Curriculum for Multi-Disciplinary Minor (MDM) Degree in Instrumentation & Control

(In light of NEP 2020)

(NEP_Version II)

Offered By

DEPARTMENT OF INSTRUMENTATION ENGINEERING

For students admitted in 2023-24 onwards

Government College of Engineering, Amravati
(An Autonomous Institute of Government of Maharashtra)
Near Kathora Naka, Amravati, Maharashtra
PIN 444604
www.gcoea.ac.in

Approved in Academic Council 25 April 2025 Unto third Year

A. Preamble:

The Instrumentation engineering minor is tailored to students who want to understand the fundamentals of Instrumentation engineering other than courses covered in engineering sciences. The students will develop abilities in measurement using transducers, control system concepts and recent automation technology .The students will be able to study the concepts and implementation of the instrumentation measurement and control by using the modern tools.

The students can combine the skills and technological expertise of this minor with a major in technology of aligned branch to prepare for a wide variety of opportunities in industrial fields and in demand careers.

B. Structure of the MDM course:

Instrumentation Engineering Department offer Multidisciplinary Minor Basket , Track-1 (Instrumentation and Control)

Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
			TH	TU	PR	Total	CT1	CT2	TA	ESE	ICA	ESE		
MM1	IN1315	Industrial Measurement I	3			3	15	15	10	60			100	3
MM2	IN1415	Industrial Measurement 2	3			3	15	15	10	60			100	3
MM3	IN1515	Control system Engineering	3			3	15	15	10	60			100	3
MM4	IN1615	Industrial Automation	3			3	15	15	10	60			100	3
MM5	IN1715	Programming for PLC,DCS & SCADA	1		2	3	15	15	10	60			100	2
Total			**13**	**0**	**2**	**15**	**75**	**75**	**50**	**300**	**0**	**0**	**500**	**14**

C. **Eligibility criteria:** Students enrolled in B. Tech program other than Instrumentation Engineering are eligible. The allotment of minor degree Programme will be as per the policy of the Institute.

D. **Intake :** Minimum 15

E. Detailed syllabus:

SEMESTER – III

Course Code	IN1315							Course category			MM1
Course Name	Industrial Measurement-I										
Teaching Scheme				Examination Scheme							Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	00	00	03	15	15	10	60	2 hrs 30 min	00	00	100	03

Course Objectives:

Aim of the course is to:

1. To provide the knowledge of fundamentals and types of all the sensors and Transducers
2. To understand the sensors and transducers concept and its applications in the process measurement
3. To describe, draw, classify and produced sketches, drawings to explain working principles of various sensors and transducers.
4. To select transducers/sensors for specific applications

Course Contents:

Temperature Measurement :- Temperature scales, classification of temperature sensors, standards, working principle, types, materials, Non electrical sensors (thermometer, thermostat), electrical sensors (RTD, thermocouple, thermistor), radiation sensors (pyrometers), photo electric radiation thermometers, IC temperature transducers

Pressure measurement: Definition, pressure scale, standards, working principle, types, materials, elastic pressure sensors, secondary pressure sensors, differential pressure sensors, capacitive (delta cell), Pressure Transmitter definition, two wire and four wire transmitters, I/P and P/I converters.

Flow Measurement: Essential principles of fluid mechanics and properties of fluid, types of fluid flow, continuity equation, Bernoulli's equation, Reynolds‟s number, laminar and turbulent flows, pascal's law, 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, Mass Flow Meter: Coriolis, Thermal & solid flow meters

Level measurement: Basic level measurement principals, selection criteria for level sensors. float, Bubblers, displacer (torque tube unit), capacitive, conductivity, Differential level sensor, float level sensor, Laser level sensor, microwave level switch, radar Laser (contact, non-contact – TDR / PDS), optical level devices, radiation level sensor, , Ultrasonic level Detector

Humidity, pH and Viscosity Measurement: Humidity terms - dry & wet bulb psychrometers - hot wire electrode type hygrometer, electrolytic hygrometer, Dewpoint hygrometer,

Capacitive hygrometer, pH measurement : Nearnst equation, construction & working of pH sensor, temperature compensation, pH measurement electrodes, maintenance and applications, Viscosity terms, saybolt viscometer, rotometer type viscometer

Text Books:

1. Arun Ghosh, Introduction to Measurements and Instrumentation, PHI Learning Pvt. Ltd.
2. B. C. Nakra and K. K. Choudhari, "Instrumentation Measurements and Analysis" by, Tata McGraw Hill Education, Second ed., 2004.

Reference Books:

1. A. K. Sawhney, "Electrical and Electronic Measurements and Instrumentation", Dhanpat Rai and Sons, Eleventh ed., 2000.
2. D.V.S. Murthi, "Instrumentation and Measurement Principles", PHI, New Delhi, Second ed. 2003.
3. B. C. Nakra and K. K. Choudhari, "Instrumentation Measurements and Analysis" by, Tata McGraw Hill Education, Second ed., 2004.
4. E.O. Doebelin, "Measurement Systems", McGraw Hill.
5. Bentley J. P., Principles of measurement systems, Third Edition, Pearson education Asia pvt.ltd, 2000
6. D. Patranabis, "Principle of Industrial Instrumentation", Tata McGraw Hill, Second ed., 1999.
7. S. P. Venkateshan," Mechanical Measurements", Willy publication second edition. 2015

Useful Link:

1. **Course name: Industrial Measurement-I course**
   https://onlinecourses.nptel.ac.in/noc23_ee105/preview Name of Course offered by NPTEL: Transducers for Instrumentation By Prof. Ankur Gupta, IIT Delhi.

Course Outcomes:

On completion of the course, students will be able to:

INU1315.1 : Identification of sensors and transducer (Primary and secondary).
INU1315.2 : Demonstrate the working principles of various sensors and transducers
INU1315.3 : Evaluate and classify various sensors and transducers
INU1315.4 : Interpret the characteristics of the transducers/sensors
INU1315.5 : Demonstrate working principle of chemical sensors used in process industry

CO – PO – PSO Mapping as per Jan-2016 Format

This subject is offered for other deptt. Students, PSO is not considered

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IN1315.1	1	1	0	0	0	0	0	0	0	1	0	0
IN1315.2	1	1	1	2	0	0	0	0	0	0	0	0
IN1315.3	1	0	0	0	0	0	0	0	0	0	0	0
IN1315.4	1	0	1	0	0	0	1	0	0	0	1	0
IN1315.5	1	1	1	0	2	0	0	0	0	0	0	0

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CO – PO – PSO Mapping as per NBA Jul-2024 format [w.e.f. 01 Jan 2025]

Course Outcomes	Program Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
IN1315.1	1	1	0	0	0	0	0	0	0	1	0
IN1315.2	1	1	1	2	0	0	0	0	0	0	0
IN1315.3	1	0	1	2	0	0	0	1	0	0	0
IN1315.4	1	0	1	0	0	0	1	0	0	0	1
IN1315.5	1	1	1	0	2	0	0	0	0	0	0

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

SEMESTER – IV

Course Code	IN1415							Course category				MM2
Course Name	INDUSTRIAL MEASUREMENT-II											
Teaching Scheme				Examination Scheme								Credits
				Theory					Practical		Total	
Th	Tu	Pr	Total	CT 1	CT 2	TA	ESE	ESE Duration	ICA	ESE		
03	00	00	03	15	15	10	60	2hr30 min	00	00	100	03

Course Objectives :

Aim of the course is to:

1. To understand how physical quantities are measured and how they are converted to electrical or other forms
2. To have an adequate knowledge of change in resistance in various transducers
3. To develop the knowledge of inductance and capacitance transducers.
4. To teach the design of signal conditioning circuits

Course Contents:

Displacement Measurement: Resistive (Potentiometer and Linear), Inductive(LVDT and Eddy current type) and capacitive(Capacitance principles Concept & variable capacitance due to change in dielectric media, area of the plate, distance between the plates) Displacement Sensors, Piezoelectric Transducers and Sensors, Ultrasonic Displacement Sensors, Optical Encoder Displacement Sensors, Hall effect transducers.

Velocity and speed measurement: Doppler Velocimeter, Doppler effect, Ultrasonic Doppler velocity meter, time of flight velocimeter Mechanical tachometer: centrifugal force tachometer, vibrating tachometer , Electrical Tachometer: Drag Cup Tachometer, AC-DC Tachogenerators, Photoelectric tachometer, Photoelectric tachometer, Magnetic pickups, stroboscope

Vibration and acceleration measurement: Eddy current type, piezoelectric type, Seismic Transducer, Accelerometer: Absolute Accelerometer, Relative Accelerometer Piezoelectric accelerometers , Piezoresistive Accelerometers

Force and torque measurement: Basic methods of force measurement, elastic force traducers, strain gauge, load cells, shear web, piezoelectric force transducers, vibrating wire force transducers, Strain gauge torque meter, Inductive torque meter, Magneto-strictive transducers, torsion bar dynamometer.

Design of signal conditioning circuit : Input Characteristics, Amplifiers, operational amplifiers Voltage Follower, various Converters, Sensor Connections, use of bridges, voltage generator, oscillators, Signal Conditioning for Resistive Sensors, Reactance Variation and Electromagnetic Sensors, Signal Conditioning for Reactance Variation Sensors

Advances in sensors technology: Introduction to Smart sensors, MEMS, Nano sensors, Semiconductor sensors, Optical fiber sensors. Applications of these technologies in various industry sectors.

Text Books:

1. S. P. Venkateshan," Mechanical Measurements", Willy publication second edition. 2015

2. Ramon Palla¡ S-areny, John g. Webster, “sensors and signalconditioning” second edition, john wiley & sons, inc

Reference Books:

1. A. K. Sawhney, “Electrical and Electronic Measurements and Instrumentation”, Dhanpat Rai and Sons, Eleventh ed., 2000.
2. D.V.S. Murthi, “Instrumentation and Measurement Principles”, PHI, New Delhi, Second ed. 2003.
3. B. C. Nakra and K. K. Choudhari, “Instrumentation Measurements and Analysis” by, Tata McGraw Hill Education, Second ed., 2004.
4. E.O. Doebelin, “Measurement Systems”, McGraw Hill.

Useful Link:

1. **Course name: Industrial Measurement -II course** https://onlinecourses.nptel.ac.in/noc23_ee105/preview Name of Course offered by NPTEL: Transducers for Instrumentation By Prof. Ankur Gupta, IIT Delhi.

Course Outcomes:

Upon Completion of this course, students will able to

INU1415.1 Interpret the concepts of signal conditioning circuits for resistive sensors
INU1415.2 To demonstrate working of various resistive, inductive and capacitive transducers
INU1415.3 Illustrate the working principle of velocity and acceleration transducers
INU1415.4 Apply the adequate knowledge of force transducers
INU1415.5 Provide exposure new trends in smart sensors.

CO – PO – PSO Mapping as per Jan-2016 Format This subject is offered for other deptt. students, PSO is not considered

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IN1415.1	1	1	0	0	0	0	0	0	0	1	0	0
IN1415.2	1	1	1	2	0	0	0	0	0	0	0	0
IN1415.3	1	0	1	2	0	0	0	1	0	0	0	0
IN1415.4	1	0	1	0	0	0	1	0	0	0	1	0
IN1415.5	1	1	1	0	2	0	0	0	0	0	0	0

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

CO – PO – PSO Mapping as per NBA Jul-2024 format [w.e.f. 01 Jan 2025]

Course Outcomes	Program Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
IN1415.1	1	1	0	0	0	0	0	0	0	1	0
IN1415.2	1	1	1	2	0	0	0	0	0	0	0
IN1415.3	1	0	1	2	0	0	0	1	0	0	0
IN1415.4	1	0	1	0	0	0	1	0	0	0	1
IN1415.5	1	1	1	0	2	0	0	0	0	0	0

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correla

SEMESTER – V

Course Code	IN 1515	Course category	MM3
Course Name	**CONTROL SYSTEM ENGINEERING**		

Teaching Scheme				Examination Scheme								Credits
				Theory					Practical		Total	
Th	Tu	Pr	Total	CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	00	00	03	15	15	10	60	2hr30 min	00	00	100	03

Course Objectives:

Aim of the course is to:

1. Understand the basic knowledge of fundamentals of control systems
2. Gain the knowledge of the mathematical model for different physical systems
3. Find the transfer function for control system by BDR,SFG techniques
4. Analyse the performance characteristics of first and second-order systems for different standard inputs
5. Determine the stability of control system by RH Criterion, time domain and frequency domain techniques, state space representation of control system

Course Contents:

Fundamentals of control systems: Basic components of a control System, Concept of open loop and closed loop systems, Effects of Feedback, Review of Laplace and inverse Laplace transform, Transfer functions.

Mathematical modelling: of electrical systems, mechanical systems, Electrical analogy of mechanical translational & rotational systems, Block diagrams of control system, Block diagram reductions, Signal flow graph, Mason's gain formula and its applications

Time response analysis: Time response of system, Standard test signals, Analysis of first order and second order systems, Time response specifications, Steady state errors and error constants.

Stability analysis: Stability of open loop and closed loop systems, Routh-Hurwitz criterion, Stability and Performance analysis, Root locus techniques, Root locus construction rules, Sketching of Root Locus.

Frequency response analysis: Frequency domain specifications, Correlation between time and frequency responses, Bode plots, Phase margin and Gain margin, Introduction to polar plots, Nyquist plots.

Introduction to state space: State Space Representation of the control system, State Variables representation, conversion of transfer function to state variable model, Representation of state equation. .

Text Books:

1. Nagrath and Gopal, "Control System Engineering", New Age International Publication, 5th edition, 2003.
2. Norman Nise, "Control System Engineering", Wiley International, 6th edition, 2011.

Reference Books:

1. C.H. Houpis, S.N. Sheldon, "Linear Control System Analysis and Design with MATLAB", CRC Press; 6th edition.

2. G. Franklin, J.Powell, A. Naeini, "Feedback Control of Dynamic Systems", Pearson, 6th edition.
3. K. Ogata, "Modern Control Engineering", Prentice Hall Publications,5th edition.
4. Dorf and Bishop, "Modern Control Systems", Addison Wesley, LPE, 9th Edition.
5. B. C. Kuo, "Automatic control system", Prentice Hall of India, 7th Edition, 1995

Course Outcomes:

After completion of the course students will be able to

INU1515.1 Classify open and closed control systems with their characteristics

INU1515.2 Derive the transfer function of electrical ,mechanical or any given system by using BDR, SFG techniques

INU1515.3 Obtain the response of first & second-order systems

INU1515.4 Determine the stability of control system by Time & frequency domain

INU1515.5 Represent the control system in State space representation

CO – PO – PSO Mapping as per Jan-2016 Format This subject is offered for other deptt. Students, PSO is not considered

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IN1515.1	3	1	0	0	0	0	0	0	0	0	0	0
IN1515.2	3	2	0	0	0	0	0	0	0	0	0	0
IN1515.3	3	3	0	0	0	0	0	0	0	0	0	0
IN1515.4	3	2	1	0	2	0	0	0	0	0	1	1
IN1515.5	2	0	0	0	1	0	0	0	0	0	0	0

0-Not correlated 1 -Weakly Correlated 2- Moderately Correlated 3-Strongly Correlate

CO – PO – PSO Mapping as per NBA Jul-2024 format [w.e.f. 01 Jan 2025]

Course Outcomes	Program Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
IN1515.1	3	1	0	0	0	0	0	0	0	0	0
IN1515.2	3	2	0	0	0	0	0	0	0	0	0
IN1515.3	3	3	0	0	0	0	0	0	0	0	0
IN1515.4	3	2	1	0	2	0	0	0	0	1	1
IN1515.5	2	0	0	0	1	0	0	0	0	0	0

0-Not correlated 1 -Weakly Correlated 2- Moderately Correlated 3-Strongly Correlate

SEMESTER – VI

Course Code	IN 1615	Course category	MM4
Course Name	**INDUSTRIAL AUTOMATION**		

Teaching Scheme				Examination Scheme								Credits
				Theory					Practical		Total	
Th	Tu	Pr	Total	CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	00	00	03	15	15	10	60	2hr30 min	00	00	100	03

Course Objectives:

Aim of the course is to**:**

I. Introduce the fundamentals of Industrial Automation.
II. Introduce International Communication Standards and their practical applications.
III. Apply the knowledge of PLC, DCS and SCADA systems in various applications.
IV. Understand industrial safety and its management.
V. Apply communication protocol for any practical application developed by PLC, DC, ESD, F&G.

Course Contents:

Industrial Automation: Introduction to Instrumentation and Control (Block Diagram), Types of Automation, Role of Automation in Industries, Industrial Revolution 1, 2, 3, 4, Reference Architecture Model of Industry 4.0 (RAMI), Industrial Control **:**Programmable logic controllers (PLC): Introduction &Basic Architecture, Ladder diagrams and examples, PLC programming method: Function Block Diagram (FBD) as per IEC 61131-3, Distributed Control System (DCS): Basic Concept of DCS and its Architecture, Basic Comparison of Honeywell TDC3000 and Yokogawa Centum CS3000, Supervisory Control and Data Acquisition (SCADA):Introduction and Objectives of SCADA, SCADA in Process Control applications. Human Machine Interface (HMI) & Graphic Pages .Concept of Remote IO Modules (RIO), Concept of Remote Terminal Unit (RTU)

Industrial Safety: Introduction to Process Safety & Emergency Shutdown System (ESD), Safety Interlocks, Basics of Hazard Identification Study (HAZID) ,Hazard and Operability Study (HAZOP), Safety Integrity Levels (SIL),Introduction to IEC 61508 & 61511 standards for Functional safety, IEC 61508-1 :- Functional Safety of Electrical / Electronic/ Programmable Electronic Safety Related Systems – General Requirements, IEC 61511-1 Management of Functional Safety, Safety life-cycle requirements Introduction to Layers Of Protection & Safety Instrumented Systems, Fire & Gas System (F&G): Addressable and Non-Addressable F&G Devices, Concept of Addressable Loops, Introduction to Fire Alarm Control Panel (FACP)

Instrumentation Standard Communication Protocols: Basic understanding of communication, Open Systems Interconnection (OSI): Introduction to 7 Layers as per ISO/IEC7498-1. Definition of Protocols, RS232, RS485, Modbus:-Layers, Protocol Data Unit, Application Data Unit, IEC61158-1 :- Mapping onto OSI Basic Reference Model, Structure of IEC 61158, brief summary of the characteristics of service & protocol for each fieldbus type,

concept of OPC (Object linking and embedding for Process Control), HART Protocol,

Foundation Fieldbus :- Introduction, frame structure, implementation examples, advantages and limitations, basic comparison and applications of Foundation Fieldbus, Profibus, ControlNet, DeviceNet, Industrial Ethernet, Introduction to IIOT in Industrial Plants

Text Books: -

1. D. Eckman, "Process Control Instrument Engineers Handbook", X 3rd edition, Butterworth Heinemann Company, 1999
2. W. Bolton "Programmable Logic Controllers", Newnes Publications, 4th edition

Reference Books:

1. Johnson C. D., "Process Control Instrumentation Technology", 7th edition, Pearson Education, New Delhi, 2003.
2. Webb J. W. "Programmable Controllers: Principles and Applications", Mergy/publishing co.1988.
3. Krishankant, "Computer Based Industrial Control", 7th edition, PHI, 2005.
4. MadhuchandraMitra,Samarjit Sen Gupta, "Programmable logic controllers and Industrial Automation An introduction" ,Penram publishing (India) Pvt Ltd,2009.
5. http://www.nptel.iitm.ac.in (Industrial Automation And Control By Prof. Alokkanti Deb | IIT Kharagpur)

Web Resources:

1. https://prod-edam.honeywell.com/content/dam/honeywell-edam/hbt/en-us/documents/literature-and-specs/datasheets/hbt-fire-74-4034-16.pdf
2. https://www.nexinstrument.com/assets/images/02032017Honeywell/MT11-520.pdf
3. https://skoge.folk.ntnu.no/puublications_others/apc-book-papers/honeywell3000-AP09-600.pdf
4. https://web-material3.yokogawa.com/TI33Q01B10-01E.pdf
5. https://prod-edam.honeywell.com/content/dam/honeywell-edam/hbt/en-us/documents/literature-and-specs/datasheets/hbt-fire-74-4034-16.pdf
6. https://control.com/technical-articles/what-is-a-remote-terminal-unit-rtu/#:~:text=There%20are%2C%20however%2C%20several%20technical,with%20more%20features%20and%20functionalities.

Course Outcomes:

On completion of the course, students will be able to:

IN1615.1 Introduce the fundamentals of Industrial Automation.

IN1615.2 Understand concepts of International Communication Standards and their Practical applications.

IN1615.3 Demonstrate an understanding the concept of PLC, DCS and SCADA systems in Industry.

IN1615.4 Study & Understand the industrial safety and its management.

IN1615.5 Propose of the integration and communication of various Industrial Control and Safety systems (i.e. PLC, DCS, ESD, F&G) and introduction to the current trends in Industrial Automation.

CO – PO – PSO Mapping as per Jan-2016 Format: This subject is offered for other deptt. students, PSO is not considered

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IN1615.1	2	2	0	0	0	0	0	0	0	0	0	0
IN1615.2	1	0	0	0	0	0	0	0	0	0	0	0
IN1615.3	3	2	1	1	3	1	0	0	0	0	0	0
IN1615.4	2	1	2	2	0	0	0	0	0	0	0	0
IN1615.5	2	2	0	0	2	0	0	0	0	0	0	0

0 - Not correlated1 - Weakly Correlated2- Moderately Correlated 3- Strongly Correlated

CO-PO-PSO mapping as per NBA Jul 2024 Format [w.e.f. from 01 Jan 2025]:

Course Outcomes	Program Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
IN1615.1	2	2	0	0	0	0	0	0	0	0	0
IN1615.2	1	0	0	0	0	0	0	0	0	0	0
IN1615.3	3	2	1	1	3	1	0	0	0	0	0
IN1615.4	2	1	2	2	0	0	0	0	0	0	0
IN1615.5	2	2	0	0	2	0	0	0	0	0	0

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

SEMESTER – VII

Course Code	IN 1715							Course category			MM5
Course Name	**PROGRAMMING FOR PLC,DCS &SCADA**										
Teaching Scheme				**Examination Scheme**							**Credits**
				Theory					Practical		Total	
Th	Tu	Pr	Total	CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	00	00	03	15	15	10	60	2hr30 min	00	00	100	03

Curriculum will be published and implemented from Academic Year 2026-2027 progressively

Curriculum for
Multi-Disciplinary Minor (MDM)
Degree in
Banking and Finance

(In light of NEP 2020)

(NEP_Version II)

Offered By

DEPARTMENT OF INSTRUMENTATION ENGINEERING

For students admitted in 2023-24 onwards

Government College of Engineering, Amravati
(An Autonomous Institute of Government of Maharashtra)
Near Kathora Naka, Amravati, Maharashtra
PIN 444604
www.gcoea.ac.in

Approved in Academic Council 25 April 2025 Unto third Year

A. Preamble:

The Instrumentation engineering minor is tailored to students who want to understand the fundamentals of Banking and Finance related courses which is other than courses covered in engineering sciences. The students will develop abilities in to understand the fundamentals of Banking and, Finance .Students will learn the concepts and implement the strategies in good banking and finance sectors

The students can combine the skills and technological expertise of this minor with a major in technology of aligned branch to prepare for a wide variety of opportunities in banking and finance fields and in demand careers.

B. Structure of the MDM course:

Instrumentation Engineering Department offer Multidisciplinary Minor Basket , Track-2 (Banking and Finance)

Category	Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
							Theory				Practical		Total	
			TH	TU	PR	Total	CT1	**CT2**	TA	ESE	ICA	ESE		
MM1	IN1316	Bank operations Management	3			3	15	15	10	60			100	3
MM2	IN1416	Strategic management and innovation in banking	3			3	15	15	10	60			100	3
MM3	IN1516	Security analysis and portfolio management	3			3	15	15	10	60			100	3
MM4	IN1616	Spreadsheet based data analysis	3			3	15	15	10	60			100	3
MM5	IN1716	IT operations &Management	2			2	15	15	10	60			100	2
Total			**14**	**0**	**0**	**14**	**75**	**75**	**50**	**300**	**0**	**0**	**500**	**14**

C. **Eligibility criteria:** Students enrolled in B. Tech program other than Instrumentation Engineering are eligible. The allotment of minor degree Programme will be as per the policy of the Institute.

D. Intake : Minimum 15

E. Detailed syllabus:

SEMESTER – III

Course Code	IN 1316	**Course category**	**MM1**
Course Name	**BANKING OPERATION AND MANAGEMENT**		

Teaching Scheme				**Examination Scheme**								**Credits**
				Theory					Practical		Total	
Th	Tu	Pr	Total	CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	00	00	03	15	15	10	60	2hr30 min	00	00	100	03

Course Objective :

Aim of the course is to :

This course aims at enabling the students to understand and to contribute to the strategic operational policies and practices of commercial banks management in a competitive environment

Course Contents:

Introduction –Scheduled and non scheduled banks, origin and developments, evolution and growth of banking system in India, present structure of banking

Concept of Bank marketing, formulating and implementing marketing strategies for commercial bank ,relationship banking concept and strategy

Liquidity, purpose, sources, measurement, liquidity, profitability problems , theories of liquidity management, priorities in the employment of bank funds ,capital adequacy in banks

Credit Management : cardinal principal of sound bank lending, formulating loan policy, factors influencing loan policy, contents of loan policy ,evaluating credit applicant, loan supervision

Investment Management: Nature and significance of investment management in commercial banks, fundamental principles of security investment by commercial bank ,management of security investment ,reviewing investment portfolio, organization of investment function

Asset Liability Management and Non performing asset : concept of Asset Liability Management ,objectives ,functions,processes,measurement and management risks, concept of NPAs, NPAs in Indian commercial banks, causes, suggestions and steps for containing NPAs, Prudential norms

Text Books

1 Srivastava, Divya Nigam, Manageent of Indian financial Institutions, Himalaya Publishing house

2 M.Y.Khan,Indian Financial System,Tata Mc Graw Hill

Reference Books

1. Bharati Pathak,Indian Financial System
2. Gerald Halter,Bank Investments and Funds Management ,McMillan
3. Stigum,Managing Bank Assets and Liabilities,Dow-Jones Irwin
4. Dudley Luckett,Money and Banking ,Mc Graw Hill
5. Vasant Joshi ,VinayJoshi ,Managing Indian Banks, -Challenges Ahead Response Books

6. Journals: Professional Banker

Coure Outcome :

IN1316.1 Gain thorough understanding with fundamentals of Banking operation & Management

IN1316.2 Express the liquidity system in banking

IN1316.3 Explore the credit management system and loan system in banking

IN1316.4 Explore the investment portfolio with good strategy

IN1316.5 Identify the ALM and NPA in banking

CO – PO – PSO Mapping as per Jan-2016 Format This subject is offered for other deptt. Students /Multidisciplinary course , PSO is not considered

Course	Program Outcomes											
Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IN1316.1	3	0	0	0	0	0	0	0	0	0	0	0
IN1316.2	3	2	0	0	0	0	0	0	0	0	0	0
IN1316.3	3	0	0	0	0	0	0	0	0	2	0	0
IN1316.4	3	0	0	0	0	0	0	0	0	2	0	0
IN1316.5	3	0	0	0	0	0	0	0	0	2	0	0

0-Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

CO – PO – PSO Mapping as per NBA Jul-2024 format [w.e.f. 01 Jan 2025]

Course	Program Outcomes													
Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
IN1316.1	3	0	0	0	0	0	0	0	0	0	0	3	0	0
IN1316.2	3	2	0	0	0	0	0	0	0	0	0	3	0	0
IN1316.3	3	0	0	0	0	0	0	0	0	2	0	3	0	0
IN1316.4	3	0	0	0	0	0	0	0	0	2	0	3	0	0
IN1316.5	3	0	0	0	0	0	0	0	0	2	0	3	0	0

0- Not correlated 1 - Weakly Correlated 2 - Moderately Correlated 3 - Strongly Correlated

SEMESTER – IV

Course Code	IN 1416							Course category			MM
Course Name	STRATEGIC MANAGEMENT AND INNOVATION IN BANKING										
Teaching Scheme				Examination Scheme							Credits
				Theory					Practical		Total	
Th	Tu	Pr	Total	CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	00	00	03	15	15	10	60	2hr30 min	00	00	100	03

Course Objectives:

Aim of the course is to:

I. Acquire knowledge about the banking and strategy for changing environment
II. To introduce strategy asset management system
III. To understand management of technological innovation in banking
IV. Learn digital technology involved in banking.
V. To understand Corporate social responsibility in banking system

Course Contents:

Strategy and Strategic Leadership in dynamic times- Introducing Strategic Management, leading strategically through effective vision and mission, Strategic Thinking Meaning, Foundation of Strategy, Strategic Intelligence including strategy analytics, appreciation of conflicts including resources, Strategic Finance Management, Strategic Cost Management
Innovation and Technology Factor: Innovation, Strategic Management of Innovation and challenges, Strategy design process, Management of technological innovation and Challenges
Digital Factor: Digitalization, Payment System, Strategic Digital banking and Capabilities applied and required along the stages of the customer journey, big data, social media
Strategic Leadership-Innovation, and Change: Role of strategic leadership in innovation and transformation, Organizational ambidexterity and innovation typologies, managing resistance and enabling strategic renewal
Strategic Evaluation and Control Mechanisms: Designing strategic control systems, Key Performance Indicators (KPIs) and feedback loops, Corrective actions and continuous improvement, Strategic Corporate Social Responsibility (CSR)

Text/Reference Books:

1. Strategic management and Innovation in banking -Indian Institute of Banking and finance
2. Ethics in Banking - Indian Institute of Banking and finance
3. John A Peace II ,RichardB ,AmitaMital ,Strategic Management planning for domestic andglobal competition ,Tata McGraw Hill

Course Outcomes:

IN1416.1Address the banking and strategy in the context of fast changing environment
IN1416.2 Analysis of the strategy asset management system
IN1416.3 Explore the management of technological innovation in banking
IN1416.4 Demonstrate the digital technology system in banking
IN1416.5 Explore the Corporate social responsibility in banking system\

CO – PO – PSO Mapping: This subject is offered for other deptt. Students/Multidisciplinary course , PSO is not considered

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IN1416.1	2	2	0	0	0	0	0	0	0	0	0	0
IN1416.2	1	0	0	0	0	0	0	0	0	0	0	0
IN1406.3	1	2	2	1	1	1	0	0	0	0	0	0
IN1406.4	2	1	2	2	0	0	0	0	0	0	0	0
IN1406.5	2	2	0	0	2	0	0	0	0	0	0	0

0 - Not correlated1 - Weakly Correlated2- Moderately Correlated 3- Strongly Correlated

CO – PO – PSO Mapping as per NBA Jul-2024 format [w.e.f. 01 Jan 2025]

Course Outcomes	Program Outcome										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
IN1416.1	3	0	0	0	0	0	0	0	0	0	0
IN1416.2	3	2	0	0	0	0	0	0	0	0	0
IN1416.3	3	0	0	0	0	0	0	0	0	2	0
IN1416.4	3	0	0	0	0	0	0	0	0	2	0
IN1416.5	3	0	0	0	0	0	0	0	0	2	0
Average	3	2	0	0	0	0	0	0	0	2	0

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

SEMESTER V

Course Code	IN 1516						Course category		MM
Course Name	SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT								
Teaching Scheme				Examination Scheme					Credits
Th	Tu	Pr	Total	Theory				Practical	Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	00	00	03	15	15	10	60	2 hrs 30 min	00	00	100	03

Course Objectives:

Aim of the course is to

I. Understand the meaning of investment, speculation and gambling
II. Analyse different alternatives for making efficient investment.
III. Understand the type of investor's mistake made by investors.
IV. Understand the concept of return and risk
V. Calculate the risk and return.

Course Contents:

Investment Management: Critical Differences between Investment and Speculation, Gambling, Investment Objectives, Investment Process, Investment Alternatives Evaluation, Common Investor Mistakes

Meaning and types of Financial Markets: How Do Financial Markets Work? Who Are the Main Participants in Financial Markets? Money and Capital Markets, Forex and Derivative markets

Fixed Income and Other Investment Alternatives: Bonds, Types of Bonds, Bond Pricing, Risk in Bonds, Alternative Investments

Risk and Return: The Concept of Return, the Concept of Risk, Quantification of Risk, The Variance & Standard Deviation

Fundamental Analysis: Understanding Fundamental Analysis Basics, Industry Analysis, Economic Analysis, Company Analysis

Portfolio Construction and Management: The Efficient Frontier, Portfolio risk, Portfolio return, Diversification- Meaning

Portfolio Evaluation and Revision: Need for Portfolio Revision, Evaluation, Passive vs. Active Portfolio Management

Text Books

1. K Sasidharan& Alex K Mathews,"Security Analysis And Portfolio Management",McGraw Hill Education
2. Pandian, Punithavathy, "Security Analysis and Portfolio Management", Vikas Publishing House.

Web Resources:

1. https://en.wikipedia.org/wiki/Securities_market\
2. https://www.indiainfoline.com/knowledge-center/share-market/differencebetweenprimary-market-and-secondary-market
3. https://en.wikipedia.org/wiki/Stock_market
4. https://groww.in/blog/clearing-and-settlement-process-in-stock-market

Course Outcome:

After successful completion of this course, students will be able to:

IN1516.1 Explain the fundamental concepts of investment, financial markets, and various investment alternatives.

IN1516.2 Assess risk and return characteristics of individual securities and portfolios using various financial models.

IN1516.3 Apply valuation techniques for equity, bonds, and other financial instruments to determine their intrinsic value.

IN1516.4 Explain the Efficient Market Hypothesis (EMH) and its implications for investment strategies.

IN1516.5 Use fundamental and technical analysis tools to evaluate securities and make informed investment decisions.

CO – PO – PSO Mapping as per Jan-2016 Format This subject is offered for other deptt. Students/Multidisciplinary course , PSO is not considered

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IN1515.1	3	1	0	0	0	0	0	0	0	0	0	0
IN1515.2	3	2	0	0	0	0	0	0	0	0	0	0
IN1515.3	3	3	0	0	0	0	0	0	0	0	0	0
IN1515.4	3	2	1	0	2	0	0	0	0	0	1	1
IN1515.5	2	0	0	0	1	0	0	0	0	0	0	0

0-Not correlated 1 -Weakly Correlated 2- Moderately Correlated 3-Strongly Correlated

CO – PO – PSO Mapping as per NBA Jul-2024 format [w.e.f. 01 Jan 2025]

Course Outcomes	Program Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
IN1516.1	3	1	0	0	0	0	0	0	0	0	0
IN1516.2	3	2	0	0	0	0	0	0	0	0	0
IN1516.3	3	3	0	0	0	0	0	0	0	0	0
IN1516.4	3	2	1	0	2	0	0	0	0	1	1
IN1516.5	2	0	0	0	1	0	0	0	0	0	0

0-Not correlated 1 -Weakly Correlated 2- Moderately Correlated 3-Strongly Correlated

SEMESTER VI

Course Code	IN 1616								Course category			MM
Course Name	SPREADSHEET BASED DATA ANALYSIS											
Teaching Scheme				Examination Scheme								Credits
Th	Tu	Pr	Total	Theory					Practical		Total	
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE		
03	00	00	03	15	15	10	60	2 hrs 30 min	00	00	100	03

Course Objectives:

Aim of the course is to**:**

I. Introduce students to the use of spreadsheets for financial data analysis and decision-making.
II. Develop proficiency in financial modelling, forecasting, and investment analysis using spreadsheet tools.
III. Enable students to apply statistical and financial functions for data-driven decision-making.
IV. Equip students with skills in financial reporting, budgeting, and risk analysis.
V. Enhance problem-solving skills through hands-on exercises and real-world case studies.

Course Contents:

Introduction to Spreadsheet for Financial Analysis

Overview of spreadsheet tools (MS Excel, Google Sheets), Basic operations: Data entry, formatting, and conditional formatting, Importance of spreadsheets in financial decision-making

Basic Financial Functions & Formulas

Arithmetic and logical operations, Cell referencing (absolute, relative, mixed), Common financial functions: SUM, AVERAGE, MIN, MAX, ROUND, Text functions useful for financial reporting

Time Value of Money & Financial Functions

Present Value (PV) and Future Value (FV) functions, Net Present Value (NPV) and Internal Rate of Return (IRR), Payment (PMT) function for loan and mortgage calculations, Depreciation calculations (SLN, DB, DDB)

Financial Statement Analysis

Understanding balance sheets, income statements, and cash flow statements, Ratio analysis: Liquidity, profitability, and solvency ratios, Trend analysis using spreadsheets, Common size analysis and financial forecasting

Budgeting and Forecasting

Creating dynamic budgets in spreadsheets, Forecasting revenue and expenses using moving averages, Break-even analysis using Goal Seek and Solver

Data Analysis & Visualization for Finance

Creating financial charts (line graphs, bar charts, waterfall charts), Pivot tables for financial data analysis, Dynamic dashboards for financial reporting, Conditional formatting for financial insights

Investment Analysis & Portfolio Management

Risk and return analysis using spreadsheet functions, Portfolio optimization using Solver, Capital Asset Pricing Model (CAPM) in Excel, Scenario and sensitivity analysis for investment decisions

Reference Books:

1. Simon Benninga," Financial Modelling" MIT Press
2. Craig W. Holden," Spread sheet Modelling in Corporate Finance" –

Course Outcomes

By the end of the course, students will be able to:

IN1616.1 Apply spreadsheet tools for financial data entry, analysis, and reporting.
IN1616.2 Use basic and advanced financial functions to evaluate investments and business decisions.
IN1616.3 Create financial models for cash flow analysis, budgeting, and forecasting.
IN1616.4 Analyze financial statements and performance metrics using Excel.
IN1616.5 Perform sensitivity and scenario analysis for risk assessment.

CO – PO – PSO Mapping as per Jan-2016 Format : This subject is offered for other deptt. Students/Multidisciplinary course, PSO is not considered

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IN1616.1	2	3	1	0	0	0	0	0	0	0	0	0
IN1616.2	2	3	1	0	0	0	0	0	0	0	0	0
IN1616.3	1	1	3	1	3	0	0	0	0	0	0	0
IN1616.4	1	3	2	2	2	0	0	0	0	0	0	0
IN1616.5	1	3	1	0	3	0	0	0	0	0	0	0

0 - Not correlated1 - Weakly Correlated2- Moderately Correlated 3- Strongly Correlated

CO-PO-PSO mapping as per NBA Jul 2024 Format [w.e.f. from 01 Jan 2025]

Course Outcomes	Program Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
IN1616.1	2	3	1	0	0	0	0	0	0	0	0
IN1616.2	2	3	1	0	0	0	0	0	0	0	0
IN1616.3	1	1	3	1	3	0	0	0	0	0	0
IN1616.4	1	3	2	2	2	0	0	0	0	0	0
IN1616.5	1	3	1	0	3	0	0	0	0	0	0

0 - Not correlated 1 - Weakly Correlated 2- Moderately Correlated 3- Strongly Correlated

SEMESTER VII

Course Code	IN 1716											**Course category**	**MM5**
Course Name	**IT OPERATION AND MANAGEMENT**												
Teaching Scheme				**Examination Scheme**								**Credits**	
Th	Tu	Pr	Total	Theory					Practical		Total		
				CT1	CT2	TA	ESE	ESE Duration	ICA	ESE			
03	00	00	03	15	15	10	60	2hr30 min	00	00	100	03	

Curriculum will be published and implemented from Academic Year 2026-2027 progressively