SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

Course Title: MECHANICAL DRAWING & DESIGN

Code No.: DRF 215-5

Program: Mechanical Drafting Technician

Semester: Four

Date: June, 1983

Author: C. Rising

New: _____ Revision: x

APPROVED: L.P. Arsenault
Chairperson

Date

CALENDAR DESCRIPTION

MECHANICAL DRAWING & DESIGN	DRF 215-5
Course Name	Course Number

PHILOSOPHY/GOALS:

To develop in the student an ability to:

Read and check drawings, including the analysis of applied tolerances.

Determine by calculation the stresses induced by interference fits and their effect.

Understand the basic principles of lubrication and its importance.

Relate to bearing terminology, the use of bearings and calculation relative to basic bearing design.

Design shafts for various applications.

Analyze and produce drawings of the motion obtained by various mechanisms.

Work for given specification to solve a simple mechanical design problem.

METHOD OF ASSESSMENT (GRADING METHOD):

A
B
C
X

Grading will be on logical solutions, layout, sketches, diagrams, drawings, general tidiness of presentation, and time factor.

TEXTBOOK(S):

Engineering Drawing & Design, Jensen & Helsel - (McGraw-Hill)

Mechanical Drawing & Design

DRF 215-5

TEXTBOOKS & REFERENCE BOOKS:

Engineering Drawing & Design (Jensen & Helsel)

Mechanical Engineering Handbook (Kent)

Machinery Handbook

C.S.A. Drawing Standards

Mechanisms (Faires & Keowin)

Worms & Worm Gears (Boston Gear)

Principles of Mechanical Design (Parr)

Technical Drawing (Giesecke)

Mechanical Drawing SI Metric (McGraw-Hill)

Fastener Standards

Metals Handbook (ASTM)

Manufacturers Catalogues

Bearing Technical Journal

Link Belt Standard Products

MECHANICAL DRAWING & DESIGN

DRF 215-5

TOPIC NO.	PERIODS	TOPIC DESCRIPTION
1	10	Checking of and Reading Drawings Select industrial drawing (general arrangement plus detail drawings) Check completely, and produce notes and corrections where necessary.
2	12	Tolerances Analysis of geometric, true position and stack tolerancing from given detail drawings and respective sub-assembly drawings. Correct where necessary.
3	6	Fits Determination of stress induced and temperature change required for interference fits. If necessary, make recommendations with respect to material selection.
4	10	Bearings Plain: Friction, lubrication, properties of bearing materials. Determination of bearing dimensions for given conditions. Roller: Terminology. Selection for specified conditions and life expectancy. Lubrication.
5	10	Shaft Design Make necessary calculations and sketches for the design of shafts and couplings from given information.
6	10	Design Simplification Analysis of given detail drawings and recommendations for component simplification.

TOPIC NO.	PERIODS	TOPIC DESCRIPTION
7	12	Mechanism Preparation of drawings, indicating motion obtained within a mechanism
8	26	Design Project Mechanical Design using given specifications. Preparation of all working drawinqs and completion of calculations where necessary.

MECHANICAL DRAWING & DESIGN

DRF 215-5

PERFORMANCE OBJECTIVES:

General Objectives:

To develop further the use of Engineering Drawing as a lanquage of communication.

To expand into the field of fundamental techniques of design, including material selection, use of reference material and catalogue information.

In addition to the above, the student will be required to demonstrate an ability to use knowledge gained in other areas of study in order to complete the various aspects of assigned work.

The following more specific objectives relate to what the student shall be able to do, apply, determine, analyze and communicate.

UNIT #1

1. Identify the purpose of engineering design.
2. Identify the necessity of having good channels of communication between design, production, sales, and manufacturing departments.
3. Demonstrate ability to provide for good communications.

UNIT #2

4. Identify the need for the checking of drawings.
5. Demonstrate ability to methodically check drawings including assembly and detail drawings.
6. Identify the need and demonstrate ability to systematically note and correct errors when checking drawings.
7. Analyze and put forth arguments from a personal viewpoint with respect to the advantages and disadvantages of a component's features and functions.

UNIT #3

8. Demonstrate ability to use reference materials for selection of limits fits and tolerances. e.g. C.S.A. publications.

9. Prove the validity of given applied tolerances with respect to:
   a) geometric tolerancing
   b) true positional tolerancing
   c) tolerance stacking

10. Identify the above tolerance applications and apply them to his/her work in order to provide for correct assembly and working conditions.

11. Demonstrate ability to recognize faults in tolerance applications and dimensioning methods.

12. Demonstrate ability to rectify faults such as those encountered in specific objective 11.

13. Evaluate induced stress due to interference fits.

14. Evaluate temperature increase required for shrink fits.

UNIT #4

15. Identify the purpose of bearings.

16. Identify the need for various types of bearing materials.

17. Identify the purpose of bearing lubrication.

18. Identify methods of bearing lubrication.

19. Identify the need for various types of bearings.

20. Demonstrate ability to recognize types of plain bearings and situations where they will be used.

21. Demonstrate ability to determine the intensity of bearing stress.

22. Demonstrate ability to determine the frictional force in a bearing.

23. Demonstrate ability to determine the frictional torque in a bearing.

24. Demonstrate ability to determine work done against friction in a bearing.

25. Demonstrate ability to determine Horse Power lost due to friction in a bearing.

26. Identify the relationship between life, load and capacity for bearings.

27. Identify use of Rotation factor V for bearings.
    1.0 for inner ring rotation
    1.2 for outer ring rotation

28. Demonstrate ability to determine specific dynamic capacity of a bearing.

29. Demonstrate ability to determine the equivalent load on a bearing.

30. Demonstrate ability to work from given information of bearing working conditions in order to select the correct bearing from manufacturers' catalogues.

UNIT #5

31. Identify the need for a sound knowledge of strengths and properties of materials in mechanical design problems.

32. Demonstrate ability to trace load transmission.

33. Demonstrate ability to perform a relatively simple stress analysis.

34. Demonstrate ability to produce a diagram indicating type of failure tending to occur at various points in specific objective 33

35. Demonstrate ability to use specific objectives 31 to 34 to design a simple joint. e.g. Pin Joint from given information.

36. Demonstrate ability to use reference text, e.g. Mechanical Engineers Handbook (Kent), to extract relevant information for the design of a similar joint to that in specific objective 35.

37. Apply information obtained from specific objectives 35 and 36, to make assembly and complete detail drawings of the designed joint.

38. Analyze given information to determine if a shaft is in simple torsion.

39. Analyze given information to determine if a shaft is in simple bending.

40. Analyze given information to determine if a shaft is in Torsion and Bending.

41. Demonstrate ability to determine torsion in a shaft.

42. Demonstrate ability to determine bending in a shaft.

43. Demonstrate ability to determine the Equivalent Twisting Moment in a shaft.

44. Demonstrate ability to determine Horse Power transmitted by a shaft.

45. Demonstrate ability to make comparisons between solid and hollow shafts.

46. Analyze given information in order to design a shaft.

47. Identify the need for shaft couplings.

48. Demonstrate the ability to design, from given information, a coupli for a shaft.

UNIT #6

49. Identify the need for component design simplification.

50. Identify the economy of saving on machined areas.

51. Identify the economy of avoidance of small tolerances.

52. Identify the simplification by separation, under certain circumstances, of one component into two or more components.

53. Identify the simplification of amalgamation of components into one component.

54. Analyze given information with respect to specific objectives 49 to 53, and identify a need for simplification with respect to various components.

55. Identify the necessity of determining that after simplification the modified component must exactly fulfill the function of the displaced component.

56. Idenitfy the need to communicate with all affected departments with respect to changes made in any component.

UNIT #7

57. Demonstrate ability to identify the motion produced by links.

58. Demonstrate ability to identify the motion produced within a mechanism.

59. Analyze given written or oral information, use this to design and produce working drawings of components to give the desired motion within a mechanism.