Branch		Electrical Engineering		Semester		4

Course Code	403	Paper code			Subject	Instrumentation

CourseOutcome1	**Use various transducers for measurement of physical quantities.**	**Teach Hrs**	**Marks**
Learning Outcome E0140311	Identify functional elements of instrumentation system, performance characteristics and classify transducers. *(Cognitive domain)*	7	10
Contents	• 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	*Internal: Mid Semester Exam-I, Pen paper test & Assignment.*		
Learning Outcome E0140312	Compare various transducers based on their construction, working & application. *(Cognitive domain)*	9	12
Contents	• 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	*External : End Semester Theory Exam - Pen paper test*		
Learning Outcome E0140313	Apply various transducers for measurement of physical quantities. *(Psychomotor domain)*	6	10
Contents	• Measurement of linear displacement by LVDT and draw its characteristics. • Measurement of temperature by RTD. • Measurement of temperature by Thermocouple.		
Method of Assessment	*External: Laboratory observation and viva voce*		

Branch		Electrical Engineering	Semester		4

Course Code	403	Paper code		Subject	Instrumentation

CourseOutcome2	**Illustrate signal conditioning system for data manipulatio**n.	**Teach Hrs**	**Marks**
Learning Outcome E0140324	Identify various signal conditioning system for data manipulation. *(Cognitive domain)*	7	10
Contents	• 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	*External : End Semester Theory Exam - Pen paper test*		
Learning Outcome E0140325	Interpret function of Data Acquisition System and Data logger. *(Cognitive domain)*	7	10
Contents	• 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	*Internal: Mid Semester Exam-II, Pen paper test & Assignment*		
Learning Outcome E0140326	Use various signal conditioning devices for data manipulation and conversion. (Psychomotor domain)	8	10
Contents	• Use of Operational amplifier for data manipulation. • Demonstration of analog to digital converter. • Demonstration of digital to analog converter.		
Method of Assessment	*Internal: Laboratory observation and viva voce*		

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Branch		Electrical Engineering	Semester	4

Course Code	403	Paper code		Subject	Instrumentation

Course Outcome 3	Apply various transducers for measurement of non-electrical quantities.	Teach Hrs	Marks
Learning Outcome E0140337	Use various transducers for measurement of non-electrical quantities. *(Cognitive domain)*	8	10
Contents	- 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	*External : End Semester Theory Exam - Pen paper test*		
Learning Outcome E0140338	Utilize various transducers for measurement of non-electrical quantities. *(Cognitive domain)*	8	12
Contents	- 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	*External : End Semester Theory Exam - Pen paper test*		
Learning Outcome E0140339	Measure non-electrical quantities using various transducers. *(Psychomotor domain)*	8	12
Contents	- 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	*External: Laboratory observation and viva voce*		

RGPV(DIPLOMAWING)BHOPAL	OBE CURRICULUM FOR THE COURSE	FORMAT-3	Sheet No. 4/6

Branch		Electrical Engineering		Semester		4
Course Code	403	Paper code		Subject		Instrumentation

Course Outcome 4	**Identify the need, principles and various techniques of telemetry system.**	Teach Hrs	Marks
Learning Outcome E01403410	Illustrate telemetry systems used in instrumentation *(Cognitive domain).*	6	8
Contents	• 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	*External : End Semester Theory Exam - Pen paper test*		
Learning Outcome E01403411	Classify telemetry channels and multiplexing systems. *(Cognitive domain)*	8	12
Contents	• 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	*External : End Semester Theory Exam - Pen paper test*		
Learning Outcome E01403412	Demonstrate TDM, FDM and position telemetry. *(Psychomotor domain)*	7	10
Contents	• 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	*Internal: laboratory observation and viva voce.*		

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Branch		Electrical Engineering	Semester		4

Course Code	403	Paper code		Subject	Instrumentation

		Teach Hrs	**Marks**
Course Outcome 5	**Identify display devices and recorders for various applications.**		
Learning Outcome E01403513	Illustrate construction, working and applications of various display devices. *(Cognitive domain)*	6	10
Contents	• 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	*Internal: Assignment and Quiz*		
Learning Outcome E01403514	Classify recorders and describe their construction, working and applications. *(Cognitive domain)*	4	6
Contents	• 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	*External : End Semester Theory Exam - Pen paper test*		
Learning Outcome E01403515	Apply various recorders for given applications.*(Psychomotor domain)*	6	8
Contents	• Demonstration of X-T (strip chart) recorders. • Demonstration of X-Y recorders. • Use Bar code, QR readers and recorders.		
Method of Assessment	*External: Laboratory observation and viva voce*		

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