



VIII. Suggested Reading

- Jankowski G and Doyle R. 2007. *SolidWorks® For Dummies®*, 2nd Edition, Published by Wiley Publishing, Inc. ISBN: 978-0-470-12978-4
- Shih R H. 2014. *AutoCAD 2014 Tutorial-First Level: 2D Fundamentals*. SDC Publications

I. Course Title : Advanced Manufacturing Technologies

II. Course Code : FMPE 516

III. Credit Hours : 2+1

IV. Aim of the course

To learn the modern manufacturing techniques and their application to manufacture of different components and assemblies.

V. Theory

Unit I

Material and their characteristics, structure and properties of materials, wood, ferrous, Non-ferrous, alloys, plastic, elastomers, ceramics and composites. Material selection and metallurgy: Equilibrium diagram, time temperature transformation curves, heat treatments, surface treatment: Roughness and finishing.

Unit II

Measurement and quality assurance: Quality control, tolerance, limits and clearance. Automated 3-D coordinate measurements. Advance casting processes and powder metallurgy. Forming process: Fundamentals of metal forming, hot and cold rolling, forging processes, extrusion and drawing.

Unit III

Workshop practices applied in prototype production, jigs and fixtures. Traditional machining processes: Cutting tools, turning, boring, drilling, milling and related processes. Non traditional machining processes fuzzy c-mean (FCM), electric discharge machining (EDM), laser beam machining (LBM), Abrasive jet machining (AJM), and Wire-electro-discharge machining (EDM).

Unit IV

Joining processes: Gas flame processes, arc processes, brazing and soldering, adhesive and bonding.

Unit V

Numerical control: Command system codes, programme, cutter position X and Y, incremental movements, linear contouring, Z movements and commands. Manufacturing systems and automation. Robotics and robot arms. 3-D printing. Integrated manufacturing production system.

Practical

Identification of material and their application. Study of heat treatment processes and their suitability with respect to materials. Tool and equipments for measurements: Tolerance limits, clearance and surface finish. Site visits for study of advanced manufacturing techniques. Case studies.

VI. Learning outcome

The students will be able to select suitable manufacturing technique to fabricate different components used in Farm machinery.

VII. Lecture Schedule

S.No.	Topic	No. of Lectures
1.	Material and their characteristics.	1
2.	Structure and properties of materials wood, ferrous, Non-ferrous, alloys, plastic, elastomers, ceramics and composites.	2
3.	Material selection and metallurgy: Equilibrium diagram, time temperature transformation curves.	1
4.	Heat treatments, surface treatment: Roughness and finishing.	2
5.	Measurement and quality assurance: Quality control, tolerance, limits and clearance.	1
6.	Automated 3-D coordinate measurements and practice.	2
7.	Advance casting processes and powder metallurgy.	1
8.	Forming process: Fundamentals of metal forming, hot and cold rolling, forging processes, extrusion and drawing.	2
9.	Forging processes, extrusion and drawing.	1
10.	Workshop practices applied in prototype production, jigs and fixtures.	1
11.	Traditional machining processes: Cutting tools, turning, boring, drilling, milling and related processes.	2
12.	Non traditional machining processes fuzzy c-mean (FCM), electric discharge machining (EDM), laser beam machining (LBM).	2
13.	Electric discharge machining (EDM), laser beam machining (LBM).	1
14.	Abrasive jet machining (AJM), and wire-electro-discharge machining (EDM).	2
15.	Joining processes: Gas flame processes, arc processes.	2
16.	Brazing and soldering processes.	1
17.	Adhesive and bonding processes.	1
18.	Numerical control: Command system codes.	1
19.	NC Programme, Robotics and robot arms.	2
20.	Cutter position X and Y, incremental movements, linear contouring, Z movements and commands.	1
21.	Manufacturing systems and automation.	1
22.	3-D printing and integrated manufacturing production system.	2
	Total	32

VIII. List of Practicals

S.No.	Topic	No. of Practicals
1.	Identification of material and their application.	2
2.	Study of heat treatment processes and their suitability with respect to materials.	5
3.	Tool and equipments for measurements: Tolerance limits, clearance and surface finish.	4
4.	Site visits for study of advanced manufacturing techniques.	2
5.	Case studies.	2
6.	Practical examination	1
	Total	16

IX. Suggested Reading

- Begeman ML, Ostwald PF and Amstead BH. 1979. *Manufacturing Processes: SI Version*. John Wiley and Sons. 7th Edition.
- Chapman PAJ. 1996. *Workshop Technology*, Part III. CBS Publisher and distributors Pvt



Ltd. 3rd Edition international Edition.

- Gupta RB. 2017. *Production Technology*, Vol I - Production Process. Satya Prakashan, New Delhi.
- Hoyos L. 2010. *Fundamentals of Tool Design*. American Society of Tool and Manufacturer Engineers. Sixth Edition.
- Jain RK. 1994. *Production Technology: A Textbook for Engineering Students*. Khanna Publishers, New Delhi.
- Polukin P, Gringerg B, Kantenik S, Zhadan V and Vasilye D. *Metal Process Engineering*, MIR Publishers Moscow.

I. Course Title : Machinery for Precision Agriculture

II. Course Code : FMPE 517

III. Credit Hours : 2+1

IV. Aim of the course

To learn the principles behind precision agriculture and the systems for implanting the same.

V. Theory

Unit I

Importance of precision agriculture. Mapping in farming for decision making. Geographical concepts of PA. Understanding and identifying variability

Unit II

Geographical Position System (GPS) Basics (Space Segment, Receiver Segment, Control Segment), Error and correction, Function and usage of GPS. Introduction to Geographic Information system (GIS), function of GIS, use of GIS for decisions. IDI devices usage in Precision Agriculture Yield monitor, variable rate applicator for fertilizers, seed, chemicals etc. Remote sensing Aerial and satellite imagery. Above ground (non-contact) sensors.

Unit III

Data analysis, concepts of data analysis, resolution, Surface analysis. Analysis application interpretive products (map, charts, application map etc).

Unit IV

Electronics and Control Systems for Variable rate applications, Precision Variable Equipment, Tractor-Implement interface technology, Environmental Implications of Precision Agriculture.

Unit V

Goals based on end results of Precision Agriculture, Recordkeeping, Spatial Analysis, Variable Rate Application, Reducing of negative environmental impact, Crop/technology cost optimization. Economic of precision agriculture and determining equipment and software, review of Cost/Benefit of Precision Agriculture, System vs. Parcels. Making a selection.

VI. Practical

Calculation of the benefits of Data and Mapping, Determining Latitude/Longitude, UTM or State Plane Position Navigation with Waypoints, Configuring a GPS System. Defining area of field for prescriptive treatment. Making the Grid, The Grid Sampling Process, generation of yield maps, Thematic or Spatial Resolution, Yield