ANNEXURE 2

As per the decision of the academic council (res 6 dated 02-02-2023), the department proposes to offer following courses as open elective in upcoming session 2023-24 for III and IV semester students.

1. **Measurement &Metrology** **MEO235(A)** **III Semester**
2. **Computer Aided Design** **MEO251** **IV Semester**
3. **Quality Management** **MEO250** **IV Semester**

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)

Mechanical Engineering Department

Semester/Year	III / II	Program	B.Tech.

Subject Category	**OC**	Subject Code:	**MEO235(A)**	Subject Name:	**Measurement &Metrology**

Maximum Marks Allotted							Contact Hours			Total Credits
Theory				Practical		Total Marks				
End Sem	Mid-Sem	Quiz	Assignment	End Sem	Lab-Work		L	T	P	
60	20	10	10	-	-	100	3	0	0	3

Prerequisites:(Only for open electives)

Nil

Course Objective:

To provide basic understanding of measurements and metrology for all Industrial Applications

Course Outcomes:

After completion of the course, students would be able to -

1. Describe basic concepts of mechanical measurement and errors in measurements
2. Evaluate methods of measurement for various quantities like force, torque, power, displacement, velocity/seed and acceleration
3. Select appropriate Electronic measuring device for various applications
4. Select appropriate temperature measuring device& Pressure measuring device for various applications
5. Analyze basic concepts of Metrology

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	1	1								
CO2	3	2	3	2								
CO3	3	2	2	2								
CO4	3	2	2	2								
CO5	3	2	2	2								

Contents:			
UNITs	Descriptions	Hrs.	CO's
I	Need of Measurement, Basic definitions: Hysteresis, Linearity, Resolution of measuring instruments, Threshold, Drift, Zero stability, loading effect and system response. Measurement methods, Generalized Measurement system, Errors and their classification, Linear Measurement Instruments, VernierCalliper, Micrometer, Interval measurements: Slip gauges, Checking of slip gauges for surface quality	8	CO1
II	**Force measurement:** load cells, cantilever beams, proving rings, differential transformers. **Measurement of torque:** Torsion bar dynamometer, servo controlled dynamometer, absorption dynamometers. Power Measurements. **Measurement of strain:** Mechanical strain gauges, electrical strain gauges, strain gauge: materials, gauge factors, theory of strain gauges and method of measurement, bridge arrangement, temperature compensation.	8	CO2
III	Working principal of Resistive Potentiometer, Linear variable differential transducers, Electro Magnetic Transducers, Mechanical, Electrical and Photoelectric Tachometers, Piezoelectric Accelerometer, Seismic Accelerometer,	8	CO3
IV	Temperature Measuring Devices: Thermocouples, Resistance Temperature Detectors, Thermistor, Liquid in glass Thermometers, Pressure Thermometers, Pyrometer, Bimetallic strip. Calibration of temperature measuring devices, Pressure Measurement, Numerical Examples on Flow Measurement.	8	CO4
V	Basics of Metrology, Need for Inspection, Accuracy and Precision, Objectives, Standards of measurements, **Comparators:** Functional Requirements, Classification, Mechanical Comparators,	8	CO5
Guest Lectures (if any)			
Total Hours		**40**	
Suggestive list of experiments:			

Text Books-

1. **Engineering Metrology and Measurement, N V Raghavendra and Krishnamurthy, Oxford University Press,**
2. **Engineering Metrology and Measurements, Bentley, Pearson Education**

Reference Books-

1. A Text book of Engineering Metrology, I C Gupta, DhanpatRai Publications
2. Theory and Design for Mechanical Measurements, 3 rd Edition, Richard S Figliola, Donald E Beasley, Wiley India
3. Metrology and Measurement, AnandBewoor&VinayKulkarni McGraw-Hill
4. Doebelin's Measurement Systems Ernest Doebelin, DhaneshManik McGraw-Hill
5. Mechanical Measurements and Instrumentations, Er. R K Rajput, Kataria Publication(KATSON)
6. Mechanical Measurement and Metrology by R K Jain, Khanna Publisher
7. Mechanical Measurement & Control by D.S. Kumar.
8. Industrial Instrumentation & Control by S K Singh, McGrawHill

Modes of Evaluation and Rubric

There will be continuous evaluation for during the semester for 40 sessional marks and 60 semester End term Marks. Out of 40 sessional marks, 20 shall be awarded for Mid semester, 20 marks to be awarded for day to day performance and Quiz/Assignments. For the 60 Marks, there will be a semester – End examination as per the norms of AICTE.

Recommendation by Board of studies on	Date:
Approval by Academic council on	Date:
Compiled and designed by	Name 1. **Dr. GauravBajpai**
Checked and approved by	Name 1.

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Mechanical Engineering Department

Semester/Year		III-IV / II	Program		B.Tech.
Subject Category	**OC**	Subject Code:	**MEO251**	Subject Name:	**Computer Aided Design**

Maximum Marks Allotted							Contact Hours			Total Credits
Theory				Practical		Total Marks				
End Sem	Mid-Sem	Quiz	Assignment	End Sem	Lab-Work		L	T	P	
60	20	10	10	-	-	100	3	0	-	3

Prerequisites:(Only for open electives)

No specific prerequisite. Only basic understanding of computer operations is required.

Course Objective:

The main learning objective of this course is to prepare the students for: 1. Applying the fundamental concepts of computer graphics and its tools in a generic framework. 2. Creating and manipulating geometric models using curves, surfaces and solids.

Course Outcomes:

After completion of the course, students would be able to -

1. Convert views from one system to other
2. understand the fundamental of CAD Graphic standards and their modes
3. understand the concept of geometric modelling
4. solve the surface modelling and their engineering application
5. get idea of strategic plan of CAD system Design & development

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2									
CO2	3	2	2	1								
CO3	3	2	2	1	1							
CO4	3	2	2	1	1							
CO5	3	2	2	1	2							

Contents:			
UNITs	Descriptions	Hrs.	CO's
I	Basic concepts of Orthographic projection system and isometric projection system. Conversion of orthographic views to isometric view and isometric view to orthographic views.	6	CO1
II	Introduction to CAD Software (CATIA), fundamental CAD concepts and the CATIA interface	6	CO2
III	Drawing with CATIA Sketcher Workbench: Basic commands to create 2D object, visual tools, concepts of DoF in 2D, Constraining DoF's and types of constraints, modification tools and transformation tools.	8	CO3
IV	Introduction to solid modeling, Pad and Pocket, show and hide objects, multi Pad and multi Pocket, Edge fillet, chamfer, shaft and groove, threads, creating planes, drafted filleted Pad and Pocket, rib and slot.	8	CO4
V	3D wire frames introduction and application, points, lines, planes, poly lines, circle, arc, axis, corner, spline and connect curve, helix, Surface Design introduction and application	6	CO5
Guest Lectures (if any)			
Total Hours		34	

Suggestive list of experiments:

Text Books-

1. CATIA V5-6R2012 for Engineers and Designers (MISL-DT) by Sham Tickoo and Gaurav Verma ISBN 9350046733
2. CATIA V5-6R2014 for Beginners Publisher : Unitech Books
3. CATIA REFERENCE GUIDE BOOK by CAD Desk (Author)

Reference Books-

1. Chris McMohan and Jimmi Browne ,"CAD/CAM Principles, practice and manufacturingmanagement ", Pearson Education Asia , Ltd, 2000
2. Ibrahim Zeid "CAD/CAM- Theory and practice"-McGraw Hill, International edition,1998

Modes of Evaluation and Rubric

There will be continuous evaluation for during the semester for 40 sessional marks and 60 semester End term Marks. The practical marks are 50, out of which 30 marks will be awarded for viva voce and 20 marks for lab work. Out of 40 sessional marks, 20 shall be awarded for Mid semester, 20 marks to be awarded for day to day performance and Quiz/Assignments. For the 60 Marks, there will be a semester – End examination as per the norms of AICTE.

Recommendation by Board of studies on	Date:
Approval by Academic council on	Date:
Compiled and designed by	Name 1.Dr. Chandra Pal Singh Name 2:
Checked and approved by	Name 1.

Note: Classes should be held only in computer lab with adequate computer facility

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Mechanical Engineering Department

Semester/Year	IV / II		Program		B.Tech.
Subject Category	OC	Subject Code:	**MEO250**	Subject Name:	**Quality Management**

Maximum Marks Allotted							Contact Hours			Total Credits
Theory				Practical		Total Marks				
End Sem	Mid-Sem	Quiz	Assignment	End Sem	Lab-Work		L	T	P	
60	20	10	10	-	-	100	3	0	0	3

Prerequisites:(Only for open electives)

Basics of Engineering operations.

Course Objective:

To apprise learners with the basic Quality Management decisions with respect to Industrial Production and Operations Management.

Course Outcomes:

After completion of the course, students would be able to -

1. Describe the Quality
2. Explain Statistical Process Control
3. ExamineAcceptance Sampling
4. Classify Total Quality Management
5. Analyze Quality Management Tools

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO 1	3	2		3	3							
CO 2	3			3								
CO 3	3		3									
CO 4	3				3							
CO 5	3		3	2	3							
	3	2	3	2.66	3							

Contents:			
UNITs	Descriptions	Hrs.	CO's
I	**Quality Control** Definitions, dimensions, and aspects of quality, Traditional and modern Views of Quality Control and Quality Assurance , Different Philosophies byQuality Gurus.Modern Quality Control Technologies, – Cost of Quality – Quality Certification	10	1
II	**Statistical Process Control**, Statistical Process Control (SPC):, manufacturing process capability, and tolerances, Tools/methods used in SPC, Control Charts, Pareto charts, Fishbone diagrams, etc. Implementation of SPC. Control Charts: Theory and applications of control charts; Controls charts for variables: charts averages, ranges, and standard deviation; Control charts for attributes: p and c charts; Fraction defective and The number of defects per unit; Different adaptation of control charts.	8	2
III	**Acceptance Sampling**: Concept of acceptance sampling; Sampling by attributes: Single and double sampling plans,, Construction and use of operating characteristic (OC) curves; Sampling by variables: Continuous sampling plans	6	3
IV	**Total Quality Management (TQM**) PRINCIPLES : Basic concepts of TQM - Definition of TQM – TQM Framework - Contributions of Deming, Juran and Crosby – Barriers to TQM Concept and philosophy, Scope, Applications, Implementation, Quality circles: objectives, structures, and techniques. Strategic quality planning, Quality statements – Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention – Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement – PDSA cycle, 5s, Kaizen – Supplier selection, Supplier Rating	8	4
V	**TQM TOOLS & TECHNIQUES:** The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Benchmarking Reason to benchmark, Benchmarking process – FMEA – Stages, Types. Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function	8	5
Guest Lectures (if any)			
Total Hours		40	

Suggestive list of experiments:

Text Books-

1. A. Mitra, Fundamentals of Quality Control and Improvement (2nd edition), Prentice Hall of India, New Delhi, 2005.

Reference Books-

1. Dale H.Besterfiled, "Total Quality Management", Pearson Education Asia, (Indian reprint 2011)
2. John Bank, The essence of total quality management PHI 2000
3. Greg Bounds, Lyle Yorks et al, Beyond Total Quality Management, McGraw Hill, 1994
4. Takashi Osada, The 5S's The Asian Productivity Organization, 1991
5. Masaki Imami, KAIZEN, McGraw Hill, 1986
6. D.C. Montgomery, Introduction to Statistical Quality Control (3rd edition), John-Wiley & Sons Inc. New York, 1996.
7. E. Grant, and R. Leavenworth, Statistical Quality Control, McGraw-Hill Inc. New York, 1996.
8. G. Taguchi, Introduction to Quality Engineering, Kraus Int. Publications, 1986.
9. D.H. Besterfield, M.C. Besterfield, G. Besterfield, and S.M. Besterfield, Total Quality Management, Prentice Hall International Inc. 1996

Modes of Evaluation and Rubric	
There will be continuous evaluation for during the semester for 40 sessional marks and 60 semester End term Marks. Out of 40 sessional marks, 20 shall be awarded for Mid semester, 20 marks to be awarded for day to day performance and Quiz/Assignments. For the 60 Marks, there will be a semester – End examination as per the norms of AICTE.	
Recommendation by Board of studies on	Date:
Approval by Academic council on	Date:
Compiled and designed by	Name 1.Dr Ravi Mohan
Checked and approved by	Name 1.

NOTE: Presentation facility must be there in the class room for this subject.