersons bridge, Hay Bridge Measurement of mutual inductance : Hearyside bridge, **Measurement of capacitance** : Desauty's bridge, schering bridge, **Measurement of frequency** : Wein bridge, Errors in bridge circuits and Remedy, wagner earthing device , introduction of LCRQ meter	7
Unit 5	**Oscilloscope and Laboratory Devices** Block diagram of CRO, Types of Oscilloscope: Dual beam, dual trace, sampling digital storage Oscilloscope, CRO accessories: Passive and active probes, Application of CRO: Measurement of phase, frequency using lissijous patterns .Measurement of inductance and capacitance Signal generator: AF sine wave & square wave generator, square wave & pulse generator (lab type) , Random noise generator, function generator, pulse generator	7
Unit 6	**Recorders and Display Devices** Analog and Digital Displays, Alarm Annunciator (Types), Analog Recorders-Strip Chart recorders-Y recorders and Types,	7
	Total Hours	39

Text Book:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Electronic Instrumentation	U. S. Kalsi	Tata McGraw-Hill	3	2012
2	Electronic Measurements and Instrumentation	Oliver Cage	Tata McGraw-Hill (TMH)		201

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Reference Book:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Modern Electronic Instrumentation and Measurement Techniques	A. D. Helfrick, W. D. Cooper	Prentice Hall of India (PHI)	1	1996
2	Electronic Instrumentation Handbook	Clyde F. Coombs Jr.	McGraw-Hill	2	1995
3	A Course in Electrical & Electronic Measurements & Instrumentation	A. K. Sawhney	Dhanpat Rai & Co.	19	2022

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0ICPCC253 DIGITAL ELECTRONICS (SY- SEM-IV)

Course Details:

Course Code and Course Title	**0ICPCC253 - Digital Electronics**			
Semester:	IV			
Prerequisites	--			
Teaching Scheme: - Lecture/Tutorial/Practical	**Lecture**	**Tutorial**		**Practical**
	3	-		-
Credit	**03**			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (CO) Upon successful completion of this course, the students will be able to:		**Blooms Level**
CO1	**Describe** positional number systems, binary arithmetic, code conversions, and digital codes.	**2**
CO2	**Explain** fundamental digital logic families and transistor-level implementations in TTL, CMOS, NMOS, and ECL circuits.	**2**
CO3	**Apply** combinational logic circuits using gates and multiplexers, decoders, and encoders.	**3**
CO4	**Analyse** sequential logic circuits using using flip-flops, registers, and counters,	**4**
CO5	**Evaluate** data converter circuits and digital storage devices, including memory architectures and programmable logic devices.	**5**

Course Contents

Unit No.	**Contents**	**Hrs.**
Unit 1	**Number System:** Binary, Octal, Decimal and hexadecimal, Signed binary numbers, Conversion methods, Binary Arithmetic, addition, subtraction, Binary codes- Weighted, BCD, Gray code, Excess 3 code, ASCII, hamming code. code conversion.	**6**
Unit 2	**Fundamental concepts of Digital Circuits:** Boolean expressions, Sum of Products (SOP), Product of Sums (POS), Standard representation for logical function, SOP & POS form, Min-term & Max term. Realization of combinational functions, Transistor logic, TTL, Emitter coupled logic, NAND and NOR logic.	**6**
Unit 3	**Logic gates and Boolean algebra**: Basic logic gates, Universal gates, Realization of Boolean functions using universal gates, Canonical forms, Karnaugh map Minimization, Don't care conditions ,	**6**
Unit 4	**Combinational logic design**: Half and Full adder, Half and full Subtractor Multiplexer, Demultiplexers, Decoders, Encoders, ICs of MUX, DEMUX, Decoders Encoders. Hazards in combinational circuits: Static hazard, dynamic hazard, essential hazards, hazard free combinational circuits.	**7**

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Unit No.	Contents	Hrs.
Unit 5	**Sequential Logic Design:** 1 Bit memory cell, clocked S-R flip-flop, master slave J-K flip flop, D and T types of flip flops, Registers, classifications, shift registers, counters, synchronous, asynchronous, Analysis of clocked sequential circuits, state table, state diagram.	7
Unit 6	**Convertor circuits and digital storage devices:** Digital to analog converter, weighted register D/A converter, R/2R ladder D/A converter, Analog to digital conveter, successive approximation A/D converter, Digital storage devices : ROM, RAM, EPROM, EEPROM, CAM (content addressable memory), CCD, ROM as PLD and PLA, PAL, field programmable gate arrays (FPGA).	7
	Total Hours	39

Text Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	Modern Digital Electronics	R. P. Jain	Tata McGraw-Hill	Fourth Edition	2010
02	Fundamentals of Digital Circuits	Anand Kumar	PHI Learning	Third Edition	2014

Reference Book:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	Digital Fundamentals	Thomas L. Floyd	Pearson Education	Eighth Edition	2003
02	Digital Principles and Applications	Donald P. Leach, Albert Paul Malvino	Tata McGraw Hill (TMH)	-	2006
03	Digital Principles and Design	Donald D. Givone	ata McGraw Hill	-	2003

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0ICPCC254 FIELD INSTRUMENTATION (SY- SEM-IV)

Course Details:

Course Code and Course Title	**0ICPCC254 Field Instrumentation**			
Semester :	IV			
Prerequisites	Sensors and Transducers			
Teaching Scheme:-	**Lecture**	**Tutorial**	**Practical**	
Lecture/Tutorial/Practical	3	-	-	
Credit	**03**			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (COs): Upon successful completion of this course, Student will be able to:		**Blooms Level**
CO1	**Describe** industrial control devices	**2**
CO2	**Explain** Hydraulic & Pneumatic components	**2**
CO3	**Illustrate** working principles of transmitters and signal converters	**3**
CO4	**Analyse** the types and applications of control valves used as final control elements.	**4**
CO5	**Apply** knowledge of auxiliary components with appropriate safety practices in Field instrumentation.	**3**

Course Contents

Unit No.	**Contents**	**Hrs.**
Unit 1	**Industrial control devices :** Switches: Construction, types, symbolic representation, working and applications- toggle switch, slide switch, DIP switch, Rotary switch, thumbwheel switch, selector switch, push button, limit switch, temperature switch, pressure switch, level switch, flow switch. Photoelectric switch, Indicators & displays. Relays: Types, working, specification/selection criteria and applications of electro-mechanical relay, reed relay, solid state relay. Contactors: Types, working, specification and applications, concepts of sequencing & interlocking.	**7**
Unit 2	**Pneumatics:** Pneumatic components. -Standards and symbols, Source of pneumatic power-Compressor, Filter regulation lubrication (FRL) Unit, Air receiver, Actuators-Rotary, Linear, Control Valves for pressure, flow and direction, Time delay valve, typical pneumatic circuits	**7**
Unit 3	**Hydraulics:** Hydraulic components,: Standards and symbols, Hydraulic power pack, Hydraulic pumps, Actuator(Cylinder & motors),Control Valves, Hydraulic servo mechanism, Typical Hydraulic circuits	**6**

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Unit No.	Contents	Hrs.
Unit 4	**Transmitters:** Need of transmitter (concepts of field area and control room area), need for standardization of signal, current, voltage and pneumatic signal standards, concepts of line and dead zone. Converter: Working & Specifications of I/P and P/I converter, Span and zero adjustment.	6
Unit 5	**Control Valve**: Necessity and comparison, final control elements, classification of control valve based on valve body, construction, type of actuation and application. Construction Advantages, disadvantages and application of globe: single, double, 3 way angle, gate, needle, diaphragm, rotary valve. Actuator: Define actuators and their role in control systems, Classification: Electrical, Pneumatic, Hydraulic actuators, Linear and Rotary actuators.	7
Unit 6	**Auxiliary Components:** Construction, working and applications of damper, alarm annunciator, square root extractor, high/low selector, flow totalizer, seals. Motor: Working principle of electrical motor, Types of Motor, Stepper Motor, and Servo Motor.	6
	Total Hours	39

Text Book:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Instrument Engineers' Handbook – Volume 2: Process Control	B. G. Liptak	CRC Press	4	2018
2	Process Control Instrumentation Technology	Curtis D. Johnsom	Dorling Kindersley(India) Pvt. Ltd. Pearson Education.	7	2006

Reference Book:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Industrial Hydraulics	A. B. Pipenger and T. J. Hicks	McGraw-Hill.	3	1979
2	Pneumatic Controls	Joji P	WIPL Publication	1	2008
3	Industrial Hydraulics Manual	Eaton (Vickers)	Eaton Corporation	6	2015
4	Instrument Technology – Volume 1 & 2	E. B. Jones	Butterworth-Heinemann	4	1985
5	Pneumatics Basic Level Manual	Festo Didactic	Festo Didactic GmbH & Co.	-	2013
6	Hydraulics Basic Level Manual,	Festo Didactic	Festo Didactic GmbH & Co.	-	2013

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0ICMDM255 ELECTRICAL AND ELECTRONICS MEASUREMENT (SY- SEM-IV)

Course Details:

Course Code and Course Title	**0ICMDM255- Electrical and Electronics Measurement**			
Semester :	IV			
Prerequisites	--			
Teaching Scheme:-	**Lecture**	**Tutorial**	**Practical**	
Lecture/Tutorial/Practical	3	-	-	
Credit	**03**			
Evaluation Scheme	**ISE 1**	**MSE**	**ISE 2**	**ESE**
	10 Marks	20 Marks	10 Marks	60 Marks

Course Outcomes (CO) Upon successful completion of this course, the students will be able to:		**Blooms Level**
CO1	**Describe** the basic concepts of measurement systems, classification of instruments, and static & dynamic characteristics.	**2**
CO2	**Apply** the working principles of analog and digital instruments such as galvanometers, PMMC, PMMI, and digital meters to measure electrical quantities.	**3**
CO3	**Analyze** the operation and applications of electrical measurement instruments including current transformers, potential transformers, wattmeters, energy meters, and frequency meters.	**4**
CO4	**Analyze** various DC and AC bridge circuits for precise measurement of resistance, inductance, and capacitance, including identification of errors and their minimization.	**4**
CO5	Use oscilloscopes and signal generators for measurement of voltage, frequency, phase, and other electrical parameters.	**3**
CO6	**Use** recording and display devices such as analog/digital displays and recorders for monitoring and visualization of signals.	**3**

Course Contents

Unit No.	**Contents**	**Hrs.**
Unit 1	**Theory of Measurement And instrumentation:** Block diagram of Instrumentation system, Classification of measurement instruments Primary B) Secondary-Indicating, integrating, and recording analog /Digital. **Static Characteristics**-Accuracy, Precision, error, linearity, resolution, sensitivity, dead zone, drift, hysteresis. **Dynamic Characteristics** -Error, Speed Response, fidelity, lag, dynamic error .Instrument specification and factors affecting on instruments.	**6**
Unit 2	**Analog and digital Meters:** D'arsonval, Ballistic galvanometer, working principle and application disvantages and disadvantages PMMC, PMMI , Ohmmeter, Digital Meters-1) Integrating and non integrating type voltmeter 2)Frequency, time, and phase measurement	**6**

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Unit No.	Contents	Hrs.
Unit 3	**Electrical Measurement and techniques:** Current Transformer, Potential transformer, power factor meter, Synchro-scope, Energy meter, Wattmeter, frequency meter, max. Grounding and Isolation and use in measurement.	6
Unit 4	**Measurement Of R,L,C:** D.C. Bridges- D.C. bridge: whetstone bridge, Kelvin's bridge, Kelvin's double bridge (principle, working, advantage &disadvantage)A.C. bridges- **Measurement of inductance** : Maxwell's bridge, Andersons bridge, Hay Bridge Measurement of mutual inductance : Hearyside bridge, **Measurement of capacitance** : Desauty's bridge, schering bridge, **Measurement of frequency** : Wein bridge, Errors in bridge circuits and Remedy, wagner earthing device , introduction of LCRQ meter	7
Unit 5	**Oscilloscope and Laboratory Devices:** Block diagram of CRO, Types of Oscilloscope: Dual beam, dual trace, sampling digital storage Oscilloscope, CRO accessories: Passive and active probes, Application of CRO: Measurement of phase, frequency using lissijous patterns .Measurement of inductance and capacitance Signal generator: AF sine wave & square wave generator, square wave & pulse generator (lab type) , Random noise generator, function generator, pulse generator	7
Unit 6	**Recorders and Display Devices:** Analog and Digital Displays, Alarm Annunciator (Types), Analog Recorders-Strip Chart recorders-Y recorders and Types,	7
	Total Hours	**39**

Text Book:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Electronic Instrumentation	U. S. Kalsi	Tata McGraw-Hill	3	2012
2	Electronic Measurements and Instrumentation	Oliver Cage	Tata McGraw-Hill (TMH)		201

Reference Book:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Modern Electronic Instrumentation and Measurement Techniques	A. D. Helfrick, W. D. Cooper	Prentice Hall of India (PHI)	1	1996
2	Electronic Instrumentation Handbook	Clyde F. Coombs Jr.	McGraw-Hill	2	1995
3	A Course in Electrical & Electronic Measurements & Instrumentation	A. K. Sawhney	Dhanpat Rai & Co.	19	2022

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0ICOE256 INDUSTRIAL ECONOMICS (SY- SEM-IV)

Course Details:

Course Code and Course Title	0ICVEC207 – Industrial Economics		
Semester:	III		
Prerequisites	--		
Teaching Scheme: Lecture/Tutorial/Practical	Lecture	Tutorial	Practical
	2	-	-
Credit	02		
Evaluation Scheme	ISE	MSE	ESE
	50 Marks	-	-

Course Outcomes (CO) Upon successful completion of this course, the students will be able to:		Blooms Level
CO1	Explain fundamental economic concepts relevant to industrial decision-making.	2
CO2	Apply demand analysis and forecasting techniques to predict market behavior in industrial contexts.	3
CO3	Analyze cost structures, production behavior, and economic appraisal techniques for project evaluation.	4
CO4	Evaluate market structures, marketing processes, industrial finance sources, capital structure, and pricing strategies to support effective managerial decision-making.	5

Course Contents

Unit No.	Contents	Hrs.
Unit 1	**Economics** A. Introduction: Meaning & Scope of Economics, Basic Theories, Law of Demand & Supply, Elasticity of Demand & Supply. B. Consumer Theories: Meaning of Utility & Law of Diminishing Utility. C. Cost Concepts: Opportunity Costs, Sunk Costs, Marginal Cost, Total & Variable Costs, Fixed Costs, Contribution, Law of Diminishing Return.	5
Unit 2	**Demand Analysis & Forecasting** Meaning and determinants of demand, Demand function and law of demand, Elasticity of demand (price, income, cross), Demand forecasting methods: Survey methods, Statistical methods (trend analysis, regression basics), Applications in industrial decision-making	5
Unit 3	**Economic appraisal techniques** A. Economic appraisal techniques: Long- Range and Short range Budgeting, B. Criteria for Project Appraisal, C. Social benefit-cost analysis, d. Depreciation: concepts and Techniques.	5
Unit 4	**Market Structure** A. Introduction to Marketing: Concept of Market, B. Types of Market, Definition, Nature & Scope of Marketing, C. Marketing Approaches, Marketing Process, advertising market forecasting	5

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Unit No.	Contents	Hrs.
Unit 5	**Industrial Finance & Pricing** Sources of industrial finance: Equity, Debt, Bonds, Loans Capital structure Pricing methods: Cost-plus pricing, Marginal cost pricing, Skimming and penetration pricing Role of financial institutions in India	4
	Total Hours	24

Text Book:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Industrial Economics: An Introductory Textbook	Barthwal, R. R.	New Age International Publishers, New Delhi.	4	2022
2	Managerial Economics	Dwivedi, D. N.	Vikas Publishing House Pvt. Ltd., New Delhi..	16	2021
3	Industrial Economy of India	Kuchhal, S. C.	Chaitanya Publishing House, Allahabad.	9	2002

Reference Book:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Industrial Economics	Reekie, W. D.,	Edward Elgar Publishing, UK.	-	1979
2	Industrial Economics: An Applied Approach	Howe, W. Stewart	Macmillan Press Ltd., London.	-	1978
3	Economics of Industrial Organization	Shepherd, William G.	Waveland Press Inc., USA.	4	2004
4	Readings in Industrial Economics	Rowley, Charles (Ed.)	Palgrave Macmillan, London.	-	1972
5	Principles of Economics	Mankiw, N. Gregory	Cengage Learning, USA.	10	2023

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0ICAEC257 SOFT SKILLS (SY- SEM-IV)

Course Details:

Course Code and Course Title	**0ICAEC257 – Soft Skills**		
Semester :	IV		
Prerequisites	--		
Teaching Scheme:-	**Lecture**	**Tutorial**	**Practical**
Lecture/Tutorial/Practical	-	-	2
Credit	**01**		
Evaluation Scheme	**ISE**	**MSE**	**ESE**
	50 Marks	-	-

Course Outcomes (COs): Upon successful completion of this course, Student will be able to:		**Blooms Level**
CO1	**Develop** professional self-presentation and non-verbal communication skills.	**3**
CO2	**Demonstrate** effective collaborative problem-solving and leadership in team settings.	**3**
CO3	**Construct** professional documents including resumes and formal emails.	**3**
CO4	**Critically** evaluate personal career goals and execute mock professional interactions.	**4**

Course Contents

Unit No.	**Contents**
Unit 1	**Communication Skills & Confidence Building:** Topics: • Verbal communication (clarity, tone, articulation) • Non-verbal communication (body language, gestures, eye contact) • Active listening • Overcoming stage fear • Basic presentation skills Practical / Group Activities: • Self-Introduction Round (Recorded) • Pair Activity: Active Listening Drill • Role Play: Good vs Poor Communication • 1-Minute Video Speaking Task • Impromptu Speaking (Extempore) • Mirror Practice (confidence building)
Unit 2	**Teamwork, Leadership & Interpersonal Skills:** Topics: • Team dynamics • Conflict resolution • Leadership styles • Emotional intelligence (EI basics) • Collaboration & trust building

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Unit No.	Contents
	Practical / Group Activities: • Marshmallow Tower Challenge (Team Building) • Blindfold Navigation Activity (Trust exercise) • Group Puzzle Solving Task • Conflict Role Play (Student vs Team disagreement) • Rotate Leader Activity (each student leads once) Group Discussion (GD) Sessions
Unit 3	**Critical Thinking & Problem Solving:** Topics: • Logical reasoning • Decision-making frameworks • Creative thinking • Problem-solving techniques • Case study analysis Practical / Group Activities: • Case Study Discussion (Real-world engineering problem) • Mystery Problem Challenge (group deduction task) • Brainstorming Sessions (idea generation) • Lateral Thinking Puzzles Competition • Decision-Making Simulation (choose best solution scenario) • Mini Innovation Task (build simple solution prototype)
Unit 4	**Employability Skills & Professional Development:** Topics: • Resume writing • Interview skills • Group discussion techniques • Workplace etiquette • Time management • Goal setting Practical / Group Activities: • Resume Building Workshop • Mock Interviews (Panel + Recording) • Group Discussion (HR-style topics) • Time Management Game (task prioritization) • Goal Setting Exercise (SMART goals) • Professional Etiquette Role Play

Activities Planned:

Activities conducted in following areas

1. SWOT Analysis
2. Self Development Plans
3. Demonstration of reading skills
4. Role playing

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5. Group activity on poster/model presentation

6. Group Discussion/ Debate on Current issues.

7. Identifying Role Models / motivational posters/audio/video

8. Writing of reports / resume or a mini presentation.

9. Visit to library to explore technical resources /mini projects.

10. Invited expert lectures by a doctor/industrialist/ professional counselors.

11. Stress management activities/ visit to Gymnasium.

12. Mock Interview.

Text Books

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Soft Skills: Enhancing Employability	M. S. Rao	I. K. International Publishing House	1	2010
2	Personality Development and Soft Skills	Barun K. Mitra	Oxford University Press	3	2024
3	Soft Skills for Managers	Dr. Kalyana Chakravarthi, Dr. Latha Chakravarthi	Bizantra Publications	1	2015

Reference Books

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	The 7 Habits of Highly Effective People	Stephen R. Covey	Simon & Schuster	30th Anniversary Edition	2019
2	How to Win Friends and Influence People	Dale Carnegie	Simon & Schuster	-	2009
3	Emotional Intelligence: Why It Can Matter More Than IQ	Daniel Goleman	Bantam Books	-	2005
4	Adam's Time Management	Marshall Cook	Viva Books	1	2001
5	Presentation Skills	Michael Hutton	ISTE Publications	1	2004

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0ICVEC258 UNIVERSAL HUMAN VALUES (UHV) (SY-SEM-IV)

Course Details:

Course Code & Course Title	**0ICVEC258 - Universal Human Values (UHV)**		
Semester	III		
Prerequisites	Student Induction Program (SIP)		
Teaching Scheme	**Lecture**	**Tutorial**	**Practical**
	2	--	--
Credit	**2**		
Evaluation Scheme	**ISE**	**MSE**	**ESE**
	50	-	

Course Outcomes (COs): Upon successful completion of this course, Student will be able to:		**Blooms Level**
CO1	**Develop** the ability to self-explore and verify value-based living through natural acceptance having right understanding and harmonious relationships as foundational to resolving personal, familial, and societal problems sustainably.	2
CO2	**Apply** the understanding of respect as right evaluation to address societal conflicts and contribute to value-based education.	3
CO3	**Recognize** the interconnectedness of natural orders and propose responsible human participation to ensure mutual fulfilment in existence.	3
CO4	**Apply** value-based understanding to their domain expertise to propose sustainable solutions for societal and ecological mutual fulfilment.	3

Course Contents

Unit No.	**Contents**	**Hrs.**
Unit 1	**Introduction to Value Education:** Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education), Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations,	**6**
Unit 2	**Understanding Human being as the Co-existence of the Self and the Body** Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self Lecture, Understanding Harmony in the Self, Harmony of the Self with the Body Lecture, Programme to ensure self-regulation and Health	**6**
Unit 3	**Harmony in the Family – the Basic Unit of Human Interaction** 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in Society, Vision for the Universal Human Order	**6**

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Unit No.	Contents	Hrs.
Unit 4	**Understanding Harmony in the Nature** Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence.	6
	Total Hours	24

Text Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	A Foundation Course in Human Values and Professional Ethics	R. R. Gaur, R. Asthana, G. P. Bagaria	Excel Books	2	2019
2	Teachers' Manual for A Foundation Course in Human Values and Professional Ethics	R. R. Gaur, R. Asthana, G. P. Bagaria	Excel Books	2	2019
3	Human Values	A. N. Tripathi	New Age International Publishers, New Delhi	--	2004

Reference Book:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Jeevan Vidya: Ek Parichaya	A. Nagaraj	Jeevan Vidya Prakashan, Amarkantak	--	1999
2	The Story of Stuff	Annie Leonard	Free Press Publishers	--	2010
3	The Story of My Experiments with Truth	Mohandas Karamchand Gandhi	Navjivan Publishing House	--	1948
4	Small is Beautiful	E. F. Schumacher	Harper Collins / Penguin Publishers	--	1993
5	Slow is Beautiful	Cecile Andrews	Penguin Random House Publishers	--	2023

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0IVSEC259 COMPUTATIONAL LAB (SY- SEM-IV)

Course Details:

Course Code and Course Title	**0ICAEC259 – Computational Lab**		
Semester:	IV		
Prerequisites	--		
Teaching Scheme: Lecture/Tutorial/Practical	**Lecture**	**Tutorial**	**Practical**
	-	-	2
Credit	**01**		
Evaluation Scheme	**ISE**	**MSE**	**ESE**
	25 Marks	-	-

Course Outcomes (COs): Upon successful completion of this course, Student will be able to:		**Blooms Level**
CO1	**Demonstrate** the effective use of the MATLAB desktop environment and built-in help tools for performing computational tasks.	**3**
CO2	**Apply** concepts of variables, arrays, operators, and matrix operations to solve numerical and engineering problems using MATLAB.	**3**
CO3	**Develop** MATLAB programs using control structures, loops, and user-defined functions to implement logical and computational solutions.	**4**
CO4	**Analyze** 2D and 3D graphical plots for effective data visualization and interpretation in engineering applications.	**4**

Course Contents

Unit No.	**Contents**
Unit 1	**Introduction to MATLAB**: Desktop tool and development environment: Command window, Command history window, Documents window, Editor debugger, fig. window, workspace browser, Help and Path browser, Getting Help: Help, help win, help desk, look for
Unit 2	**Variables:** Local & Global, Arrays, initializing variables, MATLAB operators: Arithmetic, Relational, Logical, multi dimensional Arrays, Subscripting and Indexing (Sub arrays), Displaying O/p data, Scale and array operations, built in functions for handling arrays, Numeric data types, Sparse matrices.
Unit 3	**MATLAB Programming**: Script files, Function files, Braches : If –else, Switch –case and try / catch, Loops : While, For, Break / Continue and nesting loops, user defined functions, function function, sub functions and function handling.
Unit 4	**MATLAB Graphics** : Two dimensional continuous plots, Discreet plots, Multiple polts in same fig. window using sub plots, Multiple graphs in same plots using hold ON and hold OFF commands, Formatting Plots : X labels, Y labels, title, text, g text, Legend, axis, Handle graphics, 3-D plots, Bar graphs, Histograms, Polar plots, PIC plot. **Simulink :** Introduction, Creating models, working with blocks, running simulation, creating sub system, Masking sub system.

***Note Conduct programs based on prescribed curriculum**

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Text Books

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	MATLAB Programming for Engineers	Stephen J. Chapman	Cengage Learning	3	2012
2	Mastering MATLAB 7	Duane Hanselman, Bruce Littlefield	Pearson Education	1	2005
3	Introduction to MATLAB 7.4 (For Units 2 & 3)	William J. Palm III	Tata McGraw Hill (TMH)	1	2007

NPTEL / SWAYAM

Sr. No.	Title	Instructor	Organization / Platform	Duration	Year
1	MATLAB Programming for Numerical Computation	Dr. Niket Kaisare	NPTEL / SWAYAM, IIT Madras	8 Weeks	Ongoing (Regular Offering)
2	Scientific Computing Using MATLAB	Prof. Mani Mehra, Prof. Vivek K. Aggarwal	NPTEL / SWAYAM, IIT Delhi	12 Weeks	Ongoing (Regular Offering)

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0ICPCC260 FIELD INSTRUMENTATION LAB (SY-SEM-IV)

Preamble:

This laboratory course is designed to provide practical exposure to fundamental components and systems used in industrial automation and control. The experiments cover essential topics such as electrical control circuits, pneumatic and hydraulic systems, process instrumentation, and signal conversion techniques. Students will gain hands-on experience in the operation, design, testing, and analysis of industrial control elements including relays, contactors, cylinders, transmitters, and control valves. This course aims to bridge the gap between theoretical concepts and real-world industrial applications, enhancing students' technical skills and problem-solving abilities in instrumentation and control engineering.

Course Details:

Course Code and Course Title	**0ICPCC260-Field Instrumentation Lab**		
Semester:	IV		
Prerequisites	Sensor & Transducer		
Teaching Scheme: Lecture /Tutorial / Practical	**Lecture**	**Tutorial**	**Practical**
	-	-	2
Credit	**01**		
Evaluation Scheme	**ISE**	**MSE**	**ESE**
	50 Marks	-	50 Marks

Course Outcomes (COs): Upon successful completion of this course, Student will be able to:		**Blooms Level**
CO1	**Analyse** industrial control systems including switches, relays, and contactors, pneumatic and hydraulic components for automation applications.	**4**
CO2	**Design** instrumentation systems involving pneumatic/hydraulic circuits, transmitters (4–20 mA), converters, control valves, and electronic components.	**5**

Course Contents

Expt. No.	**Experiment List**
01	Study of Industrial Control Switches and Their Applications
02	Design and Implementation of Relay-Based Control Circuit
03	Study and Operation of Contactors with Interlocking System
04	Study of Pneumatic Components and FRL Unit
05	Operation and Analysis of Single Acting and Double Acting Pneumatic Cylinder
06	Design and Implementation of Basic Pneumatic Circuit
07	Study of Hydraulic System and Hydraulic Power Pack
08	Operation and Analysis of Hydraulic Actuator System
09	Calibration of Transmitter Using 4–20 mA Standard Signal
10	Study and Testing of I/P Converter
11	Study and Testing of P/I Converter
12	Study Characteristics of Control Valves
13	Measurement and Testing of Basic Electronic Components

***Note Conduct a minimum 10 experiments based on prescribed curriculum**

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0ICPCC261 DIGITAL ELECTRONICS LAB (SY-SEM – IV)

Preamble:

The Digital Electronics Laboratory provides practical exposure to fundamental digital concepts through the design and verification of logic circuits. Students perform experiments to understand logic gates, Boolean algebra, combinational circuits, and standard TTL ICs. The lab develops skills in circuit implementation, testing, and analysis, enabling students to apply digital principles effectively in engineering applications.

Course Details:

Course Code and Course Title	**0ICPCC261-Digital Electronics Lab**		
Semester:	IV		
Prerequisites	--		
Teaching Scheme: Lecture /Tutorial / Practical	**Lecture**	**Tutorial**	**Practical**
	-	-	2
Credit	**01**		
Evaluation Scheme	**ISE**	**MSE**	**ESE**
	50 Marks	-	50 Marks

Course Outcomes (CO) Upon successful completion of this course, the students will be able to:		**Blooms Level**
CO1	**Analyze** the performance of digital logic circuits by verifying truth tables of logic gates, Boolean algebra laws, multiplexers, demultiplexers, display drivers, and counters using TTL integrated circuits.	**4**
CO2	**Evaluate** the functionality of combinational logic circuits such as half and full adders and subtractors by designing, testing, and interpreting the output responses of the circuits.	**5**

Course Contents

Expt. No.	**Experiment List**
01	Verification of truth table of various TTL logic gates.
02	Verification of Boolean algebra laws.
03	Verification of given logical expression using universal gates.
04	Design and test adder circuits (half adder)
05	Design and test adder circuits (Full adder)
06	Design and test substractor circuits (half substractor)
07	Design and test substractor circuits (full substractor)
08	Verification of truth table of multiplexer using IC74153.
09	Verification of truth table of De-multiplexer using IC74155.
10	Verification of BCD to 7-segment display using IC7447.
11	Verification of ring counter using IC7493.
12	Implementation of flip flops.

***Note Conduct a minimum 10 experiments based on prescribed curriculum**

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