

RGPV (DIPLOMA WING) BHOPAL		OBE CURRICULUM FOR THE COURSE			FORMAT- 3	Sheet No. 1/6
Branch	ELECTRICAL & ELECTRONICS ENGINEERING			Semester	Sixth	
Course Code	601	Paper code		Subject	Instrumentation	
Course Outcome 1	Use various transducers for measurement of physical quantities.				Teach Hrs	Marks
Learning Outcome E0560111	Identify functional elements of instrumentation system, performance characteristics and classify transducers. (Cognitive domain)				7	10
Contents	<ul style="list-style-type: none"> Instrumentation System: Elements, Block Diagram & their functions Static & dynamic characteristics, Noise, S/N ratio & Noise factor Transducers: Definition and classification, Electrical transducers, Advantages of electric transducers. Classification of Electrical Transducer: Active and passive transducers, Resistive, inductive and capacitive transducers. Analog and Digital transducer. 					
Method of Assessment	<i>Internal: Mid Semester Exam-I, Pen paper test & Assignment.</i>					
Learning Outcome E0560112	Compare various transducers based on their construction, working & application. (Cognitive domain)				9	12
Contents	<ul style="list-style-type: none"> Resistive Transducer: Potentiometric, Metallic and semiconductor strain gauges, RTD and Thermistor. Inductive Transducer: Self Inductance type, LVDT and applications. Capacitive Transducers: Principle of operation, Differential arrangement, characteristics, advantage, disadvantage and applications. Active Transducers: Thermocouples, Piezo-Electric transducers. Hall effect transducers and their application. Opto-electronic transducers: photo voltaic, photo conductive, photo emissive transducers and Optical encoders. 					
Method of Assessment	<i>External : End Semester Theory Exam - Pen paper test</i>					
Learning Outcome E0560113	Apply various transducers for measurement of physical quantities. (Psychomotor domain)				8	10
Contents	<ul style="list-style-type: none"> Measurement of linear displacement by LVDT and draw its characteristics. Measurement of temperature by RTD. Measurement of temperature by Thermocouple. 					
Method of Assessment	<i>External: Laboratory observation and viva voce</i>					

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Branch	ELECTRICAL & ELECTRONICS ENGINEERING			Semester	Sixth	
Course Code	601	Paper code		Subject	Instrumentation	
Course Outcome 2	Illustrate signal conditioning system for data manipulation.			Teach Hrs	Marks	
Learning Outcome E0560124	Identify various signal conditioning system for data manipulation. (Cognitive domain)			8	10	
Contents	<ul style="list-style-type: none"> Signal conditioning: Need, Block diagram of AC and DC systems Instrumentation Amplifier: characteristics, three amplifier configuration. DC Amplifier, Chopper Amplifier. Operational amplifier: Use of Operational amplifier in instrumentation (inverter, comparator, adder, subtractor, multiplier, divider, integrator and differentiator. A/D converter: Successive approximation and dual slope. D/A converter: Binary weighted and R-2R ladder network methods 					
Method of Assessment	<i>External : End Semester Theory Exam - Pen paper test</i>					
Learning Outcome E0560125	Interpret function of Data Acquisition System and Data logger. (Cognitive domain)			8	10	
Contents	<ul style="list-style-type: none"> Data Acquisition System: Introduction, generalized block diagram, single and multi-channel DAS Microprocessor: Introduction, basic concept, block diagram. Data logger: Introduction, Block diagram, microprocessor based data logger. 					
Method of Assessment	<i>Internal: Mid Semester Exam-II, Pen paper test & Assignment</i>					
Learning Outcome E0560126	Use various signal conditioning devices for data manipulation and conversion. (Psychomotor domain)			8	10	
Contents	<ul style="list-style-type: none"> Use of Operational amplifier for data manipulation. Demonstration of analog to digital converter. Demonstration of digital to analog converter. 					
Method of Assessment	<i>Internal: Laboratory observation and viva voce</i>					

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Branch	ELECTRICAL & ELECTRONICS ENGINEERING			Semester	Sixth	
Course Code	601	Paper code		Subject	Instrumentation	
Course Outcome 3		Apply various transducers for measurement of non-electrical quantities.			Teach Hrs	Marks
Learning Outcome E0560137		Use various transducers for measurement of non-electrical quantities. (<i>Cognitive domain</i>)			8	10
Contents		<ul style="list-style-type: none"> Flow Measurement: Electromagnetic flow meter and ultrasonic flow meter. Level Measurement: Float & potentiometer type, Resistive, Capacitive and ultrasonic method. Force & Torque Measurement: Electronic weighting system (Block Diagram), stress & deflection type torque measurement. Humidity Measurement: Absolute and Relative humidity (definition only), Resistive hygrometer. 				
Method of Assessment		<i>External : End Semester Theory Exam - Pen paper test</i>				
Learning Outcome E0560138		Utilize various transducers for measurement of non-electrical quantities. (<i>Cognitive domain</i>)			8	12
Contents		<ul style="list-style-type: none"> Pressure Measurement: Classification, Pressure actuators(bellow bourdon tube & diaphragm gauge). Resistive, inductive and capacitive methods. Low Pressure measurement: Pirani gauge and thermocouple gauge. Speed Measurement: Contact and non-contact type tachometers, Photo-electric and Reluctance pick up tachometer, stroboscopic method of speed measurement and Digital tachometers (LDR type). Vibration Measurement: Concept of vibration measurement, LVDT type and Piezo-electric type accelerometers. Temperature Measurement: Radiation & optical pyrometers. pH Measurement: Definition of pH value and pH scale, pH cell. 				
Method of Assessment		<i>External : End Semester Theory Exam - Pen paper test</i>				
Learning Outcome E0560139		Measure non-electrical quantities using various transducers. (<i>Psychomotor domain</i>)			8	12
Contents		<ul style="list-style-type: none"> Measurement of Liquid level using Resistive/Capacitive methods. Measurement of temperature by optical pyrometer. Measurement of speed by stroboscope. Measurement of pH value by pH meter. 				
Method of Assessment		<i>External: Laboratory observation and viva voce</i>				

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Branch	ELECTRICAL & ELECTRONICS ENGINEERING			Semester	Sixth	
Course Code	601	Paper code		Subject	Instrumentation	
Course Outcome 4		Identify the need, principles and various techniques of telemetry system.			Teach Hrs	Marks
Learning Outcome E05601410	Illustrate telemetry systems used in instrumentation (Cognitive domain).			8	8	
Contents	<ul style="list-style-type: none"> Telemetry system: voltage, current, position (potentiometer and synchros), frequency & pulse Telemetry. Frequency Telemetry system: modulation & demodulation, A.M., F.M. & Phase Modulation. Pulse Telemetry system: analog pulse telemetry system (PAM, PFM, PDM, PPM, PCM). 					
Method of Assessment	<i>External : End Semester Theory Exam - Pen paper test</i>					
Learning Outcome E05601411	Classify telemetry channels and multiplexing systems. (Cognitive domain)			8	12	
Contents	<ul style="list-style-type: none"> Wire line, Radio channel & Microwave Channels and Concept of Optical Fiber Channels. Multiplexing system: Need, types (TDM & FDM), block diagram & functioning with applications & limitation. Pulse Code Format used in Digital Data Transmission. Various techniques used in digital data transmission (ASK, FSK, PSK). Concept of Digital Multiplexer, Digital Multiplexer & De multiplexer. 					
Method of Assessment	<i>External : End Semester Theory Exam - Pen paper test</i>					
Learning Outcome E05601412	Demonstrate TDM, FDM and position telemetry. (Psychomotor domain)			8	10	
Contents	<ul style="list-style-type: none"> Demonstrate working of time division multiplexing. Demonstrate working of frequency division multiplexing. Use of synchros for position telemetry system by measuring error voltage. 					
Method of Assessment	<i>Internal: laboratory observation and viva voce.</i>					

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Branch	ELECTRICAL & ELECTRONICS ENGINEERING			Semester	Sixth	
Course Code	601	Paper code		Subject	Instrumentation	
Course Outcome 5	Identify display devices and recorders for various applications.				Teach Hrs	Marks
Learning Outcome E05601513	Illustrate construction, working and applications of various display devices. <i>(Cognitive domain)</i>				8	10
Contents	<ul style="list-style-type: none"> • Introduction to digital display devices, seven segment and dot matrix display, construction, working and applications of LED, LCD and OLED display devices. Concept of 3½, 4½ digits. • Concept of touch screen display, types, resistive and capacitive touch screen display. 					
Method of Assessment	<i>Internal: Assignment and Quiz</i>					
Learning Outcome E05601514	Classify recorders and describe their construction, working and applications. <i>(Cognitive domain)</i>				8	6
Contents	<ul style="list-style-type: none"> • Recorders: Necessity and Classification. • Analog recorders: Construction, working and applications of ultraviolet, X-T and X-Y recorders. • Digital recorders: Introduction and uses of Bar code and QR (quick response) readers and recorders (optical). 					
Method of Assessment	<i>External : End Semester Theory Exam - Pen paper test</i>					
Learning Outcome E05601515	Apply various recorders for given applications. <i>(Psychomotor domain)</i>				8	8
Contents	<ul style="list-style-type: none"> • Demonstration of X-T (strip chart) recorders. • Demonstration of X-Y recorders. • Use Bar code, QR readers and recorders. 					
Method of Assessment	<i>External: Laboratory observation and viva voce</i>					

REFERENCE BOOKS:

S.N.	Title & Publication	Author
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1	Electrical and electronics measurement and Instrumentation, Dhanpat Rai & Co, Delhi, ISBN: 8177001000	Sawhney, A. K.
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2	Instrumentation Devices and Systems, Tata McGraw Hill Education, New Delhi, ISBN: 978-0-07-463350-2	Rangan, C. S., Sharma, G. R. and Mani, V. S. V.
3	Instrumentation Measurement and Analysis, Tata McGraw Hill Education, New Delhi, ISBN: 978-0-07-015127-7	Nakra, B. C. and Chaudhry, K. K.
4	Modern Electronic Instrumentation and Measurement Techniques, Prentice Hall India Publication, New Delhi	Helfrick, A. D. and Cooper, W. D.
5	Electronic Instrumentation and Measurement, Technical Publication, Pune. ISBN: 9350381265	Bakshi, U. A., Bakshi, A. V. and Bakshi, K. A.