List of New Course(s) Introduced

Department : *Mechanical Engineering*

Programme Name : *B.Tech.*

Academic Year: 2016-17

List of New Course(s) Introduced

Sr. No.	Course Code	Name of the Course
01.	ME3THS31	Engineering Economics
02.	ME4TPE11	Business Communication and Presentation Skill

Department : *Mechanical Engineering*

Programme Name : *Ph. D*

Academic Year : 2016-17

List of New Course(s) Introduced

Sr. No.	Course Code	Name of the Course
01.	ETPHDT00	Research Methodology in Engineering
02.	ETPHDS00	Seminar
03.	MEPHDT01	Mechatronic System Design
04.	MEPHDT02	Reliability and Maintenance Engineering
05.	MEPHDT03	Composite Materials
06.	MEPHDT04	Material Characterization Techniques
07.	MEPHDT05	Advanced Machining Processes
08.	MEPHDT06	Micro and Precision Manufacturing
09.	MEPHDT07	Industrial Automation

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Minutes of Meetings (MoM) of Board of Studies (BoS)

MOM - 2016

Minutes of Meeting

A Meeting of board of studies has been conducted in the Department of Mechanical Engineering with reference to letter no 88/Acad/BOS/2016 dt 01-06-2016 on 08-06-2016 from 0530 PM onwards under the chairmenship of Dr Rajesh Kumar Bhushan. Associate Professor and Head. Department of Mechanical Engineering, IT GGV, Bilaspur along with subject expert Professor N D Mittal, Department of Mechanical Engineering, Maulana Azad National Institute of Technology (MANIT), Bhopal, MP;

The following members of board of studies along with invited faculty members of department of mechanical and Industrial and production engineering IT GGV, Bilaspur, were also present.

1. Dr M K Singh (Professor & invited faculty member)
2. Mr Prashant Kumar Jangde (Assistant Prof & member of BOS)
3. Mrs Shewta Singh (Assistant Prof & invited faculty member)
4. Mr Atul Sahu (Assistant Prof & invited faculty member)

In this meeting the Scheme & Syllabus of B Tech (Mechanical Engineering) & Ph D were also discussed.

i. Scheme & Syllabus of B Tech (Mechanical Engineering) 3rd and 4th Semester as per CBCS was approved. This is attached at Annexure A.
ii. Scheme & Syllabus of Ph D was approved. This is attached at Annexure B.

08/6/16
Dr Rajesh Kumar Bhushan,

8.6.16
Professor N D Mittal

8.6.16
Professor M K Singh

8.6.16
Mr Prashant Kumar Jangde

8/6/16
Mrs Shewta Singh

8/6/16
Mr Atul Sahu

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Scheme and Syllabus

INSTITUTE OF TECHNOLOGY
GURU GHASIDAS VISHWAVIDHALAYA
(A CENTRAL UNIVERSITY ESTABLISHED BY THE CENTRAL UNIVERSITY ORDINANCE 2009, NO: 3 OF 2009)
DEPARTMENT OF MECHNICAL ENGINEERING
STUDY & EVALUATION SCHEME
W.E.F. SESSION 2016-2017

Year: B.Tech. II year

SEMESTER-III

S. No.	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	INTERNAL ASSESSMENT	ESE	SUB-TOTAL	
1.	ME3THS03	Elective from Humanity Science	3	0	0	40	60	100	3
2.	ME3TBS05	Statistical Methods	3	1	0	40	60	100	4
3.	ME3TES07	Mechanics of Solid-I	3	1	0	40	60	100	4
4.	ME3TES08	Material Science & Metallurgy	3	0	0	40	60	100	3
5.	ME3TPC01	Kinematics of Machine	3	0	0	40	60	100	3
6	ME3TPC02	Applied Thermodynamics	3	0	0	40	60	100	3
		Total	**18**	**02**	**0**	**240**	**360**	**600**	**20**
		PRACTICALS							
1.	ME3LPC01	Kinematics of Machine Lab	-	-	03	45	30	75	2
2.	ME3LES07	Mechanics of Solid-I Lab	-	-	03	45	30	75	2
		Total			**06**	**90**	**60**	**150**	**04**

Total Credits: 24
Total Contact Hour: 26
Total Marks: 750

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*INTERNAL ASSESSMENT- **One Class Test of 10 Marks,Mid Semester Examination of 20 Marks, ,Teacher Assessment(Attendance/Assignment)of 10 Marks**L-LECTURE, T-TUTORIAL, P-PRACTICAL,CT-CLASS TEST, E.S.E –END SEMESTER EXAMINATION.

Electives fromHumanity Science (HS 3)
ME3THS03
ME3THS31 Engineering Economics
ME3THS32 Work study and ergonomics
ME3THS33 Employee Relations

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W.E.F. SESSION 2016-2017

Year: B.Tech. II year
SEMESTER-IV

S. No.	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	INTERNAL ASSESSMENT	ESE	SUB-TOTAL	
1.	ME4TPE01	Professional Elective	3	0	0	40	60	100	3
2	ME4TPC03	Fluid Mechanics	3	0	0	40	60	100	3
3	ME4TPC04	Manufacturing Science-I	3	0	0	40	60	100	3
4	ME4TPC05	Electrical Machine	3	1	0	40	60	100	4
5	ME4TPC06	Machine Drawing	3	0	0	40	60	100	3
6	ME4TBS06	Numerical Analysis & Computer Programming	3	1	0	40	60	100	4
		Total	**18**	**02**		**240**	**360**	**600**	**20**
		PRACTICALS							
7.	ME4LPC03	Fluid Mechanics	-	-	03	45	30	75	2
8.	ME4LPC05	Electrical Machine	-	-	03	45	30	75	2
		Total			**06**	**90**	**60**	**150**	**04**

Total Credits: 24
Total Contact Hour: 26
Total Marks: 750
*INTERNAL ASSESSMENT- **One Class Test of 10 Marks, Mid Semester Examination of 20 Marks, ,Teacher Assessment(Attendance/Assignment)of 10 Marks** L-LECTURE, T-TUTORIAL, P-PRACTICAL,CT-CLASS TEST, E.S.E –END SEMESTER EXAMINATION.

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Professional Elective –PE01
ME4T PE01
ME4T PE11 Business Communication and Presentation Skill
ME4T PE12 Renewable energy system and management
ME4T PE13 Energy and environment management

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DEPARTMENT OF MECHANICAL ENGINEERING
INSTITUTE OF TECHNOLOGY
GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.), 495009

EVALUATION SCHEME OF Pre-Ph. D COURSE WORK
EFFECTIVE FROM SESSION 2016-17

SN.	Name of the Subject	Subject Code	Periods / Week L – T – P	ESE Duration	ESE MARKS		Credits
					Max.	Min. 50%	
1	Research Methodology in Engineering	ETPHDT00	3 – 1 – 0	3 Hrs.	100	50	4
2	Elective - I	**	3 – 1 – 0	3 Hrs.	100	50	4
3	Elective - II	**	3 – 1 – 0	3 Hrs	100	50	4
4	Seminar	ETPHDS00	-	-	100	50	2
Total			**9 – 3 – 0**	**-**	**400**	**200***	**14**

Duration of the semester will be 6 months.
*Candidate has to score minimum 60% of the aggregate marks to qualify in ESE.
Two core subjects as Electives (4 credits each) to be decided by the DRC.

LIST OF ELECTIVES		**	LIST OF ELECTIVES		**
SN	Name of the Subject	Subject Code	SN	Name of the subject	Subject Code
1	Mechatronic System Design	MEPHDT01	5	Advanced Machining Processes	MEPHDT05
2	Reliability and Maintenance Engineering	MEPHDT02	6	Micro and Precision Manufacturing	MEPHDT06
3	Composite Materials	MEPHDT03	7	Industrial Automation	MEPHDT07
4	Material Characterization Techniques	MEPHDT04			

L : Lecture, T: Theory, P: Practical, Max.: Maximum Marks in ESE; Min.: Minimum Pass Marks in each subject as 50%

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(ME3THS31) ENGINEERING ECONOMICS (ELECTIVE)

Unit 1: Basic Concepts and Definitions, Methodology of Economics, Demand and Supply – elasticity,Theory of the Firm and Market Structure, Price and output determinations in different types of market

Unit 2: Public Sector Economics –Welfare economics, Central and commercial marks and their functions, Industrial policies, theory of localization, weber &surgent Florence theory, investment analysis-NPV, ROI, IRR, Payback period, SWOT analysis.

Unit 3: Monetary and Fiscal Policy;Tools, impact on the economy , Inflation, Business Cycle, Cash Flow-2,3,4 Model.

Unit 4: Business Forecasting – Elementary techniques. Cost and Revenue Analysis, Capital Budget, Break Even Analysis.

Unit5: Indian economy; Urbanization, Unemployment–Poverty, Regional Disparities, Unorganized Sectors- Roll of Plans, Reforms-Post Independent period.

Text Books:

1. Mankiw Gregory N.(2002), Principles of Economics, Thompson Asia
2. V. Mote, S. Paul, G. Gupta(2004), Managerial Economics, Tata McGraw Hill
3. Misra, S.K. and Puri (2009), Indian Economy, Himalaya
4. PareekSaroj (2003), Textbook of Business Economics, Sunrise Publishers

Refrence Books:

1.Kapila U. Indian economy since Independence. Academic Foundation, New Delhi
2.Misra, S. K. and Puri V. K. Indian Economy — Its Development Experience. Himalaya
3.Publishing House, Mumbai
4.Dutt R. and Sundharam K. P. M. Indian Economy. S. Chand & Company Ltd., New Delhi.
5.Mathur R. Indian Economic Policy and Reform. RBSA Publisher, Jaipur
6.Jalan B. Indian Economic Policy. Penguin Books Ltd
7.Government of India, Economic Survey (Annual), Economic Division, Ministry of Finance, New Delhi.

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ME4T PE11-BUSINESS COMMUNICATION AND PRESENTATION SKILL (Elective)

Unit I

Business communication covering, Role of communication in information age;concept and meaning of communication; skills necessary for technical communication;Communications in a technical organization; Barriers to the process of communication and sola

Unit II

Style and organization in technical communicationcovering, Listening, speaking,reading and writing as skills; Objectivity, clarity, precision as defining features of technicalcommunication; Various types of business writing: Letters, reports, notes, memos; Language andformat of various types of business letters; Language and style of reports; Report writing strategies; Analysis of a sample report

Unit III

Communication and personality development covering, Psychological aspects ofcommunication, cognition as a part of communication; Emotional Intelligence; Politeness and
Etiquette in communication; Cultural factors that influence communication; Mannerisms to beavoided in communication; Language and persuasion; Language and conflict resolution;

Unit IV

Language Laboratoryemphasizing Listening and comprehension skills; Reading
Skills; Sound Structure of English and intonation patterns;

Unit V

Oral Presentation and professional speakingcovering, Basics of Englishpronunciation; Elements of effective presentation; Body Language and use of voice duringpresentation; Connecting with the audience during presentation; Projecting a positive image whilespeaking; Planning and preparing a model presentation; Organizing the presentation to suit theaudience and context; Basics of public speaking; Preparing for a speech;

Text books:

1. Fred Luthans, Organizational Behaviour,McGraw Hill
2. Lesikar and petit, Report writing for Business
3. M. Ashraf Rizvi, Effective Technical Communication, McGraw Hill
4. Wallace and masters, Personal Development for Life and Work, Thomson Learning

Reference books :

1. Farhathullah, T. M. Communication skills for Technical Students
2. Michael Muckian, John Woods, The Business letters Handbook
3. Herta A. Murphy, Effective Business Communication
4. *MLA* Handbook for Writers of Research Papers

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ETPHDT00-RESEARCH METHODOLOGY IN ENGINEERING

Introduction: Definition and objectives of Research – Types of research, Various Steps in Research process, Mathematical tools for analysis, developing a research question-Choice of a problem.

Literature review, Surveying, synthesizing, critical analysis, reading materials, reviewing, rethinking, critical evaluation, interpretation, Research Purposes, Ethics in research – APA Ethics code.

Quantitative Methods for problem solving: Statistical Modeling and Analysis, Time Series Analysis. Probability Distributions, Fundamentals of Statistical Analysis and Inference, Multivariate methods.

Concepts of Correlation and Regression, Fundamentals of Time Series Analysis and Spectral Analysis, Error Analysis, Applications of Spectral Analysis.

Tabular and graphical description of data: Tables and graphs of frequency data of one variable, Tables and graphs that show the relationship between two variables , Relation between frequency distributions and other graphs, preparing data for analysis.

Use of statistical software SPSS in research. Structure and Components of Research Report, Types of Report, Layout of Research Report, Mechanism of writing a research report, referencing in academic writing.

Reference Books

1. C.R. Kothari, Research Methodology Methods and Techniques, 2/e, VishwaPrakashan, 2006
2. Donald H.McBurney, Research Methods, 5th Edition, Thomson Learning, ISBN:81-315-0047-0, 2006
3. Donald R. Cooper, Pamela S. Schindler, Business Research Methods, 8/e, Tata McGraw-Hill Co. Ltd., 2006.

MEPHDT01-Mechatronic System Design

Mechatronics System design:

Introduction to Mechatronics-Integrated design issues- Key elementsand design processes-Physical system modelling - Electrical systems-Micro processor based controller and micro electronics- Mechanicaltranslation and rotational systems-Electromechanical coupling-Fluidsystem

Actuating devices:

Direct current motor, Permanent magnet stepper motor, Mechanicalactuation, Hydraulic and pneumatic power actuation devices, Linearand latching linear actuators, Rotatory actuators, Piezo electricactuators, Actuator parameters and characteristics.

Sensors and Transducers:

An introduction to sensors and transducers, sensors for motion andposition, Force torque and tactile sensors, Flow sensors, Temperaturesensing devices, Ultrasonic sensors, Range sensors, Active vibrationcontrol using magnetostructive transducers, Lasers and Optomechatronics based devices.

Software and Hardware components in Mechatronics systems:

Signals , system and controls, system representation, Signalconditioning and devices, PLC, system representation, linearization ofnonlinear systems, Time delays and measurement of systemperformance, Elements of Data acquisition and control systems, realtime interfacing.

MEMS and Microsystems:

Microsystems and miniaturization- lithography technique- Microactuators- actuation using shape memory alloys, piezo electric crystalsand electrostatic forces- micro valves and pumps-micro sensors-Overview on applications of Robotics in automobiles and otherindustries.

Text books:

1) W. Bolton, Mechatronics, Pearson publications (ISBN 978-81-3176253-3)
2) DevdasShett, Richard A. Kolk, Mechatronics System Design,Brooks/Cole, Thomson learning(ISBN 0-534-95285-2).

Reference Books:

1) John Watton, Fundamentals of Fluid power and control, Cambridgeuniversity press (ISBN 9780521762502)
2) AndrejzM.Pawlak, Sensor and Actuators in Mechatronics Design,Taylor and Francis (ISBN-13:978-0-8493-9013-5)
3) Tai-Ran Hsu, MEMS and Microsystems design and manufacture,Tata McGraw-Hill(ISBN0-07-048709-X)
4) Stephen A.Campbell, The Science and Engineering ofmicroelectronic fabrication, Oxford university press(ISBN 0-19-568144-4)

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MEPHDT01-Mechatronic System Design

Mechatronics System design:

Introduction to Mechatronics-Integrated design issues- Key elementsand design processes-Physical system modelling - Electrical systems-Micro processor based controller and micro electronics- Mechanicaltranslation and rotational systems-Electromechanical coupling-Fluidsystem

Actuating devices:

Direct current motor, Permanent magnet stepper motor, Mechanicalactuation, Hydraulic and pneumatic power actuation devices, Linearand latching linear actuators, Rotatory actuators, Piezo electricactuators, Actuator parameters and characteristics.

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Microsystems and miniaturization- lithography technique- Microactuators- actuation using shape memory alloys, piezo electric crystalsand electrostatic forces- micro valves and pumps-micro sensors-Overview on applications of Robotics in automobiles and otherindustries.

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2) AndrejzM.Pawlak, Sensor and Actuators in Mechatronics Design,Taylor and Francis (ISBN-13:978-0-8493-9013-5)
3) Tai-Ran Hsu, MEMS and Microsystems design and manufacture,Tata McGraw-Hill(ISBN0-07-048709-X)
4) Stephen A.Campbell, The Science and Engineering ofmicroelectronic fabrication, Oxford university press(ISBN 0-19-568144-4)

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MEPHDT02- Reliability and Maintenance Engineering

Fundamentals of reliability: Scope of reliability engineering,concept of bath tub curve, types of failure data, reliabilityestimations, constant failure rate models, time dependent failurerate models, concept of failure on demand, reliability estimation ofseries/parallel/mixed/complex system configuration, concepts ofavailability and maintainability.

Design for Reliability: Capturing user's reliability requirements,reliability and/or redundancy allocation/optimization, designmethods, FMEA/FMECA, reliability testing (burn-in testing,
reliability assurance testing, reliability growth testing, acceleratedlife testing), fault tree analysis.

Availability Assessment: Markov modeling approach foravailability estimation.

Maintenance Management: Corrective, preventive and predictivemaintenance. Age and time based preventive maintenance,opportunistic maintenance, concepts of imperfect maintenance,concept of TPM and RCM, maintenance optimization.

Remaining useful life prediction of equipments subject tocondition monitoring: ANN models, ARMA models, Markovmodels, proportional hazard models.

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Suggested Books

1. CharlesEbeling, **An Introduction To Reliability andMaintainability Engineering**, Waveland PrInc; 2 Har/Cdredition, 2009.

2. Igor Bazovsky, **Reliability Theory and Practice**, DoverPublications (October, 2004).

3. Patrick O'Connor, **Practical Reliability Engineering**, JohnWiley & Sons Inc.2002.

4. Gregg K. Hobbs, **Accelerated Reliability Engineering: HALTand HASS**, Wiley, 2000.

5. G. Vachtsevanos, F.L. Lewis, M. Roemer, A. Hess and B. Wu,**Intelligent Fault Diagnosis and Prognosis for EngineeringSystems**. John Wiley & Sons, 2006. Suggested webpage: WWW.weibull.com

MEPHDT03-**Composite Materials**

Introduction: classifications, terminologies, manufacturingprocesses.

Macro-mechanical analysis of lamina: Hooke's law foranisotropic, monoclinic, orthotropic, transversely isotropic andisotropic materials–2D Unidirectional and angle ply lamina – Strength theories of lamina.

Micro-mechanical analysis of lamina: Volume and massfraction, density and void content – Evaluation of Elasticmodule, Ultimate strength of unidirectional lamina.

Macro-mechanical analysis of laminates: Laminate code,Stress strain relations – In-plane and Flexural modulus,Hydrothermal effects.

Failure Analysis and Design: Special cases of laminates,symmetric, cross ply, angle ply and antisymmetric laminates,failure criteria and failure modes

Suggested Books

1.Jones, R M, *Mechanics of Composite Materials*, Scripta BookCo.

2. Agarwal, B D and Broutman, J. D, *Analysis and Performanceof Fiber Composites*, New York, John Willey and Sons, 1990

3. Mallik, P. K, *Fiber reinforced composites : materials,manufacturing and design,* New York-Marcel and Dekker,1993 (2nd edition)

4. Arthur, K Kaw, *Mechanics of Composite Materials*, CRCPress, 1997.

5. Reddy J N, *Mechanics of Laminated Composite Plates*, CRCPress

6. Mallik, P. K, *Composite Engineering Hand Book*, New York,Marcel and Dekker, 1997 (2nd edition)

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MEPHDT04-Material Characterization Techniques

Introduction: Requirement of different techniques of materialcharacterization for different situations. Mechanical and physicalcharacterization.

Optical Metallographic Techniques: Observation ofmicrostructure. Preparation of samples (polishing, etching etc.)

Mechanical Characterization Processes: Measurement ofhardness. Measurement of fracture toughness through nanoindentation.Adhesion test. Surface profilometry. Tribological studies of materials.

Physical Characterization Processes: Introduction to differentmethods and their applications. Diffraction methods for phase,residual stresses, texture analysis etc.; Electro-optical andrelated techniques like SEM, TEM, EDS, WDS/EPMA etc.;Surface analysis and related techniques like XPS, AFM etc.;Spectroscopic techniques.

Suggested Books

1. C. R. Brundle, Charles A. Evans, Shaun Wilson,Encyclopedia of materials characterization: surfaces,interfaces, thin films, Material Characterization Series, Surfaces, Interfaces, Thin Films, Butterworth-Heinemann.

2. B.D. Cullity, Elements of X-Ray Diffraction (3rd Edition),Prentice Hall

3. Said Jahanmir, Friction and Wear of Ceramics, CRC Press

4. P J Goodhew, J Humphreys, R Beanland, ElectronMicroscopy and Analysis, 3rd edition, Taylor and Francis,London

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MEPHDT05-Advanced Machining Processes

Introduction: Types of advanced machining processes (AMPs); evolution, and need.

Mechanical Type AMPs: process principle and elements;Mechanism of material removal, parametric analysis; Shape andmaterial applications; Operational characteristics; Limitations ofUSM, AJM, WJM, AWJM processes.

Advanced Fine Finishing Process: Process principle, processequipment, parametric analysis, Applications of Abrasive FlowMachining (AFM); Magnetic Abrasive Finishing; MagnetoRheological Abrasive Finishing (MRF) processes.

Chemical Type AMPs: Process principle and details ofChemical Machining (CHM); Photo-Chemical Machining (PCM),and Bio-Chemical Machining processes (BCM).

Electro Chemical Type AMPs: ECM-Process principle,mechanism of material removal; Kinematics and dynamics anddynamics of ECM; Tooling design; Choice and analysis of process parameters; Surface finish and accuracy.

Thermal Type AMPs: Working principle; Power circuits;Mechanism of material removal; Process parameters andcharacteristics; Surface finish and accuracy, Shape andmaterials applications, limitations of EDM, LBM, EBM, IBM,PAM processes.

Derived and Hybrid AMPs: Introduction of processes likerotary ultra sonic machining (RUM), electro stream drilling(ESD), shaped tube electro machining (STEM), wire electro discharge machining (WEDM), electro chemical grinding (ECG),electro chemical honing (ECH), electro chemical debarring(ECD), and electro-chemical spark machining (ECSM).

Suggested Books

1. G.F. Benedict, **Nontraditional Manufacturing Processes**,Marcel Dekker, Inc. New York, 1987.

2. V.K. Jain **Advanced Machining Processes**, AlliedPublishers, New Delhi, 2002.

3. A. Ghosh, and A.K. Mallik, **Manufacturing Science**,Affiliated East-West Press Ltd, New Delhi, 1985.

4. P.C. Pandey, and H.S. Shan, **Modern MachiningProcesses**, Tata McGraw-Hill Publishing Co. Ltd, NewDelhi, 1980.

5. J.A. McGeough, **Advance Methods of Machining**,Chapman and Hall, London, 1988.

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MEPHDT06-Micro and Precision Manufacturing

Micro-manufacturing: Introduction to different mili-machining,micromachining, Nano-machining processes, Micro and nanofinishingprocesses, Micro-forming, Micro-joining techniques,nanotechnology processes, the related process mechanism,process parameters of these processes and their applications toproduction of miniaturized components.

Micro-machines: - Introduction, Mesoscopic domain, Biologicalsystems, cells as machines, Role of proteins, Physics of micromechanism,Future prospects.

Precision manufacturing: Introduction, concept of accuracy,tolerance and fits, influence of different factors on themaintainability of accuracy of the machine tools and the product, compensation of thermal errors and location errors, effects ofvibration and tool wear, dimensioning and dimensional chains.

Metrology and Characterization Techniques for Micro andPrecision Manufactured Products: Profilometric, Microscopic,diffractometric, and electron beam based techniques.

Suggested Books

1. I. Fujimasa, "Micromachines: A New Era in MechanicalEngineering", Oxford Science Publications.

2. J. Paulo Davim, Mark J. Jackson, "Nano andMicromachining", Wiley-ISTE

3. N.P. Mahalik, "Micromanufacturing and Nanotechnology",Springer

4. P.C. Pandey and H.S. Shan, "Modern MachiningProcesses", Tata McGraw Hill Publication.

5. V. K. Jain (Ed.), Introduction to Micromachining, NarosaPublishing House, New Delhi, 2010.

6. Yi Qin, Micromanufacturing Engineering and Technology,Elsevier, 2010 (ISBN 13: 978-0-8155-1545-6)

7. R.L. Murty, "Precision Engineering in Manufacturing", NewAge International Publishers.

8. C. R. Brundle, Charles A. Evans, Shaun Wilson,Encyclopedia of materials characterization: surfaces,interfaces, thin films, Material Characterization Series,Surfaces, Interfaces, Thin Films, Butterworth-Heinemann.

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MEPHDT07-Industrial Automation

Basic Concepts: Introduction of Mechanization andAutomation, Classification and Strategies of Automation,Reasons for and Arguments against Automation. Mechanical,Electrical, Hydraulic, and Pneumatic Devices and Controls

High Volume Manufacturing or Hard Automation: AutomatedFlow Lines, Types of Automatic Transfer Mechanisms, Designand Fabrication Considerations, Analysis of Automated FlowLines.

Assembly Automation: Assembly Systems and their Types,Manual Assembly Lines and Line Balancing, AutomatedAssembly Lines and their Types, Automatic Assembly Transfer Systems, Automatic Feeding and Orienting Devices:- Vibratoryand Mechanical Feeders and their types, Orientation of Parts,Performance and Economics of Assembly Systems, FeasibilityStudy for Assembly Automation.

Design for Assembly: Design for Manual Assembly, Design forHigh-Speed Automatic Assembly, Design for Robotic Assembly

Programmable Automation: Brief Introduction of NumericalControl (NC), Computer Numerical Control (CNC), MachiningCenters, Programmable Robots, Direct Numerical Control(DNC), and Adaptive Control.

Flexible Automation: Introduction of Group Technology (GT),Steps in Implementing GT, Part Families and Machine CellFormation, Introduction of Flexible Manufacturing Systems (FMS).

Suggested Books

1. M. P. Groover, *"Automation, Production systems andComputer Integrated Manufacturing"*, Prentice-Hall Inc.Englewood Cliffs, 1987. [Indian Edition from Prentice Hall ofIndia, New Delhi].

2. G. Boothroyd*"Assembly Automation and Product Design"*,Marcel Dekker, New York, 1992.

3. G. Boothroyd, P. Dewhurst, and W. Knight *"Product Designfor Manufacture and Assembly (2nd Edition)"*, MarcelDekker, New York, 2002.

4. G. Boothroyd, C. Poli, and L. E. Murch, *"AutomaticAssembly"*, Marcel Dekker Inc. New York, 1982.

5. G. Boothroyd, and A. H. Redford, *"Mechanized Assembly:Fundamentals of Parts Feeding, Orientation andMechanized Assembly"*, McGraw Hill Publishing Co. Ltd., London, 1968.

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