I K Gujral Punjab Technical University

(Minutes of Meeting)

A meeting of members of the Board of Studies **Mechanical Engineering/Production Engineering/Industrial/Automobile Engineering** was held through online (Google meet) as on **July 30th 2021** at 11:00 AM.

Following members of BOS have attended the meeting:

1. Dr. Neelkanth Grover (Chairman), Professor and Head, IKGPTU Campus Kapurthala
2. Dr. Om Pal Singh, Professor, S. Beant Singh State University, Gurdaspur
3. Dr. Vikas Chawla, Professor, IKGPTU Campus Kapurthala
4. Dr. Paramjit Singh Bilga, Professor, GNDEC, Ludhiana
5. Dr. Manpreet Kaur, Associate Professor, BBSBEC, Fatehgarh Sahib
6. Dr. Balkar Singh, Professor, IKGPTU Campus Kapurthala
7. Dr. Jagdev Singh, Professor, S. Beant Singh State University, Gurdaspur
8. Dr. Davinder Priyadarshi, DAVIET, Jalandhar
9. Dr. Amit Handa, Assistant professor, IKGPTU Campus, Kapurthala
10. Dr. Vivek Aggarwal, Assistant Professor, IKGPTU Campus, Kapurthala
11. Dr. Harmesh Kansal, Professor, UIET, Chandigarh.
12. Chairman/ Nominee BoS EE, Special Invitee, IKGPTU Campus Kapurthala

The BOS has made the following recommendations:

1. The BOS members approved the starting the M. Tech. course from the year 2021 onwards at IK Gujral Punjab Technical University Main Campus, Kapurthala. The name of M. Tech. course has been decided as M. Tech in Mechanical (Manufacturing Engineering and Automation). The scheme of the first semester for M. Tech. course, as approved by BOS members, is attached here with as Annexure-A.
2. The committee also approved the eligibility criteria for B.Sc. (Hons.) Aircraft Maintenance Engineering Course (03 years) for IET Bhaddal Engineering College as per their request.
3. A committee of three members namely, Dr. Vivek Aggarwal, Dr. Jujhar Singh, and Dr. Amit Bansal has been formed to decide the courses for a minor degree in Electricals Vehicles to be offered to the students pursuing B. Tech. Major Degree in Electrical Engineering/ Electrical and Electronics Engineering/ Electronics and Electrical Engineering.
4. The committee approved the conduct of a theory paper for Engineering Graphics and Design for B.Tech.- First year students. The syllabus as approved by BOS members is attached herewith as Annexure-B.

The meeting ended with vote of thanks to the Chairman.

Dr. Amit Bansal (Coordinator) 30/7/2021

Dr. Neelkanth Grover (Chairman)

Annexure-A

Study Scheme of M. Tech. Mechanical Engineering (Production)

(Batch 2021 Onwards)

SEMESTER 1st		Contact Hours/Week			Maximum Marks			Credits
Subject Code	**Subject Name**	**L**	**T***	**P**	**Int.**	**Ext.**	**Total**	
MTME-101	Advanced Engineering Materials	4	0	0	50	100	150	4
MTME-102	Modern Manufacturing Processes	4	0	0	50	100	150	4
MTME-103	Advanced Casting Processes	4	0	0	50	100	150	4
MTME-104	Operations Management	4	0	0	50	100	150	4
MTME-105	Metal Forming	4	0	0	50	100	150	4
	Total	**20**	**0**	**0**	**250**	**500**	**750**	**20**
Total Contact Hours/Week = 20								
* Tutorials involve problems solving sessions including practice on relevant software								

MTME-101 ADVANCED ENGINEERING MATERIALS

L	T	P
4	0	0

Classification and Selection of Materials

Classifications of materials, properties required in Engineering materials, Criteria of selection of materials, Requirements/ needs of advance materials.

Composite Materials

Fiber reinforced, laminated and dispersed materials with metallic matrix of aluminium, copper and Titanium alloys and with non-metallic matrix of unsaturated polyesters and epoxy resins. Development, Important properties and applications of these materials.

Ceramics and Glasses - Bio-ceramics

Nearly inert ceramics, bio-reactive glasses and glass ceramics, porous ceramics; Calcium phosphate ceramics: grafts, coatings Physico-chemical surface modification of materials used in medicine.

Low & High Temperature Materials

Properties required for low temperature applications, Materials available for low temperature applications, Requirements of materials for high temperature applications, Materials available for high temperature applications, Applications of low and high temperature materials.

Smart Materials

Shape Memory Alloys, Varistors and Intelligent materials for bio-medical applications, Polymers and Plastics from industry. Development, important properties and applications of these materials.

Nanomaterials

Definition, Types of nanomaterials including carbon nanotubes and nanocomposites, Physical and mechanical properties, Applications of nanomaterials.

Books Recommended:

1. Engineering Material Technology by James A. Jacobs & Thomas F. Kilduff. Prentice Hall.
2. Materials Science and Engineering by WD. Callister Jr., Wiley India Pvt. Ltd., 2010
3. Engineering Design: A Materials and Processing Approach by G.E. Dieter, McGraw Hill, 1991.
4. Materials Selection in Mechanical Design by M.F. Ashby, Pergamon Press, 1992.
5. Introduction to Engineering Materials & Manufacturing Processes by NIIT, Prentice Hall of India.
6. Engineering Materials Properties and Selection by Kenneth G. Budinski, Prentice Hall of India.
7. Selection of Engineering Materials by Gladius Lewis, Prentice-Hall, New Jersey, US.

MTME-102 MODERN MANUFACTURING PROCESSES.

L T P

4 0 0

Introduction
Introduction to different advanced processes, importance and applications of advanced manufacturing processes. Overview: non-conventional machining Processes

Mechanical Machining Processes
Abrasive jet machining, Ultrasonic machining, Abrasive flow finishing, Magnetic abrasive finishing, Water jet cutting, Abrasive water jet machining process: working principle, theory of material removal, process variables and parametric analysis, process performance, determination of material removal rate and surface finish.

Thermodynamic Machining Processes
Electrical discharge machining (EDM), Electrical discharge grinding (EDG), WEDM, LBM, PAM, EBM: working principle, theory of material removal, process variables and parametric analysis, process performance, determination of material removal rate and surface finish.

Electrochemical and Chemical Machining Processes
Chemical machining (ChM), ECM, ECG, electrochemical stream drilling (ESD), electrochemical deburring (ECDe), shaped tube electrolytic machining (STEM): working principle, theory of material removal, process variables and parametric analysis, process performance, determination of material removal rate and surface finish

Powder Metallurgy
Important characteristics and methods of producing powders, Different techniques to form the miniature product from metal power, Extruding, Isostatic molding, Fibre metal process, Sintering Hot pressing.

Special Manufacturing Processes
Physical vapor deposition, chemical vapor deposition, thermal metal spraying and Additive manufacturing such as 3-D printing.

Books Recommended:
1. Advanced Manufacturing Processes by G.F. Benidict, Marcel Deker publisher.
2. Non-conventional Machining Processes by P.K. Mishra, Narosa Publication.
3. Manufacturing Processes by B.H. Amsteal, Philip F. Ostwald & Myron L. Bengeman, John Wiley & Sons, eighth edition
4. Manufacturing Analysis by N. Cook.
5. Modern Machining Processes by P.C. Pandey and H.S. Shan, Tata McGraw-Hill Education
6. Advanced Machining Processes by V.K.Jain

MTME – 103 ADVANCED CASTING PROCESSES

L	T	P
4	0	0

Introduction

Ferrous and non-ferrous materials and their properties, Pattern materials, types and allowances, Characteristics, Ingredients and additives of moulding sand, core sands, Structure of silica and different types of clays, bonding mechanism of silica-water-clay system, Swelling of clays, sintering adhesion and colloidal clay, silica grain shape and size distribution, standard permeability A.F.S. clay, Special sand additives

Solidification of Metals

Nucleation and growth in metals and alloys, Free energy concept, Critical radius of nucleus, Segregation, Progressive and directional solidification, Constitutional super cooling, Columnar equiacquiesced and dendritic structures, Freezing of alloys, Centreline feeding resistance, Rate and time of solidification, mould constant, Fluidity of metals, Volumes redistribution, Solidification simulation, Analysis of the process.

Gate and Riser Design

Various elements of gating system, gating-system design for ferrous and non-ferrous materials, Top, bottom and inside gating, Different methods for riser design, Riser design shape, size and placement, Effect of appendages on risering, Effective feeding distances for simple and complex shapes, Use of chills, Aspiration of gases, Directional solidification stresses in castings, Metal mould reactions, Expansion scale and metal penetration, Analysis of the process

Advanced Casting Processes

Investment casting, Shell mould casting, Full mould casting, Vacuum casting, Die casting, Permanent mould casting, Continuous casting, Centrifugal casting, Squeeze casting, Slush casting

Casting Defects, Heat-Treatment of Castings and Moulding Sand Testing

Casting defects, causes and remedies; Heat treatment of steel, iron and stainless-steel castings; Moulding sand testing and control, Repair and salvage of castings, Quality control in foundries.

Books Recommended:

1. Flimm, Fundamentals of Metals Casting, Addison Wesley
2. P. N. Rao, Manufacturing Technology - Foundry, Forming and Welding, Tata McGraw Hill
3. Heine Loper and Resenthal, Principles of Metal Casting, McGraw Hill
4. Salman &Simans, Foundry Practice, Issac Pitman
5. Richard W. Heine, Principles of Metal Casting Processes, McGraw Hill
6. P. L. Jain, Principles of Foundry Technology, Tata McGraw Hill
7. Metals Handbook - Metal Casting, ASME

MTME-104 OPERATIONS MANAGEMENT

L	T	P
4	0	0

Introduction

Basic concepts of operations and production management, Types of manufacturing systems and their characteristics, scope of operations management.

Product and Process Design

System planning and design, long-range planning, product and process design and technological considerations, MACRO and MICRO process design.

Demand Forecasting

Role of demand forecasting in operations decisions; various demand patterns, qualitative and quantitative techniques of demand forecasting, introduction to standard software used in demand forecasting.

Production Planning and Scheduling

Aggregate production planning, operation scheduling, various scheduling criteria, lot sizing, job shop control; Mutli-stage manufacturing systems, their scheduling and management, capacity planning, introduction to standard software used for Production Planning and Scheduling.

Materials Planning

Details of material requirement planning (MRP), manufacturing resource planning (MRP-II) and enterprisewide resource planning (ERP) with their various techniques, JIT and JIT-II concepts.

Facilities Planning

Plant design, types and considerations in the plant location, plant layout types, design, evaluation, principles and types of material flow, optimum plant layout.

Books Recommended:

1. Modern Production/Operations Management by Buffa, E. S. and Sarin, R. K, John Wiley & Sons.
2. Production Operations Management by Adam, E., Jr. and Ebert, R. E., Pearson Education.
3. Operations Management: Policy, Practice, and Performance Improvement by Brown, S., Blackmon, K., Cousins, P. and Maylor H., Butterworth-Heinemann.
4. Operations Management by Dervitsiotis, K. N., McGraw Hill.
5. Production and Operations Management by Starr M. K.,Thomson Business Information.
6. Operations Management: Processes & Supply Chains by Karjewski, L. J, Ritzman, L. P. and Malhotra, M. K., Pearson Education.
7. Operations Management by S. Anil Kumar & N. Suresh, New Age International Publishers.

MTME-105 METAL FORMING

L	T	P
4	0	0

Plasticity – True stress and true strain, true stress-strain curves, selection of stress-strain curves for cold and hot working, yield of isotropic plastic material, yield criteria. Tresca maximum sheer-strainenergy criterion, plastic incompressibility, Poisson's ratio for plastic deformation flow rule, strain hardening function, heat generation and heat transfer in metal forming processes, temperatures in Quasi continuous forming operations. Examination of Metal forming processes. (12 Hours)

Drawing: Prediction of working loads and maximum deformation analysis of the processes of wire drawing/tube drawing, strip drawing and extrusion. various parameters/variables affecting the processes of wire drawing, tube drawing, strip drawing and extrusion; various methods of tube drawing and their comparison. Working loads for plain strain forging of strip and disc under conditions of well lubrications and sticking of material with die and under mixed conditions, prediction of working loads under above approach (simple plain strain and axis symmetric problems) (8 Hours)

Theory of Lubrication: Lubrication in metal forming processes, principles and mechanism of lubrications, hydrodynamic and their film lubrication, boundary and extreme pressure lubricants, solid lubricants, lubricants used for rolling and cold drawing, forging, extrusion and deep drawing processes; defects in various metal forming processes like rolling, forging, extrusion, wire drawing and deep drawing and their causes and remedial measures. (8 Hours)

Forming: Theory and deep drawing of circular blanks, analysis of the process, prediction of radial stress and punch load, ironing, wrinkling, blank holding and various parameters/variables affecting the deep drawing process. (6 Hours)

Rolling: Classification of rolling mills, analysis of the process. Prediction of roll pressure for flat strip rolling in the leading and lagging zones, roll separating forces, torque on the roll, effect of front and back tensions, effect of support rolls, various factors which affect rolling force. (6 Hours)

Books: An Introduction to the Principles of Metal working by Rowe, Arnold.

Metal forming analysis by Avitzer, Mcgraw hill.

Plasticity for mechanical Engineering by Johnson & Merlore; Van Northand.

High Velocity working Metals by ASME; EEE

Annexure-B

ENGINEERING GRAPHICS & DESIGN
Course Code: BTME 101-21

Internal Marks: 40 External Marks: 60
Total Marks: 100 L – 1 P -5, C =3
Duration of Final Examination: 03 Hrs.

COURSE OVERVIEW:

One of the best ways to communicate one's ideas is through some form of picture or drawing. This is especially true for the engineers. An engineering drawing course focuses on usage of drawing instruments, lettering, construction of geometric shapes, etc. The students will study the use of dimensioning, shapes and angles or views of such drawings. Dimensions feature prominently, with focus on interpretation, importance, and accurate reflection of dimensions in engineering drawing. Other areas of study in this course may include projected views and development of surfaces.

COURSE OBJECTIVES:
To understand the basic principles of engineering drawing
To have the knowledge of generating the pictorial views
To understand the development of surfaces
Use CAD tools for making drawings of machine components and assemblies.
To have the knowledge of interpretation of dimensions of different quadrant projections.

COURSE OUTCOMES:
On completion of this course students will be able to:
Prepare and understand drawings.
Use the principles of orthographic projections.
By studying about projections of solids, students will be able to visualize three dimensional objects and that will enable them to design new products.
Design and fabricate surfaces of different shapes.
Represent the objects in three dimensional appearances.

Detailed Contents

UNIT – I (18 Hrs.)
INTRODUCTION TO ENGINEERING DRAWING: Principles of engineering drawing / engineering graphics / technical drawing and their significance –Drawing Instruments: their Standard and uses – symbols and conventions in drawing practice – lettering & numbering – BIS conventions. Types of lines and their uses, Drawing Sheets: sizes and layout, methods of folding drawing sheet, Grades of pencils used, Dimensioning: definition, types and methods of dimensioning, geometrical construction, concept of scales in drawing, types of scales, construction of plane and diagonal scales.

UNIT – II (12 Hrs.)
ORTHOGRAPHIC PROJECTIONS: Relevance of projection, Types of projections, Principles of orthographic projections in reference to quadrants – conventions – first and third angle

projections, illustration through simple problems of projection; Projections of points in quadrants. Projections and trace of a line with different possible orientations in a quadrant. Methods to find true length and inclination of a line with principal planes.

UNIT – III (18 Hrs.)
PROJECTIONS OF PLANES AND SOLIDS: Concept of plane and lamina, Projections of a lamina when; parallel to any reference plane, perpendicular to any reference plane, inclined to reference plane. Traces of planes. Definition of solid, types of solids – conventions-different possible orientations of solid in a quadrant. Projections of solid when; axis parallel to reference plane, perpendicular to reference plane, inclined to one and parallel to other reference plane, parallel to both horizontal and vertical planes.

UNIT – IV (12 Hrs.)
ISOMETRIC PROJECTIONS: Principles of Isometric Projections-Isometric Scale- Isometric Views or drawing- Conventions. Isometric drawing / projections of solids such as cube, prisms, pyramids, cylinder, and cone.

UNIT – V (12 Hrs.)
Practice using Computer Aided Drafting (CAD) tools:
Hands on training on any CAD software to strengthen the understanding of the engineering drawing where in the students will be introduced to a number of assignments as mentioned in the syllabus.

Suggested Reading/Books: Text Books:
Engineering Drawing- Basant Agarwal, TMH
D. M. Kulkarni, A. P. Rastogi, and A. K. Sarkar (2009), Engineering Graphics with AutoCAD, PHI Learning Private Limited, New Delhi.
P.S Gill, "Engineering Drawing", S K Kataria and sons, 18th edition, 2017 reprint
Jolhe, Dhananjay (2006), Engineering Drawing: With an Introduction to CAD, Tata Mc Graw Hill, India.

Reference Books:
N. D. Bhat (2006), Engineering Drawing, Charotar Publications, New Delhi.
Venugopal (2010), Engineering Drawing and Graphics, 2nd edition, New Age Publications, New Delhi.
Johle (2009), Engineering Drawing, Tata Mc Graw Hill, New Delhi, India.
Trymbaka Murthy (2007), Computer Aided Engineering Drawing, I.K. International Publishers, New Delhi.
R.B. Choudary (2005), Engineering graphics with Auto CAD, Anuradha Publishers, New Delhi

NOTE:
The Question paper shall have following structure/weightage:
Section A – Short answer type Questions based upon whole syllabus – 10 questions of 02 marks each. (All questions are compulsory; 10 x 2 =20).
Section B – Questions from unit – I & II.; – 04 questions of 08 marks each
Section C – Questions from unit – III & IV.; – 04 questions of 08 marks each
(02 Question are to be attempted from Section B & C each; 01 question from Section B or C; 5 x 08=40 marks).