Walchand College of Engineering (Government Aided Autonomous Institute)

Vishrambag, Sangli-416415



Course Content for F. Y. M. Tech. Mechanical (Design Engineering)

Semester-I

2023-24

Junaskow Starse

| | | Walc | chand College (Government Aide | of Engineering d Autonomous Institu | g, Sangli (te) | | | |
|--------|---|--------------------------------------|---|--|---|----------------------|-----------|--|
| | | | AY | 2023-24 | | | | |
| | | | Course | Information | | | | |
| Prog | ram | | M. Tech. All Bra | anches | | | | |
| Class | , Semester | • | First Year M. Te | ch., Semester I | | | | |
| Cour | se Code | | 7IC501 | | | - 10 | | |
| Cour | se Name | | Research Metho | dology and IPR | | | | |
| | | | 1 | | | | | |
| | Teaching | Scheme | | Examination S | cheme (Marks) | | | |
| Lectu | ire | 3 Hrs/week | MSE | ISE | ESE | | Total | |
| Tuto | rial | 59 4 - 1 9 | 30 | 20 | 50 | | 100 | |
| | | | | Crea | lits: 3 | | | |
| | | | - | | | | | |
| | | | Course | Objectives | | | | |
| 1 | the hypo | thesis, design a | undergoing resear research layout, se | ch, identify and fo t a research process | rmulate the resear and methodology | ch prob | lems, sta | |
| 2 | To enab solve, an | le student inter d prove the solu | pret the results, p tion adapted-logic | ropose theories, su cally and analyticall | ggest possible/alt y, conclude the res | ernative search f | solution | |
| 3 | To impa journals | rt knowledge t and to expose st | o analyze critical udents to research | ly the literature an ethics, IPR and Pat | nd publish researc | ch in co | onference | |
| | | Course O | utcomes (CO) w | vith Bloom's Tax | onomy Level | | | |
| At the | e end of th | e course, the s | tudents will be al | ole to. | onomy Lever | | -110 | |
| CO1 | Demons | strate a researc | solution in res | pective engineerir | a domain using | Apply | , | |
| | appropri | ate Engineerin | g research proce | ss and research m | ethodology | Abbi | | |
| CO2 | Device f | easible solution | n to a research proces | oblem in respectiv | ve engineering | Analy | 1070 | |
| | domain | based on econo | mic, social and leg | gal aspects using ap | propriate | Anary | 20 | |
| CO2 | research | procedures and | practices. | | | a | | |
| CUS | write re | search publicati | on, Dissertation, II | ² K and patent docu | ment. | Create | : | |
| Modi | ile | | Module | Contents | | | Hours | |
| | Engi | neering Resear | ch Process | Contents | | | Hours | |
| I | Engineering Research ProcessMeaning of research problem, Sources of research problem, Criteria and Characteristics of a good research problem, Errors in selecting a research problem, Definition, scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.6 | | | | | | 6 | |
| II | Research MethodologyProblem statement formulation, resources identification for solution, ExperimentalIIand Analytical modelling, Simulations, Numerical and Statistical methods in engineering research. Hypothesis and its testing by different techniques: Z-testetc | | | | | | 6 | |
| III | engineering research. Hypothesis and its testing by different techniques: Z-test etc., Research Methods Uni and Multivariate Analysis: ANOVA, Design of Experiments/Taguchi II Method, Regression Analysis. Software tools like spreadsheets. 7 Processing and Analysis of Data: Processing Operations, Types of Analysis- 7 | | | | | | | |

DE. S.S. Solapure Associate Protessor (IT)

Dr. R.S. Desai 23/8/2023 Applied Mechanics Dept.

| | Interpretation. Analyse your results and draw conclusions. | |
|----|--|--------------|
| | Research Practices | |
| IV | Effective literature studies approaches, critical analysis, Plagiarism, Research ethics, Mendeley - Reference Management Software. Research communication- Effective Technical Writing, Writing a research article for Journal/conference paper, Technical report, Dissertation/ Thesis report writing, Software used for report writing such as WORD, Latex etc. Presentation techniques for paper/report/seminar. Publishing article in Scopus/SCI/Web of science indexed journal or conference. | 7 |
| V | Intellectual Property Rights (IPR) Nature of Intellectual Property: Patents, Designs, Trade and Copyright, Ownership of copyright, Term of copyright, Technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. New developments in IPR, Traditional knowledge ,Various Case Studies. | 7 |
| VI | PatentsPatent Rights: Scope of Patent Rights. Various Patent databases.Geographical Indications. Procedure for grants of patents, Patenting underPCT. Licensing and transfer of technology. Administration of PatentSystem. Introduction to International Scenario: WIPO, TRIPs, Patentingunder PCT | 6 |
| | Taythooks | |
| 1 | Kothari C. R. "Research Methodology" 2nd Edition New Age International | 2004 |
| 2 | Melville Stuart and Goddard Wayne, "Research Methodology: An Introduction for Engineering Students" Juta and Company Ltd. 2000. | Science & |
| 3 | Kumar Ranjit, "Research Methodology: A Step-by-Step Guide for beginner Publications, 4 th Ed2014. | rs", SAGE |
| - | Deferrences | |
| 1 | Merges Robert, Menell Peter, Lemley Mark, "Intellectual Property in New Ter Age", ASPEN Publishers, 2016. | chnological |
| 2 | Ramappa T., "Intellectual Property Rights Under WTO", S. Chand, 2008 | |
| 3 | Mayall, "Industrial Design", McGraw Hill, 1992. | |
| 4 | Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007 | |
| 5 | Deepak Chopra and Neena Sondhi, Research Methodology : Concepts and ca Publishing House, New Delhi | ses, Vikas |
| | XT A Y Y Y | |
| 1 | Useful Links | |
| 2 | Introduction to Research - Course (notel ac in) | |
| 3 | Qualitative Research Methods And Research Writing - Course (nptel ac.in) | |
| 4 | https://onlinecourses.swayam2.ac.in/ntr21_ed23/preview - Academic Research & Report Writing | |
| 5 | https://www.scopus.com/search/form.uri?display=basic#basic | |
| 6 | https://onlinecourses.nptel.ac.in/noc21_ge12/preview - Qualitative Research Methods And Research Writing | (10)00042000 |
| 7 | https://onlinecourses.nptel.ac.in/noc21_hs44/preview - Effective Writing | |
| 8 | https://webofscienceacademy.clarivate.com/learn | |

DE.S.S.Solapare Associate protessor (IT)

| 9 | https://onlinecourses.swayam2.ac.in/ntr21_ed23/preview - Academic Research & Report Writing |
|----|--|
| 10 | https://nptel.ac.in/courses/121/106/121106007/ |
| 11 | https://www.wipo.int/about-wipo/en/ |

| | | | CO-PO M | apping | | | | |
|-----|-------------------------|---|---------|--------|---|---|--|--|
| | Programme Outcomes (PO) | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | | |
| CO1 | 3 | | 1 | | | | | |
| CO2 | | | 2 | 3 | 2 | | | |
| CO3 | | 3 | | 2 | | 2 | | |

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.



| Walchand College of Engineering, Sangli (Government Aided Autonomous Institute) | | | | | | | | |
|--|---|---|---|--|---|------------------------------------|--|--|
| | AY 2023-24 | | | | | | | |
| | | | Course l | Information | | | | |
| Progra | amme | | M. Tech. (Mecha | nical Design Engineering) |) | | | |
| Class, | Semester | | First Year M. Teo | ch., Sem I | | | | |
| Cours | e Code | | 7DE501 | | | | | |
| Cours | e Name | | Advanced Solid N | Mechanics | | | | |
| Desire | d Requisi | tes: | Strength of Mater | rials | | | | |
| | | | 1 | | | | | |
| | Teaching | Scheme | | Examination Scheme | (Marks) | | | |
| Lectur | re | 3 Hrs/week | MSE | ISE | ESE | Total | | |
| Tutori | ial | - | 30 | 20 | 50 | 100 | | |
| | | | | Credits: 3 | I | | | |
| | | 1 | 1 | | | | | |
| | | | Course | Objectives | | | | |
| 1 | To prepa | re the students to | o succeed as design | ner in industry/technical pr | ofessions. | | | |
| | To provi | de students with | a sound foundation | on in solid mechanics requ | ired to solve | the problems in | | |
| 2 | Industry | | | Ĩ | | | | |
| | To train | the students wit | h good design eng | ineering breadth required | for safe and | efficient design, | | |
| 3 | construc | tion, installation | inspection and tes | ting of structural parts of t | he mechanica | ıl system. | | |
| | | Course | Outcomes (CO) w | ith Bloom's Taxonomy I | Level | 5 | | |
| At the | end of the | course, the stud | ents will be able to | · · · · · · · · · · · · · · · · · · · | | | | |
| СО | | Cours | se Outcome Staten | nent/s | Bloom's Taxonomy | Bloom's Taxonomy Description | | |
| CO1 | Verify | rify basic field equations such as equilibrium equations. | | | | Description | | |
| | compatil | bility and constit | tive relationship V | | | Evaluating | | |
| CO2 | Study ba | sic field equatio | ns to torsion, bend | ing and two-dimensional | | | | |
| | elasticity | problems, and e | energy methods. | 0 | IV | Analysing | | |
| CO3 | Solve pr | oblems in unsvn | nmetrical bending | and shear centre. contact | | | | |
| | stresses | and pressurized of | cylinders and rotati | ng discs. | III | Applying | | |
| | | 1 | <u> </u> | 6 | | | | |
| Modu | le | | Module (| Contents | | Hours | | |
| | Anal | vsis of Stress | | | | | | |
| | Assu | mptions, Conce | pts of Stress, Equ | ality of cross shears, Ca | uchy's stress | | | |
| | princ | iple, Direction | cosines, Stress con | nponents on an arbitrary | plane, Stress | | | |
| I | trans | formation, Princ | cipal stresses, Dif | ferential equations of equation | uilibrium in | 7 | | |
| | recta | ngular and pola | coordinates. Octa | hedral stresses. Plane stre | ess and Plane | | | |
| | strair | . Airv's stress fu | inction | | | | | |
| | Strai | n and Stress-St | rain Relations | | | | | |
| | Conc | ept of strain. S | Strain-Displacemen | t relations. Compatibilit | v conditions. | | | |
| II | Biha | monic equation | Strain measurer | ment. Construction of M | ohr's Circle. | 6 | | |
| | Stres | s- strain relation | ship. Isotropy | | ioni s' enere, | | | |
| | Fner | ov Methods | | | | | | |
| | Energy Methods | | | | | | | |
| | Work done by forces and elastic strain energy, Maxwell-Betti-Rayleigh | | | | | | | |
| ш | Work Recit | done by fore | tes and elastic st First and second the | train energy, Maxwell-B heorem of Castigliano, ex | etti-Rayleigh | 6 | | |
| III | Work Recij | done by force brocal theorem, | tes and elastic st First and second the second the second the second the second se | train energy, Maxwell-B heorem of Castigliano, ex s subjected to axial force | etti-Rayleigh pressions for Shear force | 6 | | |

| | Torsion | | | | |
|--------------------|--|---------------|--|--|--|
| IV | Torsion of general prismatic bars of solid section, Torsion of Circular and Elliptical bars, Membrane analogy, Torsion of thin walled of open cross | 7 | | | |
| | section and multiple cell closed sections | | | | |
| | Axisymmetric Problems | | | | |
| V | Stress in thick walled cylinder under internal and external pressure, stresses in | 7 | | | |
| | rotating flat solid disk, flat disk with central hole, rotating shafts and cylinders | | | | |
| | Unsymmetrical Bending and Shear Centre | | | | |
| | Concept of shear centre in symmetrical and unsymmetrical bending, stress and | | | | |
| VI | deflections in beams subjected to unsymmetrical bending, shear centre for thin | 6 | | | |
| | wall beam cross section, open section with one axis of symmetry, general open | | | | |
| | section, and closed section. | | | | |
| | | | | | |
| | Textbooks | | | | |
| 1 | Sadd, Martin H., Elasticity: Theory, applications and Numeric, Academic Press, | 2005 | | | |
| 2 | Boresi, A.P. and K. P. Chong, Elasticity in Engineering Mechanics, Second Edition, John | | | | |
| Wiley & Sons, 2000 | | | | | |
| 3 | ³ Budynas, R. G. Advance strength and Applied Stress Analysis, Second Edition, W Hill 1999 | | | | |
| | | | | | |
| | References | | | | |
| 1 | Dally, J. W. and W.F. Riley, Experimental Stress Analysis, McGraw Hill Interna | tional, Third | | | |
| 1 | Edition, 1991 | | | | |
| 2 | Theory of Elasticity – Timoshenko and Goodier, McGraw Hill | | | | |
| 3 | Advanced Strength of Materials, Vol. 1,2 – Timoshenko, CBS | | | | |
| 4 | Advanced Strength of Materials – Den Harteg | | | | |
| | | | | | |
| | Useful Links | | | | |
| 1 | https://nptel.ac.in/courses/112/101/112101095/ | | | | |
| 2 | https://nptel.ac.in/courses/112/102/112102284/ | | | | |
| 3 | https://freevideolectures.com/course/2361/strength-of-materials | | | | |
| 1 | https://www.youtube.com/watch?v=4meZNc2wB4s&list=PLKZlPALGW- | | | | |
| 4 | 7TK51CrfZRyWcY8h2gaxVCy | | | | |

| CO-PO Mapping | | | | | | | | | | |
|---|--|---|---|---|---|---|--|--|--|--|
| | Programme Outcomes (PO) | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | | | | |
| CO1 | | | 1 | 3 | 2 | | | | | |
| CO2 | | | 2 | 3 | | 1 | | | | |
| CO3 | 1 | | 1 | 3 | | | | | | |
| The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High | | | | | | | | | | |
| Each CO | Each CO of the course must map to at least one PO. | | | | | | | | | |

Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

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| Walchand College of Engineering, Sangli | | | | | | | | |
|---|---|---|---|---|-----------------|--------------------------------|------------------------------------|--|
| | (Government Atdea Autonomous Institute) | | | | | | | |
| Course Information | | | | | | | | |
| Progr | amme | | M. Tech. (Mecha | nical Design Enginee | ring |) | | |
| Class. | Semester | | First Year M. Tec | ch., Sem I | <u>8</u>) | , | | |
| Cours | e Code | | 7DE502 | | | | | |
| Cours | e Name | | Advanced Machi | ne Design | | | | |
| Desire | d Requisi | tes· | Industrial produc | t design Machine de | sion | | | |
| Desire | u Requisi | | Industrial produce | t design, maenine de | ¹⁵¹¹ | | | |
| | Teaching | Scheme | | Examination Sch | eme | (Marks) | | |
| Lectu | re | 3 Hrs/week | MSE | ISE | | ESE | Total | |
| Tutor | ial | - | 30 | 20 | | 50 | 100 | |
| | | | | Credit | s: 3 | | | |
| | | | | | | | | |
| | | | Course | Objectives | | | | |
| 1 | To prepa | re the students to | o succeed as design | ner in industry /techn | cal p | profession. | | |
| 2 | To provi | de students the | knowledge of ste | ps involved in desig | n an | d developmen | ts of industrial | |
| | product. | | | | | | | |
| 3 | To prepa Product. | re the students to | o use knowledge of | f ergonomics, aesthet | ics fo | or developmen | t of industrial | |
| 4 | To prepa | re the students to | o use knowledge of | f rapid prototyping, v | alue | analysis, stand | lardization for | |
| 4 | Develop | ment of industria | al Product. | | | | | |
| | | Course | Outcomes (CO) w | vith Bloom's Taxono | my I | Level | | |
| At the | end of the | course, the stud | ents will be able to |), | | | | |
| со | | Cours | se Outcome Stater | nent/s | | Bloom's Taxonomy Level | Bloom's Taxonomy Description | |
| C01 | Demonst | rate an ability to | recognize the nee | d of society to design | the | III | Applying | |
| <u>CO2</u> | Recomm | end appropriate | changes to apply | hanges to apply aesthetic and ergonomic | | | Evaluating | |
| | concepts | to product | | | | V | Dividualing | |
| CO3 | Design a | and develop the | products by usin | ts by using principles of DFMA, VI | | | Creating | |
| | rapid pro | totyping, reliabi | lity and economy | | | | | |
| | • | | | | | | TT | |
| Modu | ne David | | Module (| Contents | | | Hours | |
| I | Deve devel devel | Product Development Process:Development processes and organizations, Product Planning, Productdevelopment management, establishing the architecture, geometric layoutdevelopment –Fundamental and incidental interactions | | | | 7 | | |
| П | Conc Need gener | ept Generation Identification ation and select | : and problem defi ion, evaluation, cre | nition, product spece eativity methods, Con | ifica cept | tion, concept testing. | 6 | |
| III Ergonomics and Aesthetics: Industrial design, Human behaviour in design, deserverience, physical, cognitive and occupational aspection of the symmetry etc. | | | | | for] aest | Emotion and hetics: form, | 6 | |
| IV | Desig Desig of M Minin | gn for Manufac gn for manufact anufacturing co nize system con | eturing and Assemure, assembly, ma bost, reducing the opplexity. | ibly: intenance, casting, fo component costs and | orgin 1 ass | g, Estimation sembly costs, | 7 | |

Course Contents for M. Tech Programme, Department of Mechanical Engineering, AY2023-24

| | Robust Design: | | | | | |
|---|--|-----------------------------------|--|--|--|--|
| V | Design for Reliability, strength based reliability, parallel and series systems, | 7 | | | | |
| | robust design, Integrate process design, Managing costs, Robust design, | / | | | | |
| | Simulating product performance and manufacturing processes electronically, | | | | | |
| | Rapid Prototyping: | | | | | |
| VI | Rapid Prototyping Liquid based processes, Powder based processes and Solid | C | | | | |
| V1 | based processes; Classes of RP systems: 3D Printers, Enterprise Prototyping | 0 | | | | |
| | centers, RP Applications | | | | | |
| | | | | | | |
| | Textbooks | | | | | |
| Ulrich K.T. and Eppinger S., Product Design and Development, McGraw-Hi | | lucation; 5th | | | | |
| edition, 2011. | | | | | | |
| 2 | Dieter G.E., Engineering Design, McGraw-Hill Education 5th edition, 2012. | | | | | |
| Prashant Kumar, Product Design, Creativity, Concepts and Usability, PHI New I | | | | | | |
| | edition, 2011 | | | | | |
| | | | | | | |
| | References | | | | | |
| | | | | | | |
| 1 | John J.C., Design Methods, Wiley Inter science, 2nd edition, 1970. | | | | | |
| 1 | John J.C., Design Methods, Wiley Inter science, 2nd edition, 1970.Law A. M. and Kelton W.D, Simulation, Modelling and Analysis, McGraw Hill | Education, 4th | | | | |
| 1 2 | John J.C., Design Methods, Wiley Inter science, 2nd edition, 1970. Law A. M. and Kelton W.D, Simulation, Modelling and Analysis, McGraw Hill 2 edition, 2017 | Education, 4th | | | | |
| 1 2 3 | John J.C., Design Methods, Wiley Inter science, 2nd edition, 1970. Law A. M. and Kelton W.D, Simulation, Modelling and Analysis, McGraw Hill edition, 2017 Pahl G. and W. Beitz, Engineering Design- a Systematic Approach, Springer | Education, 4th r, 2nd edition, | | | | |
| 1 2 3 | John J.C., Design Methods, Wiley Inter science, 2nd edition, 1970. Law A. M. and Kelton W.D, Simulation, Modelling and Analysis, McGraw Hill 2 edition, 2017 Pahl G. and W. Beitz, Engineering Design- a Systematic Approach, Springer 1996. | Education, 4th r, 2nd edition, | | | | |
| 1 2 3 | John J.C., Design Methods, Wiley Inter science, 2nd edition, 1970. Law A. M. and Kelton W.D, Simulation, Modelling and Analysis, McGraw Hill 1 edition, 2017 Pahl G. and W. Beitz, Engineering Design- a Systematic Approach, Springer 1996. | Education, 4th r, 2nd edition, | | | | |
| 1 2 3 | John J.C., Design Methods, Wiley Inter science, 2nd edition, 1970. Law A. M. and Kelton W.D, Simulation, Modelling and Analysis, McGraw Hill 1 edition, 2017 Pahl G. and W. Beitz, Engineering Design- a Systematic Approach, Springer 1996. | Education, 4th r, 2nd edition, | | | | |
| 1 2 3 1 | John J.C., Design Methods, Wiley Inter science, 2nd edition, 1970. Law A. M. and Kelton W.D, Simulation, Modelling and Analysis, McGraw Hill 2 edition, 2017 Pahl G. and W. Beitz, Engineering Design- a Systematic Approach, Springer 1996. Useful Links https://nptel.ac.in/courses/112/107/112107217/ | Education, 4th r, 2nd edition, | | | | |
| 1 2 3 1 2 | John J.C., Design Methods, Wiley Inter science, 2nd edition, 1970. Law A. M. and Kelton W.D, Simulation, Modelling and Analysis, McGraw Hill 1 edition, 2017 Pahl G. and W. Beitz, Engineering Design- a Systematic Approach, Springer 1996. Useful Links https://nptel.ac.in/courses/112/107/112107217/ https://nptel.ac.in/courses/107/103/107103084/ | Education, 4th r, 2nd edition, | | | | |
| 1 2 3 1 2 3 | John J.C., Design Methods, Wiley Inter science, 2nd edition, 1970. Law A. M. and Kelton W.D, Simulation, Modelling and Analysis, McGraw Hill 2 edition, 2017 Pahl G. and W. Beitz, Engineering Design- a Systematic Approach, Springer 1996. Useful Links https://nptel.ac.in/courses/112/107/112107217/ https://nptel.ac.in/courses/107/103/107103084/ https://youtu.be/hPrQXgQ-dY8 | Education, 4th r, 2nd edition, | | | | |

| CO-PO Mapping | | | | | | | | | |
|---|-------------------------|---|---|---|---|---|--|--|--|
| | Programme Outcomes (PO) | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | | | |
| CO1 | 3 | | 2 | 3 | 1 | | | | |
| CO2 | 1 | | 1 | 2 | | | | | |
| CO3 | 3 | | | | | 2 | | | |
| The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High | | | | | | | | | |
| Each CO of the course must map to at least one PO. | | | | | | | | | |

| Assessment |
|--|
| The assessment is based on MSE, ISE and ESE. |
| MSE shall be typically on modules 1 to 3. |
| ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can |
| be field visit, assignments etc. and is expected to map at least one higher order PO. |
| ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on |
| modules 4 to 6. For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. |

40% marks in ESE are needed. (ESE shall be a separate head of passing)

| Walchand College of Engineering, Sangli (Government Aided Autonomous Institute) | | | | | | | | | | |
|--|--|---|-----------------------------|---------------------------------|---------|----------------------------|-----------------|--|--|--|
| AY 2023-24 | | | | | | | | | | |
| | Course Information | | | | | | | | | |
| Progra | Programme M. Tech. (Mechanical Design Engineering) | | | | | | | | | |
| Class, | Semester | | First Year M. Te | ch., Sem I | | | | | | |
| Cours | e Code | | 7DE503 | | | | | | | |
| Cours | e Name | | Computer Aided | Design | | | | | | |
| Desired Requisites: | | | | | | | | | | |
| | · · · | | | | | | | | | |
| , | Teaching | Scheme | | Examination Scl | heme | (Marks) | | | | |
| Lectur | ·e | 3 Hrs/week | MSE | ISE | | ESE | Total | | | |
| Tutori | al | - | 30 | 20 | | 50 | 100 | | | |
| | | | | Credit | s: 3 | I | | | | |
| | | | Course | Objectives | | | | | | |
| 1 | To introd | luce the students | s application of Ge | ometric Dimensionir | ng and | Tolerancing | | | | |
| 2 | To impar | t the students m | odern CAD operat | ions. | | | | | | |
| 3 | To prepa | re the students f | or use of modern F | EA system | | | | | | |
| At the | and of the | Course Course | Outcomes (CO) w | ith Bloom's Taxono | omy I | level | | | | |
| At the | | course, student | s will be able to, | | | Bloom's | Bloom's | | | |
| со | | Cours | e Outcome Staten | nent/s | | Taxonomy | Taxonomy | | | |
| | | | | | | Level | Description | | | |
| CO1 | Demonst | rate various app | roaches of geomet | ric modeling | | II | Applying | | | |
| CO2 | Analyse | geometric dime | nsioning and toler | ancing based on AS | SME | IV | Analysing | | | |
| <u> </u> | Standard | in design and ge | lorn parametric CA | neering drawings | | VI | Croating | | | |
| | Design p | arts using a mod | | | | V 1 | Creating | | | |
| Modu | le | | Module (| Contents | | | Hours | | | |
| - | CAD | Hardware and | Software, Types of | of systems and system | em co | onsiderations, | | | | |
| I | input trend | and output de s, Software mod | evices, hardware i lules | ntegration and netw | vorkir | ng, hardware | 6 | | | |
| | Com | Computer Communications, Principle of networking, classification networks, | | | | | | | | |
| | syster | ork wring, meth | ods, transmission n | nedia and interfaces, | netwo | ork operating | | | | |
| | Com | outer Graphics | , Introduction, tr | ansformation of g | eome | tric models: | | | | |
| | transl | ation, scaling | reflection, rot | ation, homogeneou | is re | presentation, | | | | |
| | conca | concatenated transformations; mappings of geometric models, translational | | | | | | | | |
| | transf | mapping, general mapping, mappings as changes of coordinate system; inverse transformations and mapping | | | | | | | | |
| | Proje | ctions of geo | metric models, | orthographic project | ctions. | Geometric | | | | |
| | Mode | eling, curve rep | resentation: Param | etric representation | of ana | alytic curves, | 7 | | | |
| 1. | paran | netric represent | ation of synthetic | curves, curve mani | ipulati | ons. Surface | , | | | |
| | repres | sentation | colid modeling | have down nonna | antati | (\mathbf{D}, \mathbf{m}) | | | | |
| V | Cons | tructive Solid G | eometry (CSF), sw | eep representation, | | оп (в-тер), | 7 | | | |
| VI | Analy | ytic Solid Mode | applications: ma | r representations; so | olid m | anipulations, | 6 | | | |
| × 1 | tolera | incing etc. | a apprications. ma | ss properties calcul | au0115 | , incentational | | | | |
| | | ÷ | | | | | | | | |
| 1 | Zaid | Ebrahim CAD | CAM Theory and I | t Books Practice Tata Ma Cry | w Li | lle 3rd adition | 2009 | | | |
| | Radh | akrishnan P., S | ubramanyan S., Ra | aju V. ,CAD/CAM/C | CIM, , | New Age Int | ernational, 2nd | | | |
| 2 | editio | on, 2010. | • • • • | · · · · · · | | | · · · | | | |
| | | | Ref | erences | | | | | | |

Course Contents for M. Tech Programme, Department of Mechanical Engineering, AY2023-24

| 1 | Lee Kunwoo, Principles of CAD/CAM/CAE systems, , Addison Wesley, 2nd edition, 1999 | | | | | | | |
|---|--|--|--|--|--|--|--|--|
| C | Machover Carl ,The C4 handbook: CAD, CAM, CAE, CIM, Tab Professional and Reference | | | | | | | |
| Z | Books, 3rdedition, 1998 | | | | | | | |
| 3 | Taraman Khalil ,CAD-CAM: Meeting Today's Productivity Challenge, University of | | | | | | | |
| 5 | Michigan, 6th edition, 2012 | | | | | | | |
| | | | | | | | | |
| | Useful Links | | | | | | | |
| 1 | https://www.youtube.com/watch?v=EgKc9L7cbKc | | | | | | | |
| C | https://www.youtube.com/watch?v=swtH_okidQc&list=PLUtfVcb-iqn8dG1- | | | | | | | |
| 2 | Cn7NTEdILR3hRVgcN&index=1 | | | | | | | |
| 3 | https://www.youtube.com/watch $2y$ -OlaOapAtauM | | | | | | | |
| 5 | https://www.youtube.com/watch?v=01gOapAtauw | | | | | | | |

| CO-PO Mapping | | | | | | | | |
|---------------|-------------------------|---|---|---|---|---|--|--|
| | Programme Outcomes (PO) | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | | |
| CO1 | 3 | | 3 | | 2 | | | |
| CO2 | | 3 | | | 2 | | | |
| CO3 | | 3 | | 2 | | | | |

The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High Each CO of the course must map to at least one PO.

Assessment (for Theory Course)

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

| | Walchand College of Engineering, Sangli | | | | | | | |
|------------|---|-------------------------|--------------------------|----------------------|-------------|-------------------|-------------------------|--|
| | (Government Attea Autonomous Institute) | | | | | | | |
| | | | Course | e Information | | | | |
| Progra | amme | | M. Tech. (Mecha | nical Design Engir | eering) | | | |
| Class. | Semester | | First Year M. Tec | ch Sem I | 6) | | | |
| Cours | e Code | | 7DE551 | | | | | |
| Cours | e Name | | Advanced Solid N | Mechanics Lab | | | | |
| Desire | ed Requisi | tes: | | | | | | |
| | | | 1 | | | | | |
| ' | Teaching | Scheme | | Examination | Scheme (| Marks) | | |
| Practi | cal | 2 Hrs/ Week | LA1 | LA2 | Lab | ESE | Total | |
| Intera | ction | - | 30 | 30 | 40 | 0 | 100 | |
| | | | | Cre | edits: 1 | | | |
| | | | | | | | | |
| | | | Cours | e Objectives | | | | |
| | To provi | de an opportuni | ty to student to do | work independent | ly on a to | pic/ problem | experimentation | |
| 1 | selected | by him/her and | encourage him/he | r to think indepen | dently on | his/her own | to bring out the | |
| | conclusio | on under the giv | en circumstances a | ind limitations. | C" 1 | 1 | <u> </u> | |
| 2 | To encou | irage creative th | inking process to | help student to get | confiden | ce by success | fully completing | |
| | the exper | riment / mini-pr | oject, through obse | rvations, discussio | ns and de | cision making | process. | |
| 3 | 10 enabl | e student for tec | chnical report writin | ng and effective pro | | S. | | |
| At the | end of the | Course the stud | lents will be able to | with Bloom's Tax | onomy L | evel | | |
| | | course, the stat | ients will be able to | , | | Bloom's | Bloom's | |
| CO | | Cou | rse Outcome State | ement/s | | Taxonomy Level | Taxonomy Description | |
| CO1 | Solve fie | eld problems by | using different tec | chniques in advance | ed solid | Ш | Applying | |
| | mechani | cs | | | | | rippiying | |
| CO2 | Verify the solid me | he fundamental chanics. | concepts of analy | ysis of machines | by using | V | Evaluating | |
| CO3 | Prepare | and present a d | etailed technical re | eport based on exp | periment | V | Evaluating | |
| | /mini pro | oject work. | | | | v | Lvaluating | |
| | | | | | | | | |
| | ~ |] | List of Experimen | ts / Lab Activities | /Topics | | | |
| List of | f Lab Acti | vities: | us/ small aquinma | nt/oxporimontal so | t un/ inr | ovation of a | visting product/ | |
| analys | is or simu | lation of a proc | ess/ experimental x | verification of prin | ciples in t | thrust areas of | F advanced solid | |
| mecha | nics | | essi experimentar v | verification of prin | cipies in t | indst areas of | advanced solid | |
| | | | | | | | | |
| | | | | | | | | |
| | I | | Te | extbooks | | | | |
| 1 | Suita | ble books based | on the contents of | the experiment/mi | ni project | selected. | | |
| | | | | | | | | |
| | Cuito | hle hooks based | Re on the contents of | eterences | ini projec | t calacted and | racarch papara | |
| 1 | from | Reputed nation | al and international | iournals and confe | m projec | i selected and | research papers | |
| | | | | | | | | |
| | | | LIG | eful Links | | | | |
| | | | USU | | | | | |
| 1 | As pe | er the need of the | e experiment/mini | project. | | | | |

| | CO-PO Mapping | | | | | | | | |
|-----------|---|---|---|---|---|---|--|--|--|
| | Programme Outcomes (PO) | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | | | |
| CO1 | 3 | | | 1 | | | | | |
| CO2 | | | 3 | | | | | | |
| CO3 | | | | | 3 | 1 | | | |
| The stren | The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High | | | | | | | | |

| Assessment | | | | | | |
|-------------------|--|---------------------------|---------------------------------------|----------|--|--|
| There are three | There are three components of lab assessment, LA1, LA2 and Lab ESE. | | | | | |
| IMP: Lab ESE | is a separate head | of passing.(min 40 %), LA | 1+LA2 should be min 40% | | | |
| Assessment | Assessment Based on Conducted by Typical Schedule Marks | | | | | |
| | Lab activities, | | During Week 1 to Week 8 | | | |
| LA1 | attendance, | Lab Course Faculty | Marks Submission at the end of | 30 | | |
| | journal | | Week 8 | | | |
| | Lab activities, | | During Week 9 to Week 16 | | | |
| LA2 | attendance, | Lab Course Faculty | Marks Submission at the end of | 30 | | |
| | journal | | Week 16 | | | |
| | Lab activities, | Lab Course Faculty and | During Week 18 to Week 19 | | | |
| Lab ESE | journal/ | External Examiner as | Marks Submission at the end of | 40 | | |
| | performance | applicable | Week 19 | | | |
| Week 1 indicat | Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing | | | | | |
| experiments, m | experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the | | | | | |
| nature and requ | irement of the lab | course. The experimental | lab shall have typically 8-10 experim | ents and | | |
| related activitie | es if any. | | | | | |

| Walchand College of Engineering, Sangli | | | | | | | |
|---|---|------------------------------------|-----------------------|----------------------|------------|------------------------------|------------------------------------|
| | (Government Atdea Autonomous Institute) | | | | | | |
| | | | Course | Information | | | |
| Progra | amme | | M. Tech. (Mechai | nical Design Engine | eering) | | |
| Class. | Semester | | First Year M. Tec | h Sem I |) | | |
| Cours | e Code | | 7DE552 | | | | |
| Cours | e Name | | Advanced Machir | ne Design Lab | | | |
| Desire | d Requisi | tes: | | 6 | | | |
| | 1 | | | | | | |
| | Teaching | Scheme | | Examination | Scheme (| Marks) | |
| Practi | cal | 2 Hrs/ Week | LA1 | LA2 | Lab l | ESE | Total |
| Intera | ction | - | 30 | 30 | 40 |) | 100 |
| | | | | Cre | dits: 1 | I | |
| | | | | | | | |
| | | | Cours | e Objectives | | | |
| | To provi | de an opportuni | ty to student to do | work independent | ly on a to | pic/ problem | experimentation |
| 1 | selected | by him/her and | encourage him/he | r to think independ | dently on | his/her own | to bring out the |
| | conclusio | on under the giv | en circumstances a | nd limitations. | | | |
| 2 | To encou | urage creative th | inking process to l | help student to get | confidenc | e by successi | fully completing |
| | the exper | riment / mini-pr | oject, through obse | rvations, discussion | ns and dec | cision making | process |
| 3 | To enabl | e student for tec | hnical report writir | ng and effective pre | sentation | s | |
| | | Course | e Outcomes (CO) | with Bloom's Tax | onomy L | evel | |
| At the | end of the | course, the stud | lents will be able to |), | | DI 9 | Dia |
| со | | Cou | rse Outcome State | ement/s | | Bloom's Taxonomy Level | Bloom's Taxonomy Description |
| CO1 | Solve fi machine | eld problems design | by using different | t techniques in a | dvanced | III | Applying |
| CO2 | Design a advanced | and develop sui 1 machine desig | table mechanical s | systems using con- | cepts in | VI | Creating |
| CO3 | Prepare | and present a d | etailed technical re | port based on exp | eriment/ | N7 | Evelvetin e |
| | mini proj | ject work. | | | | V | Evaluating |
| | | | | | | | |
| | | l | List of Experiment | ts / Lab Activities/ | Topics | | |
| List of | ² Lab Acti | vities: | | | | | |
| Creatio | on of pro | totype/ apparatu | is/ small equipme | nt/experimental se | t up/ inn | ovation of e | xisting product/ |
| analysi | is or simu | ilation of a pro | ocess/ experimenta | l verification of p | rinciples | in thrust are | as of advanced |
| machir | ne design. | | | | | | |
| | | | | | | | |
| | | | Те | exthooks | | | |
| 1 | Suita | ble books based | on the contents of | the experiment/min | ni project | selected. | |
| | | | | - r | r Jest | | |
| | | | Re | eferences | | | |
| 1 | Suita | ble books based | on the contents of | the experiment/mi | ni project | t selected and | research papers |
| | from | Reputed nationa | al and international | journals and confe | rences. | | |
| | | | | | | | |
| | | | Use | eful Links | | | |
| 1 | As pe | er the need of th | e experiment/mini | project. | | | |

| | CO-PO Mapping | | | | | | | | |
|-----------|-------------------------|-----------------------|-------------------|-----------------|--------|---|--|--|--|
| | Programme Outcomes (PO) | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | | | |
| CO1 | 3 | | | 1 | | | | | |
| CO2 | | | 3 | | | | | | |
| CO3 | | | | | 3 | 1 | | | |
| The stren | gth of mapping | g is to be written as | 1,2,3; Where, 1:L | ow, 2:Medium, 1 | 3:High | · | | | |

| Assessment | | | | | | |
|-------------------|--|---------------------------|---------------------------------------|----------|--|--|
| There are three | There are three components of lab assessment, LA1, LA2 and Lab ESE. | | | | | |
| IMP: Lab ESE | is a separate head | of passing.(min 40 %), LA | 1+LA2 should be min 40% | | | |
| Assessment | Assessment Based on Conducted by Typical Schedule Marks | | | | | |
| | Lab activities, | | During Week 1 to Week 8 | | | |
| LA1 | attendance, | Lab Course Faculty | Marks Submission at the end of | 30 | | |
| | journal | | Week 8 | | | |
| | Lab activities, | | During Week 9 to Week 16 | | | |
| LA2 | attendance, | Lab Course Faculty | Marks Submission at the end of | 30 | | |
| | journal | | Week 16 | | | |
| | Lab activities, | Lab Course Faculty and | During Week 18 to Week 19 | | | |
| Lab ESE | journal/ | External Examiner as | Marks Submission at the end of | 40 | | |
| | performance | applicable | Week 19 | | | |
| Week 1 indicate | Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing | | | | | |
| experiments, m | experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the | | | | | |
| nature and requ | irement of the lab | course. The experimental | lab shall have typically 8-10 experim | ents and | | |
| related activitie | es if any. | | | | | |

| Walchand College of Engineering, Sangli (Government Aided Autonomous Institute) | | | | | | | | | | | |
|--|---|--|---|--|--|---|---|--|--|--|--|
| | AY 2023-24 | | | | | | | | | | |
| | | | Course | e Information | | | | | | | |
| Progr | amme | | M. Tech. (Mecha | nical Design Engineeri | ing) | | | | | | |
| Class, | Semester | | First Year M. Teo | ch., Sem I | | | | | | | |
| Cours | e Code | | 7DE553 | | | | | | | | |
| Cours | e Name | | Computer Aided | Design Lab | | | | | | | |
| Desire | ed Requisi | tes: | | | | | | | | | |
| | | | | | | | | | | | |
| 1 | Teaching | Scheme | | Examination Sch | eme (Mark | 5) | | | | | |
| Practi | cal | 2 Hrs/ Week | LA1 | LA2 | Lab ESE | | Total | | | | |
| Intera | iction | - | 30 | 30 | 40 | | 100 | | | | |
| | | | | Credits | s: 1 | | | | | | |
| | | | | | | | | | | | |
| | | | Cours | se Objectives | | | | | | | |
| | To provid | de an opportuni | ty to student to do | work independently on | n a topic/ pro | blem ex | perimentation | | | | |
| 1 | selected | by him/her and | encourage him/her | to think independently | on his/her o | wn to b | ring out the | | | | |
| | conclusio | on under the giv | en circumstances a | and limitations. | | | | | | | |
| 2 | To encou | rage creative th | inking process to h | nelp student to get conf | idence by su | ccessful | lly completing | | | | |
| | the exper | iment/ mini-pro | oject, through obser | rvations, discussions ai | nd decision r | naking p | process. | | | | |
| 3 | To enable | e student for tec | chnical report writin | ng and effective presen | itations. | | | | | | |
| At the | and of the | Course the stud | e Outcomes (CO) | with Bloom's Taxono | omy Level | | | | | | |
| At the | | course, the stuc | |), | Blo | om's | Bloom's | | | | |
| СО | | Cou | rse Outcome State | ement/s | Taxe | onomy | Taxonomy | | | | |
| | | | | | L | evel | Description | | | | |
| | Solve fie | ld problems by | using different tec | chniques in computer a | aided | Ш | Applying | | | | |
| CO1 | design III Applying | | | | | | i ippiying | | | | |
| CO1 | design | | | | | CO2 Design and develop suitable mechanical systems using concepts in | | | | | |
| CO1 CO2 | design Design a | nd develop sui | table mechanical | systems using concep | ots in | VI | Creating | | | | |
| CO1 CO2 | design Design a computer | nd develop sui aided design | table mechanical | systems using concep | ots in | VI | Creating | | | | |
| CO1 CO2 CO3 | design Design a computer Prepare a | and develop suit aided design and present a d | table mechanical etailed technical r | systems using concep eport based on experi | ment | VI V | Creating | | | | |
| CO1 CO2 CO3 | design Design a computer Prepare a /mini pro | nd develop sui aided design and present a d ject work. | table mechanical etailed technical r | systems using concep eport based on experi | ment | VI V | Creating Evaluating | | | | |
| CO1 CO2 CO3 | design Design a computer Prepare a /mini pro | and develop suit aided design and present a d ject work. | table mechanical etailed technical r | systems using concep eport based on experi | ment | VI V | Creating Evaluating | | | | |
| CO1 CO2 CO3 | design Design a computer Prepare a /mini pro | and develop suit aided design and present a d ject work. | table mechanical etailed technical r List of Experimen | systems using concep eport based on experi ts / Lab Activities/To | ment pics | VI V | Creating Evaluating | | | | |
| CO1 CO2 CO3 | design Design a computer Prepare a /mini pro | and develop sui aided design and present a d ject work. | table mechanical etailed technical r List of Experimen | systems using concep eport based on experi ts / Lab Activities/To | pics | VI V | Creating Evaluating | | | | |
| CO1 CO2 CO3 | design Design a computer Prepare a /mini pro f Lab Acti on of CAI mental ver | and develop suit r aided design and present a d ject work. | table mechanical etailed technical r List of Experimen vation of existing p ciples in thrust are: | systems using concep eport based on experi ts / Lab Activities/To product/ analysis or si as of computer aided d | pics | VI V a proce | Creating Evaluating ss/case studies/ | | | | |
| CO1 CO2 CO3 List of Creatic experi: | design Design a computer Prepare a /mini pro f Lab Acti on of CAE mental ver | and develop sui r aided design and present a d ject work. | table mechanical etailed technical r List of Experimen vation of existing ciples in thrust area | systems using concep eport based on experi ts / Lab Activities/To product/ analysis or si as of computer aided d | ment pics | VI V a proce | Creating Evaluating ss/case studies/ | | | | |
| CO1 CO2 CO3 | design Design a computer Prepare a /mini pro f Lab Acti on of CAI mental ver | and develop suit r aided design and present a d ject work. | table mechanical etailed technical r List of Experimen vation of existing p ciples in thrust area | systems using concept eport based on expering ts / Lab Activities/To product/ analysis or sites as of computer aided d | nts in ment pics | VI V a proce | Creating Evaluating ss/case studies/ | | | | |
| CO1 CO2 CO3 List of Creation experiment | design Design a computer Prepare a /mini pro f Lab Acti on of CAE mental ver | and develop suit r aided design and present a d ject work. | table mechanical etailed technical r List of Experimen vation of existing p ciples in thrust area on the contents of | systems using concep eport based on experi ts / Lab Activities/To product/ analysis or si as of computer aided d extbooks the experiment/mini p | ment pics | VI V a proce | Creating Evaluating ss/case studies/ | | | | |
| CO1 CO2 CO3 List of Creatic experi: | design Design a computer Prepare a /mini pro f Lab Acti on of CAI mental ver | and develop suit aided design and present a d ject work. | table mechanical etailed technical r List of Experimen vation of existing p ciples in thrust area on the contents of | systems using concep eport based on experi ts / Lab Activities/To product/ analysis or si as of computer aided d extbooks the experiment/mini p | nts in ment pics | VI V a proce ed. | Creating Evaluating ss/case studies/ | | | | |
| CO1 CO2 CO3 List of Creation experimentary 1 | design Design a computer Prepare a /mini pro f Lab Acti on of CAI mental ver | and develop suit r aided design and present a d ject work. | table mechanical etailed technical r List of Experimen vation of existing p ciples in thrust area To on the contents of | systems using concep eport based on experi ts / Lab Activities/To product/ analysis or si as of computer aided d extbooks the experiment/mini p | nent nent nent nent nent nent nent nent | VI V a proce | Creating Evaluating ss/case studies/ | | | | |
| CO1 CO2 CO3 List of Creation experiments 1 | design Design a computer Prepare a /mini pro f Lab Acti on of CAI mental ver | and develop suit r aided design and present a d ject work. | table mechanical etailed technical r List of Experimen vation of existing p ciples in thrust area on the contents of R on the contents of | systems using concep eport based on experi ts / Lab Activities/To product/ analysis or si as of computer aided d extbooks the experiment/mini p eferences f the experiment/mini n | pics ment pics mulation of esign. project selector | VI V a proce ed. | Creating Evaluating ss/case studies/ | | | | |
| CO1 CO2 CO3 List of Creatic experi- | design Design a computer Prepare a /mini pro f Lab Acti on of CAI mental ver Suital | and develop suit r aided design and present a d ject work. | table mechanical etailed technical r List of Experimen vation of existing p ciples in thrust area on the contents of Rate on the contents of al and international | systems using concep eport based on experi ts / Lab Activities/To product/ analysis or si as of computer aided d extbooks the experiment/mini p eferences f the experiment/mini p | project select ces. | VI V a proce ed. ted and | Creating Evaluating ss/case studies/ | | | | |
| CO1 CO2 CO3 List of Creation experiments 1 | design Design a computer Prepare a /mini pro f Lab Acti on of CAI mental ver Suital from | and develop sui r aided design and present a d ject work. | table mechanical etailed technical r List of Experimen vation of existing p ciples in thrust area on the contents of al and international | systems using concep eport based on experi ts / Lab Activities/To product/ analysis or si as of computer aided d extbooks the experiment/mini p eferences f the experiment/mini j | pics in project selected project selected ces. | VI V a proce ed. ted and | Creating Evaluating ss/case studies/ | | | | |
| CO1 CO2 CO3 List of Creation experiments 1 | design Design a computer Prepare a /mini pro f Lab Acti on of CAI mental ver Suital from | and develop sui aided design and present a d ject work. I vities: D models/ innov ification of prin ble books based Reputed nationa | itable mechanical etailed technical r List of Experimen vation of existing p ciples in thrust area on the contents of al and international Use | systems using concep eport based on experi ts / Lab Activities/To product/ analysis or si as of computer aided d extbooks the experiment/mini p eferences f the experiment/mini p l journals and conferen | nts in ment ment pics mulation of esign. | VI V a proce ed. ted and | Creating Evaluating ss/case studies/ research papers | | | | |

| | CO-PO Mapping | | | | | | | | |
|-----------|-------------------------|-----------------------|-------------------|-----------------|--------|---|--|--|--|
| | Programme Outcomes (PO) | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | | | |
| CO1 | 3 | | | 1 | | | | | |
| CO2 | | | 3 | | | | | | |
| CO3 | | | | | 3 | 1 | | | |
| The stren | gth of mapping | g is to be written as | 1,2,3; Where, 1:L | ow, 2:Medium, 3 | 3:High | | | | |

| Assessment | | | | | | | |
|-----------------|---|--|---|----------|--|--|--|
| There are three | There are three components of lab assessment, LA1, LA2 and Lab ESE. | | | | | | |
| INIP: Lab ESE | is a separate nead | or passing.(min 40 %), LA | 1+LA2 should be min 40% | | | | |
| Assessment | Based on | Conducted by | Typical Schedule | Marks | | | |
| | Lab activities, | | During Week 1 to Week 8 | | | | |
| LA1 | attendance, | Lab Course Faculty | Marks Submission at the end of | 30 | | | |
| | journal | | Week 8 | | | | |
| | Lab activities, | | During Week 9 to Week 16 | | | | |
| LA2 | attendance, | Lab Course Faculty | Marks Submission at the end of | 30 | | | |
| | journal | | Week 16 | | | | |
| | Lab activities, | Lab Course Faculty and | During Week 18 to Week 19 | | | | |
| Lab ESE | journal/ | External Examiner as | Marks Submission at the end of | 40 | | | |
| | performance | applicable | Week 19 | | | | |
| LA2 Lab ESE | Lab activities, attendance, journal Lab activities, journal/ performance | Lab Course Faculty Lab Course Faculty and External Examiner as applicable | Marks Submission at the end of Week 16 During Week 18 to Week 19 Marks Submission at the end of Week 19 | 30 40 | | | |

Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.

| | Walchand College of Engineering, Sangli (Government Aided Autonomous Institute) | | | | | | |
|---|--|--------------------|--|----------------------------------|------------------|--------------|--|
| | AY 2023-24 | | | | | | |
| | | | Course | Information | | | |
| Progra | Programme M. Tech. (Mechanical Design Engineering) | | | | | | |
| Class. | Semester | | First Year M. Te | ch Sem I | | | |
| Cours | e Code | | 7DE511 | , | | | |
| Cours | e Name | | Design for Manu | facturing and Assembly | | | |
| Desire | d Requisi | ites: | | | | | |
| | | | | | | | |
| | Teaching | Scheme | | Examination Scheme | (Marks) | | |
| Lectu | re | 3 Hrs/week | MSE | ISE | ESE | Total | |
| Tutor | ial | - | 30 | 20 | 50 | 100 | |
| | | | | Credits: 3 | I | | |
| | | 1 | 1 | | | | |
| | | | Course | Objectives | | | |
| 1 | To provi | de the students t | he knowledge of d | ifferent steps involved in t | he Product De | velopment | |
| 1 | Cycle. | | | | | | |
| 2 | To prepa | tre the students t | o use knowledge o | f the manufacturing proce | ss. | | |
| 3 | To prepa | Course | o succeed as design O succeed as (CO) as | ner in industry /technical p | orofessions. | | |
| At the | end of the | course the stud | ents will be able to | viui bioom s raxonomy i | Jevel | | |
| | | course, the stud | ients will be uble to | , | Bloom's | Bloom's | |
| СО | | Cours | se Outcome Stater | ment/s | Taxonomy | Taxonomy | |
| Level De | | | | | Description | | |
| CO1Explain the product development cycle.IV | | | | Analysing | | | |
| CO2 | Study the | e principles of as | ssembly to minimiz | ze the assembly time. | V | Evaluating | |
| CO3 | Interpret | the effect of | f manufacturing | process and assembly | III | Applying | |
| | operation | ns on the cost of | product. | | | | |
| Modu | ıle | | Module | Contents | | Hours | |
| | Intro | duction Need Id | entification and P | roblem Definition Conce | ot Generation | | |
| I | and H | Evaluation, Emb | odiment Design, So | election of Materials and S | Shapes | 6 | |
| | Prop | erties of Engine | ering Materials, | Selection of Materials-I, | Selection of | | |
| П | Mate | rials–II, Case S | tudies-I, Selection | n of Shapes, Co-selection | of Materials | 6 | |
| | and S | Shapes, Case Stu | dies-II | | D | | |
| ш | Desig | on for Casting I | cturing Processes, | eformation Processes Des | ig Processes, | 6 | |
| | Meta | 1 Forming Proce | sses. | cronnation riocesses, Des | sign for sheet | 0 | |
| TV. | Desig | gn for Machining | g, Design for Powd | ler Metallurgy, Design for | Polymer | 6 | |
| 1 V | Proce | essing, Co-select | ion of Materials ar | nd Processes, Case-Studies | -III | 0 | |
| | Desig | gn for Assembly | , Review of Asser | mbly Processes, Design fo | or Welding–I, | | |
| V | Desig | gn for welding | g–II, Design for Design for Joir | Brazing and Soldering, | Design for Heat | 9 | |
| | Treat | ment. Case- Stu | dies-IV | ling of rorymers, Desi | gii ioi iicat | | |
| | Desig | gn for Reliability | y, Failure Mode ar | nd Effect Analysis and Qu | ality, Design | | |
| VI | for Q | Quality, Design | for Reliability, Ap | pproach to Robust Design | n, Design for | 6 | |
| | Optii | nization | | | | | |
| | | | | 41 1 | | | |
| 1 | Dag | S S Enginaamin | a Optimization: th | ACTIVE AND A Presentiase Labre W | ilay and adition | n 1006 | |
| | Achh | v M F and Ioh | son K Materials | and Design - the art and se | ience of materi | al selection | |
| 2 | inPro | duct design. Pea | rson publications. | 3rd edition, 2002. | | ui selection | |

| 3 | G Dieter, Engineering Design - a materials and processing approach, McGraw Hill, 2nd edition, 2006. |
|---|---|
| | |
| | References |
| 1 | Bralla J G, Handbook for Product Design for Manufacture, McGraw Hill, 2nd edition, 2003. |
| 2 | ASTM Design handbook |
| 3 | Courtney T H, Mechanical Behaviour of Materials, McGraw Hill, 4th edition, 2008 |
| 4 | Swift K G and Booker J D, Process selection: from design to manufacture, London: |
| | Arnold,1997 |
| | |
| | Useful Links |
| 1 | https://nptel.ac.in/courses/107/108/107108010/ |
| 2 | https://nptel.ac.in/courses/112/108/112108150/ |
| 3 | https://nptel.ac.in/courses/112/101/112101005/ |
| 4 | https://youtu.be/LBVeK_7I0PM |

| | | | CO-PO Mappin | g | | |
|------------|----------------|---------------------|---------------------|-----------------|--------|---|
| | | | Programme Out | comes (PO) | | |
| | 1 | 2 | 3 | 4 | 5 | 6 |
| CO1 | | 2 | 2 | | 3 | |
| CO2 | 3 | | | 2 | 2 | |
| CO3 | | 2 | 3 | | 2 | |
| The streng | gth of mapping | is to be written as | 1,2,3; Where, 1:L | ow, 2:Medium, 3 | 3:High | |

Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

| | | Wal | chand College (Government Aide | of Engineerin | ig, Sangl i ^{ute)} | i | |
|--------------------------|---|---|--|--|--|--|---------------------|
| | | | AY | 2023-24 | | | |
| | | | Course | Information | | | |
| Progra | amme | | M. Tech. (Mechani | ical Design Engine | ering) | | |
| Class, | Semester | | First Year M. Tech | I., Sem I | | | |
| Course Code 7DE512 | | | | | | | |
| Course Name Robotics | | | | | | | |
| Desire | d Requisites: | | | | | | |
| | | | | | | | |
| | Teaching So | cheme | | Examinatio | n Scheme (| Marks) | |
| Lectur | e | 3 Hrs/week | MSE | ISE | ESE | | Total |
| Tutori | al | - | 30 | 20 | 50 | | 100 |
| | | | · · · · | C | redits: 3 | 1 | |
| L | | | Course | e Objectives | | | |
| 1 | To introduce | students to fund | lamentals of robot w | vorking, programm | ing and inte | gration in a m | anufacturing |
| 1 | process. | | | | C | - | C . |
| 2 | To make stuc | lents understand | l basic working com | ponents of an indu | strial robot | | |
| 3 | To introduce | recent technolo | gy as machine visio | n | | | |
| 1 | 1.0.1 | Cours | e Outcomes (CO) v | with Bloom's Tax | onomy Lev | el | |
| At the | end of the cou | rse, students will | Il be able to, | | | Dl | DL |
| CO | | Cour | se Autcome Staten | nent/s | | Bloom's Taxonomy | Bloom's Taxonomy |
| | | Cour | se Outcome Staten | ient/s | | Level | Description |
| CO1 | Understand l | pasic terminolog | gies and concepts a | ssociated with Ro | botics and | II | Understanding |
| COI | Automation. | | | | | | |
| CO2 | Demonstrate | comprehension | of various Robotic | sub-systems. | | III | Applying |
| CO3 | Analyse kine | matics and dyna | amics to explain exa | et working pattern | of robots. | IV | Analyzing |
| | - | | | | | | |
| Modu | le | • | Module C | Contents | | | Hours |
| I | Introduct Basic Con anatomy, dexterity, Automatic Functions | tion acepts such as D Classification, compliance, et on, Basic Elen , Levels of Auto | Definition, three law Associated paramet c. Automation - Co ments of an Automations, introduction | s, DOF, Misunders ters i.e. resolution, oncept, Need, Print comated System, on to automation p | stood device , accuracy, aciples and Advanced roductivity. | es etc., Robot repeatability, Strategies of Automation | 7 |
| II | Robot Gr Types of sensing de for sensor | ippers Grippers, Desigevices, Selections and vision sys | gn aspect for gripp ns of sensors, Class tem in the working | er, Sensors for Re ification and appli and control of a rol | obots- Char cations of s bot. | acteristics of ensors. Need | 7 |
| III | for sensors and vision system in the working and control of a robot. Drives and control systems Types of Drives, Actuators and its selection while designing a robot system. Types of I transmission systems, Control Systems -Types of Controllers, Introduction to closed I loop control Control Technologies in Automation:- Industrial Control Systems, Process Industries Discrete Control | | | | | 6 | |
| IV | Kinemati Transform Hartenber redundanc geometric | cs nation matrices g parameters, cy, kinematics al methods. Vel | and their arithmet frame assignment calibration, invers ocities and Static fo | tic, link and join to links, direct ke kinematics, so rces in manipulato | t descriptio kinematics lvability, a rs | n, Denavit - , kinematics lgebraic and | 6 |
| V | MachineVision SyProcessinginterpolatitypes suchrecent robModeling | Vision System stem Devices, I g Techniques, N ion, branching on a s RAIL and V ot systems. | mage acquisition, N oise reduction meth capabilities, Program VAL II etc, Features | Masking, Sampling nods, Edge detection mming Languages s of type and devel | and quantis on, Segment Introduction opment of I | sation, Image ation, motion on to various languages for | 7 |
| V I | | , and Simulatio | n ivi manufactufil | ng i iani Automat | | | 0 |

Course Contents for M. Tech. Programme, Department of Mechanical Engineering, AY2023-24

| | Introduction, need for system Modeling, Building Mathematical Model of a manufacturing Plant, robots and application of robots for automation. Introduction to Artificial Intelligence, AI techniques, Need and application of AI |
|---|---|
| | |
| | Text Books |
| 1 | John J. Craig, Introduction to Robotics (Mechanics and Control), Addison-Wesley, 2nd Edition, 04 |
| 2 | Mikell P. Groover et. Al., Industrial Robotics: Technology, Programming and Applications, McGraw – Hill International, 1986. |
| 3 | Shimon Y. Nof, Handbook of Industrial Robotics, John Wiley Co, 01. |
| | |
| | References |
| 1 | Richard D. Klafter, Thomas A. Chemielewski, Michael Negin, Robotic Engineering: An Integrated Approach, Prentice Hall India, 02. |
| 2 | Handbook of design, manufacturing & Automation: R.C. Dorf, John Wiley and Sons. |
| | |
| | Useful Links |
| 1 | https://nptel.ac.in/courses/112/104/112104298/ |
| 2 | https://nptel.ac.in/courses/107/106/107106090/ |
| 3 | https://nptel.ac.in/courses/112/107/112107289/ |
| 4 | https://nptel.ac.in/courses/112/105/112105249/ |

| | | CO |)-PO Mapping | | | |
|-----|---|-------------------------|---------------------|---|---|---|
| | | Programme Outcomes (PO) | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 |
| CO1 | | | 1 | 1 | | |
| CO2 | 1 | | | 2 | | 1 |
| CO3 | 1 | 2 | 2 | | | 2 |

The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High Each CO of the course must map to at least one PO.

Assessment (for Theory Course)

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6. For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

| | | Walc | hand College (Government Aidea | of Engineering, San Autonomous Institute) | gli | |
|---|-----------------------|-----------------------------------|-----------------------------------|---|------------------------------|------------------------------------|
| | | | AY | 2023-24 | | |
| | | | Course l | Information | | |
| Progr | amme | | M. Tech. (Mecha | nical Design Engineering) | | |
| Class, | Semester | | First Year M. Teo | ch., Sem I | | |
| Course Code | | | 7DE513 | | | |
| Course Name | | | Mathematical Me | ethods in Engineering | | |
| Desire | ed Requisi | tes: | | | | |
| | | | | | | |
| | Teaching | Scheme | | Examination Scheme | (Marks) | |
| Lectu | re | 3 Hrs/week | MSE | ISE | ESE | Total |
| Tutor | ial | - | 30 | 20 | 50 | 100 |
| | | | | Credits: 3 | | |
| | | | | | | |
| | 1 | | Course | Objectives | | |
| 1 | To make | students to orga | nize systems of eq | uations, their algebraic and | d graphical rep | resentations, |
| | and their | use in practical | applications. | watama and formulate mot | hamatical mad | lala for them |
| | To prepa | students to solv | e differential equat | ions using numerical tech | nematical mod | els for mem. |
| 3 | Techniqu | ie. | e unicientiai equat | ions using numerical teem | inques and trai | 13101111 |
| | | Course | Outcomes (CO) w | ith Bloom's Taxonomy L | Level | |
| At the | end of the | course, the stud | ents will be able to |), | | 1 |
| со | | Cours | se Outcome Staten | nent/s | Bloom's Taxonomy Level | Bloom's Taxonomy Description |
| CO1 | Apply sta | atistical techniqu | es to analyze mult | ivariate functions. | V | Applying |
| CO2 | Evaluate | solution of | engineering probl | lems by applying the | Ш | Evaluating |
| | knowled | ge of ordinary an | nd partial differenti | al equations | | A |
| 05 | the pers | pective of D"A n of variables. | Alembert principle | and obtain solution from and/or by method of | IV | Anarysnig |
| | 1 ··· 1 ··· ·· | | | | | 1 |
| Modu | ıle | | Module (| Contents | | Hours |
| | Intro | duction to Prol | bability Theory: | | | |
| I | Proba with | bility Theory an examples. | nd Sampling Distri | butions. Basic probability | theory along | 5 |
| | Prob | ability distribut | tions and theorem | S: utions like Dinamial Daia | con Normal | |
| II | - Stand | nential etc. Cen | tral Limit Theorem | n and its significance. So | me sampling | 6 |
| | distri | butions like x^2 , t | t, F. | in and its significance. 50 | nic sampning | |
| | Testi | ng of Statistical | Hypothesis: | | | |
| Ш | Testi | ng a statistical | hypothesis, tests | on single sample and | two samples | 8 |
| | conce | erning means | and variances. A | NOVA: One – way, | Гwo – way | |
| | With/ | without interaction | OIIS. | | | |
| IV | Ordir | ary linear diffe | erential equations | solvable by direct soluti | on methods: | 6 |
| | solva | ble nonlinear OI | DE"s. | | | Ĭ |
| | Parti | al Differential | Equations and | Concepts in Solution t | o Boundary | |
| | | e Problems: | | | | |
| | Solut | ion methods for | wave equation, D | 'Alembert solution, poten | tial equation, | 7 |
| properties of harmonic separation method. | | | IN THECHOUS HEAR | Amuni principle, solution | by variable | |

| VI | Major Equation Types Encountered in Engineering and Physical Sciences: Solution methods for wave equation, D'Alembert solution, potential equation, properties of harmonic functions, maximum principle, solution by variable separation method. | 7 |
|----|---|----------------|
| | | |
| | Textbooks | |
| 1 | Ronald E, Walpole, Sharon L. Myers, Keying Ye, Probability and Statistics for Scientists (8th Edition), Pearson Prentice Hall, 07. | Engineers And |
| 2 | J. B. Doshi, Differential Equations for Scientists and Engineers, Narosa, New De | elhi, 10. |
| | | |
| | References | |
| 1 | Douglas C. Montgomery, Design and Analysis of Experiments (7th Edition), Edition, 09. | Wiley Student |
| 2 | S. P. Gupta, Statistical Methods, S. Chand & Sons, 37th revised edition, 08. | |
| 3 | William W. Hines, Douglas C. Montgomery, David M. Goldsman, Probability an Statistics for Engineering, (4th Edition), Willey Student edition, 06. | nd |
| 4 | Advanced Engineering Mathematics (9th Edition), Erwin Kreyszig, Wiley India | (13). |
| | | |
| | Useful Links | |
| 1 | https://www.ajronline.org/doi/10.2214/ajr.180.4.1800917 | |
| 2 | https://www.healthknowledge.org.uk/public-health-textbook/research-methods/1 methods/statistical-distributions | b-statistical- |
| 3 | https://nptel.ac.in/courses/111/106/111106100/ | |
| 4 | https://www.math.upenn.edu/~deturck/m425/m425-dalembert.pdf | |

| | | | CO-PO Mappin | g | | |
|------------|----------------|---------------------|---------------------|-----------------|--------|---|
| | | | Programme Out | comes (PO) | | |
| | 1 | 2 | 3 | 4 | 5 | 6 |
| CO1 | 3 | | 1 | 2 | | 3 |
| CO2 | 2 | | | 1 | 1 | 2 |
| CO3 | 1 | | 1 | 2 | | |
| The streng | gth of mapping | is to be written as | 1,2,3; Where, 1:L | ow, 2:Medium, 3 | 3:High | |

Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

| | | Walc | hand College (Government Aided | of Engineering, San | ıgli | |
|--|---|--|--|--|--|--|
| | | | AY | 2023-24 | | |
| | | | Course | Information | | |
| Progr | amme | | M. Tech. (Mecha | nical Design Engineering |) | |
| Class. | Semester | | First Year M. Teo | ch., Sem I | · | |
| Cours | e Code | | 7DE514 | | | |
| Cours | e Name | | Process Equipme | ent Design | | |
| Desired Requisites: | | | | | | |
| | u nequisi | | | | | |
| | Teaching | Scheme | | Examination Scheme | (Marks) | |
| Lectu | re | 3 Hrs/week | MSE | ISE | ESE | Total |
| Tutor | ial | _ | 30 | 20 | 50 | 100 |
| | | | | Credits: 3 | | |
| | | 1 | 1 | | | |
| | | | Course | Objectives | | |
| 1 | To prepa | re the students to | o succeed as design | ner in the process industry | /technical prof | ession. |
| - | To provi | de students with | h a sound foundat | ion in process equipment | design require | ed to solve the |
| 2 | problems | in the process i | ndustry. | F | 81 | |
| | To train | the students wit | h good design eng | ineering breadth required | for safe and e | fficient design, |
| 3 | construct | ion, installation | , inspection, testing | g and certification of unfire | ed pressure ves | sels. |
| | To aware | the students ab | out rules and regul | ations related to the operation | tional safety of | process |
| 4 | equipment | nt | e | 1 | 2 | |
| | | Course | Outcomes (CO) w | vith Bloom's Taxonomy I | Level | |
| At the | end of the | course, the stud | ents will be able to | · · · · · | | |
| | | | |), | | |
| СО | | Cours | se Outcome Stater | , nent/s | Bloom's Taxonomy Level | Bloom's Taxonomy Description |
| C0 C01 | Distingui | Course sh types of equations of equations of equations of equations of equations of the equation of the equati | se Outcome Stater | nent/s he process industry and | Bloom's Taxonomy Level IV | Bloom's Taxonomy Description Analysing |
| CO CO1 | Distingui their gen | Cours ish types of equeral procedure o | se Outcome Stater uipment used in t of design. | nent/s he process industry and | Bloom's Taxonomy Level IV | Bloom's Taxonomy Description Analysing |
| CO CO1 CO2 | Distingui their gen Recomm | Course ish types of equeral procedure of end the approprimation | se Outcome Stater uipment used in t of design. iate equipment for ty measures | nent/s he process industry and a process by considering | Bloom's Taxonomy Level IV V | Bloom's Taxonomy Description Analysing Evaluating |
| CO CO1 CO2 | Distingui their gen Recomm process h | Course ish types of equeral procedure of end the appropri- nazards and safet pressure vessels | se Outcome Stater uipment used in t of design. iate equipment for ty measures. | he process industry and a process by considering | Bloom's Taxonomy Level IV V | Bloom's Taxonomy Description Analysing Evaluating |
| CO CO1 CO2 CO3 | Distingui their gen Recomm process h Design p BIS and | Course ish types of equiparts o | se Outcome Stater uipment used in t of design. iate equipment for ty measures. and its correspon pressure vessels. | nent/s he process industry and a process by considering nding components using | Bloom's Taxonomy Level IV V VI | Bloom's Taxonomy Description Analysing Evaluating Creating |
| CO CO1 CO2 CO3 | Distingui their gen Recomm process h Design p BIS and | Course ash types of equeral procedure of end the appropri- nazards and safet pressure vessels ASME codes of | se Outcome Stater uipment used in t of design. iate equipment for ty measures. and its correspon pressure vessels. | nent/s he process industry and a process by considering nding components using | Bloom's Taxonomy Level IV V V | Bloom's Taxonomy Description Analysing Evaluating Creating |
| CO CO1 CO2 CO3 | Distingui their gen Recomm process h Design p BIS and | Course ish types of equeral procedure of end the appropri- nazards and safet pressure vessels ASME codes of | se Outcome Stater uipment used in t if design. iate equipment for ty measures. and its correspon pressure vessels. Module | nent/s he process industry and a process by considering nding components using Contents | Bloom's Taxonomy Level IV V V | Bloom's Taxonomy Description Analysing Evaluating Creating Hours |
| CO CO1 CO2 CO3 Modu | Distingui their gen Recomm process h Design p BIS and | Course ish types of equeral procedure of end the appropri- nazards and safet pressure vessels ASME codes of duction to Proc | se Outcome Stater uipment used in t of design. iate equipment for ty measures. and its correspon pressure vessels. Module cess Equipments: | nent/s he process industry and a process by considering nding components using Contents | Bloom's Taxonomy Level IV V VI | Bloom's Taxonomy Description Analysing Evaluating Creating Hours |
| CO CO1 CO2 CO3 Modu | Distingui their gen Recomm process h Design p BIS and Ile Intro | Course ish types of equeral procedure of end the appropri- nazards and safet pressure vessels ASME codes of duction to Proof luction, Basic pro- | se Outcome Stater uipment used in t if design. iate equipment for ty measures. and its correspon pressure vessels. Module (cess Equipments: rocess requirement | nent/s he process industry and a process by considering nding components using Contents of plants and projects, Ty | Bloom's Taxonomy Level IV V VI | Bloom's Taxonomy Description Analysing Evaluating Creating Hours |
| CO CO1 CO2 CO3 Modu | Distingui their gen Recomm process h Design p BIS and Ile Intro classi | Cours ish types of equeral procedure of end the appropri- nazards and safet pressure vessels ASME codes of duction to Proof fuction, Basic pu- fication of eque | se Outcome Stater uipment used in t of design. iate equipment for ty measures. and its correspon pressure vessels. Module cess Equipments: rocess requirement uipments used i | nent/s he process industry and a process by considering nding components using Contents of plants and projects, Ty n process industry, Ge | Bloom's Taxonomy Level IV V VI | Bloom's Taxonomy Description Analysing Evaluating Creating Hours |
| CO CO1 CO2 CO3 Modu | Distingui their gen Recomm process h Design p BIS and Ile Introo classi proce | Course ish types of equeral procedure of end the appropri- nazards and safet pressure vessels ASME codes of duction to Proof fuction, Basic pu- fication of eq- dure, Materials | se Outcome Stater uipment used in t of design. iate equipment for ty measures. and its correspon pressure vessels. Module cess Equipments: rocess requirement uipments used i of construction an | nent/s he process industry and a process by considering nding components using Contents of plants and projects, Ty n process industry, Ge nd corrosion prevention, | Bloom's Taxonomy Level IV V VI | Bloom's Taxonomy Description Analysing Evaluating Creating Hours 6 |
| CO CO1 CO2 CO3 Modu | Distingui their gen Recomm process h Design p BIS and Ile Intro classi proce requi | Course ish types of equeral procedure of end the appropri- mazards and safer pressure vessels ASME codes of duction to Proof luction, Basic pu- fication of eq- dure, Materials red in process ed | se Outcome Stater uipment used in t of design. iate equipment for ty measures. and its correspon pressure vessels. Module (cess Equipments: rocess requirement uipments used i of construction an quipment design | nent/s he process industry and a process by considering nding components using Contents of plants and projects, Ty n process industry, Ge nd corrosion prevention, | Bloom's Taxonomy Level IV V VI | Bloom's Taxonomy Description Analysing Evaluating Creating Hours 6 |
| CO CO1 CO2 CO3 Modu | Distingui their gen Recomm process h Design p BIS and Ile Introo classi proce requin | Course ish types of equeral procedure of end the appropri- nazards and safet pressure vessels ASME codes of duction to Proof fuction, Basic pu- fication of equeration dure, Materials red in process ec- sure Vessels: | se Outcome Stater uipment used in t of design. iate equipment for ty measures. and its correspon pressure vessels. Module cess Equipments: rocess requirement uipments used i of construction an quipment design | nent/s he process industry and a process by considering nding components using Contents of plants and projects, Ty n process industry, Ge nd corrosion prevention, | Bloom's Taxonomy Level IV V VI | Bloom's Taxonomy Description Analysing Evaluating Creating Hours 6 |
| CO CO1 CO2 CO3 Modu | Distingui their gen Recomm process h Design p BIS and Ile Intro classi proce requi Press Desig | Course ish types of equeral procedure of end the appropri- mazards and safer pressure vessels ASME codes of duction to Proof fication of equeration of equeration dure, Materials red in process economics of sure Vessels: an parameters, I | se Outcome Stater uipment used in t of design. iate equipment for ty measures. and its correspon pressure vessels. Module (cess Equipments: rocess requirement uipments used i of construction an quipment design Design criteria, De | nent/s he process industry and a process by considering inding components using Contents of plants and projects, Ty n process industry, Ge nd corrosion prevention, T esign of pressure vessel c | Bloom's Taxonomy Level IV V VI pes and neral design Design codes | Bloom's Taxonomy Description Analysing Evaluating Creating Hours 6 |
| CO CO1 CO2 CO3 Modu | Distingui their gen Recomm process h Design p BIS and Ile Introd classi proce requin Press Desig Shell | Course ish types of equeral procedure of end the appropri- nazards and safet pressure vessels ASME codes of duction to Pro- fuction, Basic pu- fication of equeration dure, Materials red in process ec- sure Vessels: on parameters, I on Head, Nozzle | se Outcome Stater uipment used in t of design. iate equipment for ty measures. and its correspon pressure vessels. Module cess Equipments: rocess requirement uipments used i of construction an quipment design Design criteria, De e, flanged joint, 7 | nent/s he process industry and a process by considering nding components using Contents of plants and projects, Ty n process industry, Ge nd corrosion prevention, T esign of pressure vessel c Thermal stresses in cyli | Bloom's Taxonomy Level IV V VI pes and neral design Design codes | Bloom's Taxonomy Description Analysing Evaluating Creating Hours 6 |
| CO CO1 CO2 CO3 Modu I II | Distingui their gen Recomm process h Design p BIS and Ile Intro classi proce requi Press Desig Shell Cylin | Course ish types of equeral procedure of end the appropri- azards and safed pressure vessels ASME codes of duction to Proof fication of eq- dure, Materials red in process ec- sure Vessels: gn parameters, I , Head, Nozzle drical pressure | se Outcome Stater uipment used in t of design. iate equipment for ty measures. and its correspon pressure vessels. Module (cess Equipments: rocess requirement uipments used i of construction an quipment design Design criteria, Design criteria, Design conterior (vessels under conterior) | nent/s he process industry and a process by considering inding components using Contents of plants and projects, Ty n process industry, Ge nd corrosion prevention, T esign of pressure vessel conternal stresses in cyling ombined loading, Fabrica | Bloom's Taxonomy Level IV V VI pes and neral design Design codes | Bloom's Taxonomy Description Analysing Evaluating Creating Hours 6 7 |
| CO CO1 CO2 CO3 Modu | Distingui their gen Recomm process h Design p BIS and Ile Introd classi proce requin Press Desig Shell Cylin Inspe | Course ish types of equeral procedure of end the appropri- nazards and safet pressure vessels ASME codes of duction to Proof duction, Basic pre- fication of equeration dure, Materials red in process economic sure Vessels: gn parameters, I gn pa | se Outcome Stater uipment used in t of design. iate equipment for ty measures. and its correspon pressure vessels. Module cess Equipments: rocess requirement uipments used i of construction an quipment design Design criteria, De e, flanged joint, To vessels under co g of pressure vessel | nent/s he process industry and a process by considering nding components using Contents of plants and projects, Ty n process industry, Ge nd corrosion prevention, Ty esign of pressure vessel co Fhermal stresses in cylit ombined loading, Fabrica ls. | Bloom's Taxonomy Level IV V VI vi vi vi vi vi vi vi vi vi vi vi vi vi | Bloom's Taxonomy Description Analysing Evaluating Creating Hours 6 |
| CO CO1 CO2 CO3 Modu I II | Distingui their gen Recomm process h Design p BIS and Ile Intro classi proce requin Press Desig Shell Cylin Inspe | Course ish types of equeral procedure of end the appropri- nazards and safet pressure vessels ASME codes of duction to Proof luction, Basic pu- fication of eq- dure, Materials red in process ec- sure Vessels: gn parameters, I head, Nozzle drical pressure ction and testing Pressure Vesse | se Outcome Stater uipment used in t of design. iate equipment for ty measures. and its correspon pressure vessels. Module (cess Equipments: rocess requirement uipments used i of construction an quipment design Design criteria, De e, flanged joint, 7 vessels under co g of pressure vessel els: | nent/s he process industry and a process by considering nding components using Contents of plants and projects, Ty n process industry, Ge nd corrosion prevention, T esign of pressure vessel c Thermal stresses in cyli ombined loading, Fabrica ls. | Bloom's Taxonomy Level IV V VI pes and neral design Design codes components – ndrical shell, tion process, | Bloom's Taxonomy Description Analysing Evaluating Creating Hours 6 7 |
| CO CO1 CO2 CO3 Modu I II | Distingui their gen Recomm process h Design p BIS and Introd classi proce requir Press Desig Shell Cylin Inspe High Const | Course ish types of equeral procedure of end the appropri- mazards and safet pressure vessels ASME codes of duction to Proof duction, Basic pu- fication of eq- dure, Materials red in process ec- sure Vessels: gn parameters, I gn parameters, I g | se Outcome Stater uipment used in t of design. iate equipment for ty measures. and its correspon pressure vessels. Module cess Equipments: rocess requirement uipments used i of construction an quipment design Design criteria, De e, flanged joint, 7 vessels under co g of pressure vessel els: ures, Stresses in | nent/s he process industry and a process by considering nding components using Contents of plants and projects, Ty n process industry, Ge nd corrosion prevention, T esign of pressure vessel c Fhermal stresses in cylit bmbined loading, Fabrica ls. n thick walled shells, | Bloom's Taxonomy Level IV V VI v v | Bloom's Taxonomy Description Analysing Evaluating Creating Hours 6 7 |
| CO CO1 CO2 CO3 Modu I II | Distingui their gen Recomm process h Design p BIS and Ile Intro classi proce requin Shell Cylin Inspe High Const | Course ish types of equeral procedure of end the appropri- nazards and safet pressure vessels ASME codes of duction to Proof luction, Basic pu- fication of eq- dure, Materials red in process ec- sure Vessels: an parameters, I by Head, Nozzle drical pressure ction and testing Pressure Vessel tructional feature ruction, Shrink | se Outcome Stater uipment used in t of design. iate equipment for ty measures. and its correspon pressure vessels. Module (cess Equipments: rocess requirement uipments used i of construction an quipment design Design criteria, Design criteria, Design criteria, Design construction and quipment design Design criteria, Design criteria, Design construction and quipment design Design criteria, Design construction and quipment design | nent/s he process industry and a process by considering nding components using Contents of plants and projects, Ty n process industry, Ge nd corrosion prevention, T esign of pressure vessel of Thermal stresses in cylicombined loading, Fabrica ls. n thick walled shells, Stresses in shrink fit | Bloom's Taxonomy Level IV V VI vi vi vi vi vi vi vi vi vi vi vi vi vi | Bloom's Taxonomy Description Analysing Evaluating Creating Hours 6 7 7 7 7 |

| IV | Storage Vessels: Storage vessels and its type, Fixed roof storage tanks, Variable volume tanks- vapor lift type and floating roof type, Accessories of storage tanks, column supported storage tanks, Design of rectangular tanks. Reaction vessel - Heating systems of reaction vessels, Design and construction of jackets | 7 |
|----|---|---------------|
| | Heat Exchangers: | |
| V | Types of heat exchangers and constructional features, Design of shell and tube heat exchangers, Arrangements of tubes, baffles, Expansion provisions for heat exchangers. Evaporators and crystallizers – Types and its constructional features | 6 |
| | Process Equipments: | |
| VI | Agitators, Centrifugal machines, Filters and dryers used in process industries. | 6 |
| | Process hazards and safety in the process industry | |
| | | |
| | Textbooks | |
| 1 | Mahajani V.V. and Umbrani S.B., "Process Equipment Design", Macmillan Publ | lishing India |
| 1 | Ltd., Fourth edition, 2009. | |
| 2 | Bieuro of Indian standard "Code for unfired pressure vessels IS:2825", Indian Sta | andard |
| | Institution, Revised Edition | |
| | | |
| | References | |
| 1 | Brownell L. E and Young H, "Process Equipment Design", John Willey Publicat | ion, First |
| 1 | Edition, 2004. | |
| 2 | Harvey J. F., "Theory and Design of Pressure Vessel" CBS Publisher, Third Edit | ion, 2004. |
| | | |
| | Useful Links | |
| 1 | https://www.nptel.ac.in/courses/103/107/103107143/ | |
| 2 | https://nptel.ac.in/courses/103/107/103107207/ | |
| 3 | https://youtu.be/WG4l8jpYXKc | |
| 4 | https://nptel.ac.in/courses/112/105/112105248/ | |
| | | |

| | | | CO-PO Mappin | ıg | | |
|---------------|----------------|-----------------------|-------------------|------------------|--------|---|
| | | | Programme Ou | tcomes (PO) | | |
| | 1 | 2 | 3 | 4 | 5 | 6 |
| CO1 | 1 | | | | | 2 |
| CO2 | | | 2 | | | |
| CO3 | 3 | | 2 | | | 3 |
| The stren | gth of mapping | ; is to be written as | 1,2,3; Where, 1:L | low, 2:Medium, 3 | 3:High | |
| F 1 GO | 0.1 | | DO | | | |

Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

| | | Walc | hand College | of Engineering, San | ngli | |
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| | | | (Government Atted | 2023-24 | | |
| | | | Course | Information | | |
| Progra | amme | | M. Tech. (Mecha | nical Design Engineering |) | |
| Class. | Semester | | First Year M. Teo | ch Sem I | , | |
| Cours | e Code | | 7DE501 | , ~ • • • • • | | |
| Course Name Optimization Techniques in Design | | | | | | |
| Desired Requisites: | | | | | | |
| | <u></u> | | | | | |
| | Teaching | Scheme | | Examination Scheme | (Marks) | |
| Lectu | re | 3 Hrs/week | MSE | ISE | ESE | Total |
| Tutor | ial | - | 30 | 20 | 50 | 100 |
| | | | | Credits: 3 | 1 | |
| | | 1 | 1 | | | |
| | | | Course | Objectives | | |
| | To desig | n a system, com | ponent, or process | to meet desired needs wi | thin realistic c | onstraints such |
| 1 | as econ | omic, environi | nental, social, e | thical, health and safe | ety, manufact | urability, and |
| | sustainab | oility. | | | | |
| 2 | To use th | e operations res | earch techniques a | nd tools for necessary eng | ineering practi | ce. |
| 2 | To use n | nathematical me | ethods and comput | ers to make rational deci | sions in solvin | ng a variety of |
| | optimiza | tion problems. | | | | |
| | | Course | Outcomes (CO) w | ith Bloom's Taxonomy I | Level | |
| At the | end of the | course, the stud | ents will be able to |), | | |
| Bloom's | | | | DI 1 | | |
| CO | | Cours | ya Autaama Statan | nont/s | Bloom's | Bloom's |
| СО | | Cours | se Outcome Staten | nent/s | Bloom's Taxonomy Level | Bloom's Taxonomy Description |
| CO CO1 | Develop | Cours algorithms for d | e Outcome Staten | nent/s | Bloom's Taxonomy Level III | Bloom's Taxonomy Description Applying |
| CO CO1 CO2 | Develop Evaluate | Cours algorithms for d and interpret so | e Outcome Staten lesign optimization lution of an optimi | nent/s zation problem. | Bloom's Taxonomy Level III V | Bloom's Taxonomy Description Applying Evaluating |
| CO CO1 CO2 CO3 | Develop Evaluate Formulat | Course algorithms for d and interpret so e and construct | se Outcome Stater lesign optimization lution of an optimi the optimum soluti | nent/s zation problem. on of the problems using | Bloom's Taxonomy Level III V VI | Bloom's Taxonomy Description Applying Evaluating Creating |
| CO CO1 CO2 CO3 | Develop Evaluate Formulat optimizat | Cours algorithms for d and interpret so e and construct tion techniques. | e Outcome Staten lesign optimization lution of an optimi the optimum soluti | nent/s zation problem. on of the problems using | Bloom's Taxonomy Level III V VI | Bloom's Taxonomy Description Applying Evaluating Creating |
| CO CO1 CO2 CO3 | Develop Evaluate Formulat optimizat | Course algorithms for d and interpret so e and construct tion techniques. | se Outcome Stater lesign optimization lution of an optimi the optimum soluti | nent/s zation problem. on of the problems using | Bloom's Taxonomy Level III V VI | Bloom's Taxonomy Description Applying Evaluating Creating |
| CO CO1 CO2 CO3 | Develop Evaluate Formulat optimizat | Cours algorithms for d and interpret so e and construct tion techniques. | se Outcome Staten lesign optimization lution of an optimi the optimum soluti Module (| nent/s zation problem. on of the problems using Contents | Bloom's Taxonomy Level III V VI | Bloom's Taxonomy Description Applying Evaluating Creating Hours |
| CO CO1 CO2 CO3 Modu | Develop Evaluate Formulat optimizat | Course algorithms for d and interpret so e and construct tion techniques. | se Outcome Stater lesign optimization lution of an optimi the optimum soluti <u>Module (</u> nization, classificat | nent/s zation problem. on of the problems using Contents ion of optimization proble | Bloom's Taxonomy Level III V VI | Bloom's Taxonomy Description Applying Evaluating Creating Hours |
| CO CO1 CO2 CO3 Modu | Develop Evaluate Formulat optimizat | Cours algorithms for d and interpret so e and construct tion techniques. luction to optim | se Outcome Stater lesign optimization lution of an optimi the optimum soluti <u>Module (</u> nization, classifications | nent/s | Bloom's Taxonomy Level III V VI | Bloom's Taxonomy Description Applying Evaluating Creating Hours 7 |
| CO CO1 CO2 CO3 Modu I | Develop Evaluate Formulat optimizat | Course algorithms for d and interpret so e and construct tion techniques. duction to optimi ization technique r programming | se Outcome Stater lesign optimization lution of an optimi the optimum soluti Module (hization, classificat les. , simplex method | nent/s | Bloom's Taxonomy Level III V VI VI | Bloom's Taxonomy Description Applying Evaluating Creating Hours 7 |
| CO CO1 CO2 CO3 Modu I II | Develop Evaluate Formulat optimizat | Cours algorithms for d and interpret so e and construct tion techniques. luction to optim ization techniqu r programming ivity or post-opt | se Outcome Staten lesign optimization lution of an optimi the optimum soluti Module (nization, classificat nes. , simplex method timality analysis | nent/s zation problem. on of the problems using Contents ion of optimization proble and Duality in linear p | Bloom's Taxonomy Level III V VI VI | Bloom's Taxonomy Description Applying Evaluating Creating Hours 7 7 |
| CO CO1 CO2 CO3 Modu I II | Develop Evaluate Formulat optimizat Ile Introc optim Linea sensit One o | Course algorithms for d and interpret so e and construct tion techniques. luction to optimi ization technique r programming ivity or post-opti dimensional min | se Outcome Stater lesign optimization lution of an optimi the optimum soluti Module (hization, classificat nes. , simplex method timality analysis nimization, uncons | nent/s | Bloom's Taxonomy Level III V VI VI | Bloom's Taxonomy Description Applying Evaluating Creating Hours 7 7 6 |
| CO CO1 CO2 CO3 Modu I II III | Develop Evaluate Formulat optimizat | Course algorithms for d and interpret so e and construct tion techniques. luction to optimi ization technique r programming ivity or post-opti dimensional mine and indirect me | se Outcome Staten lesign optimization lution of an optimi the optimum soluti Module (nization, classificat nes. , simplex method timality analysis nimization, unconsethods. | nent/s | Bloom's Taxonomy Level III V VI VI ems, classical programming, minimization, | Bloom's Taxonomy Description Applying Evaluating Creating Hours 7 7 6 |
| CO CO1 CO2 CO3 Modu I II III | Develop Evaluate Formulat optimizat Ile Introc optim Linea sensit One o direct | Course algorithms for d and interpret so e and construct tion techniques. duction to optimi ization technique r programming ivity or post-option dimensional mine and indirect me netric programming | se Outcome Stater lesign optimization lution of an optimi the optimum soluti Module (hization, classificat les. , simplex method timality analysis nimization, uncons ethods. ing, Optimum desi | nent/s | Bloom's Taxonomy Level III V VI VI ems, classical programming, minimization, ts like beams, | Bloom's Taxonomy Description Applying Evaluating Creating Hours 7 7 6 6 |
| CO CO1 CO2 CO3 Modu I II III III | Develop Evaluate Formulat optimizat | Course algorithms for d and interpret so e and construct tion techniques. duction to optime ization technique r programming ivity or post-option dimensional mine and indirect me netric programming ins, gears, shafts | se Outcome Staten lesign optimization lution of an optimi the optimum soluti Module (hization, classificat les. , simplex method timality analysis nimization, unconse thods. ing, Optimum desi s, etc. | nent/s . zation problem. on of the problems using Contents ion of optimization proble and Duality in linear p strained and constrained n ign of mechanical element | Bloom's Taxonomy Level III V VI ems, classical programming, minimization, ts like beams, | Bloom's Taxonomy Description Applying Evaluating Creating Hours 7 7 6 6 |
| CO CO1 CO2 CO3 Modu I II III IV V | Develop Evaluate Formulat optimizat | Course algorithms for d and interpret so e and construct tion techniques. duction to optimi ization technique r programming ivity or post-option dimensional mine and indirect me netric programming ins, gears, shafts duction to Gene | se Outcome Stater lesign optimization lution of an optimi the optimum soluti Module (hization, classificat les. , simplex method timality analysis nimization, uncons ethods. ing, Optimum desi s, etc. etic Algorithms, C | nent/s | Bloom's Taxonomy Level III V VI VI ems, classical programming, minimization, ts like beams, | Bloom's Taxonomy Description Applying Evaluating Creating Hours 7 7 6 6 6 |
| CO CO1 CO2 CO3 Modu I II III IV V | Develop Evaluate Formulat optimizat | Course algorithms for d and interpret so e and construct tion techniques. luction to optimi ization technique r programming ivity or post-opti dimensional mine and indirect me netric programming luction to Gene ization Problem | se Outcome Staten lesign optimization lution of an optimi the optimum soluti Module (ization, classificat les. , simplex method timality analysis nimization, unconse thods. ing, Optimum desi s, etc. etic Algorithms, C | nent/s | Bloom's Taxonomy Level III V VI VI ems, classical programming, minimization, ts like beams, o engineering | Bloom's Taxonomy Description Applying Evaluating Creating Hours 7 7 6 6 6 6 |
| CO CO1 CO2 CO3 Modu I II III IV V V | Develop Evaluate Formulat optimizat Ile Introc optim Linea sensit One o direct Geon colun Introc optim | Course algorithms for d and interpret so e and construct tion techniques. duction to optimi ization technique r programming ivity or post-opt dimensional min and indirect me netric programming nus, gears, shafts duction to Gene ization Problem num selection of ial selection about | A control cont | nent/s | Bloom's Taxonomy Level III V VI VI ems, classical programming, minimization, ts like beams, o engineering design using | Bloom's Taxonomy Description Applying Evaluating Creating 7 7 6 6 6 6 6 7 |
| CO CO1 CO2 CO3 Modu I II III IV V VI | Develop Evaluate Formulat optimizat | Course algorithms for d and interpret so e and construct tion techniques. luction to optime ization technique r programming ivity or post-opt dimensional mine and indirect me netric programming hus, gears, shafts luction to Gene ization Problem num selection cha | ese Outcome Staten lesign optimization lution of an optimi the optimum soluti Module (ization, classificat les. , simplex method timality analysis nimization, unconsect hods. ing, Optimum desi s, etc. etic Algorithms, C as. of material and p arts and optimizatio | nent/s | Bloom's Taxonomy Level III V VI VI ems, classical programming, minimization, ts like beams, o engineering design using | Bloom's Taxonomy Description Applying Evaluating Creating 7 7 6 6 6 6 6 7 |
| CO CO1 CO2 CO3 Modu I II III IV V VI | Develop Evaluate Formulat optimizat | Course algorithms for d and interpret so e and construct tion techniques. duction to optimi ization technique r programming ivity or post-opt dimensional min and indirect me netric programming nus, gears, shafts luction to Gene ization Problem num selection cha | es Outcome Staten lesign optimization lution of an optimi the optimum soluti Module (iization, classificat ies. , simplex method timality analysis nimization, uncons ethods. ing, Optimum desi s, etc. etic Algorithms, C is. of material and p arts and optimizatio | nent/s | Bloom's Taxonomy Level III V VI ems, classical programming, minimization, ts like beams, o engineering design using | Bloom's Taxonomy Description Applying Evaluating Creating 7 7 6 6 6 6 6 7 |
| CO CO1 CO2 CO3 Modu I II III IV V VI | Develop Evaluate Formulat optimizat | Course algorithms for d and interpret so e and construct tion techniques. luction to optimi ization technique r programming ivity or post-opti dimensional mine and indirect me netric programming huction to Gene ization Problem num selection cha | se Outcome Staten lesign optimization lution of an optimi the optimum soluti Module (hization, classificat les. , simplex method timality analysis nimization, unconsections ethods. hing, Optimum desi s, etc. etic Algorithms, C lis. of material and p urts and optimization Tex- | nent/s | Bloom's Taxonomy Level III V VI VI ems, classical programming, minimization, ts like beams, o engineering design using | Bloom's Taxonomy Description Applying Evaluating Creating 7 7 6 6 6 6 6 7 |
| CO CO1 CO2 CO3 Modu I II III IV V VI VI | Develop Evaluate Formulat optimizat lle Introc optim Linea sensit One o direct Geom colum Introc optim Optim mater | Course algorithms for d and interpret so e and construct tion techniques. duction to optimi ization technique r programming ivity or post-opti dimensional mine and indirect me netric programming num selection of ial selection char Stricker, "Optimi Johnson "Optimi | se Outcome Staten lesign optimization lution of an optimi the optimum soluti Module (nization, classificat nes. , simplex method timality analysis nimization, unconsethods. ning, Optimum desi s, etc. etic Algorithms, C us. of material and p urts and optimization Tex nising performance num Design of Max | nent/s | Bloom's Taxonomy Level III V VI VI ems, classical programming, minimization, ts like beams, o engineering design using | Bloom's Taxonomy Description Applying Evaluating Creating 7 7 6 6 6 6 6 6 7 7 York, 1985. |
| CO CO1 CO2 CO3 Modu I II III IV V VI VI VI | Develop Evaluate Formulat optimizat Ile Introc optim Linea sensit One o direct Geon colun Introc optim ater S. S. S. R.C. | Course algorithms for d and interpret so e and construct tion techniques. luction to optimi ization technique r programming ivity or post-opt dimensional mine and indirect me hetric programm nuns, gears, shafts luction to Gene ization Problem num selection cha Stricker, "Optimi Johnson, "Optim | se Outcome Stater lesign optimization lution of an optimi the optimum soluti Module (hization, classificat les. , simplex method timality analysis nimization, uncons ethods. hing, Optimum desi s, etc. etic Algorithms, C lis. of material and p urts and optimization Tex hising performance num Design of Mea- tion to Optimum D | nent/s . zation problem. on of the problems using Contents ion of optimization proble and Duality in linear p trained and constrained n gn of mechanical element Operators, applications to processes in mechanical on. tbooks of energy systems" Battel chanical Elements", Wille basign" McGraw Hill Na | Bloom's Taxonomy Level III V VI VI ems, classical programming, minimization, ts like beams, o engineering design using | Bloom's Taxonomy Description Applying Evaluating Creating 7 7 6 6 6 6 6 7 7 York, 1985. |

| 4 | Kalyanmoy Deb, "Optimization for Engineering Design", Prentice Hall of India, New Delhi, |
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| | References |
| 1 | Rao S, "Engineering optimization, Theory and Practice, New Age International Publishers, |
| 1 | 1996. |
| 2 | R.J. Duffin, E.L. Peterson and C.Zener "Geometric Programming-Theory and Applications", |
| 2 | Willey, New York, 1967. |
| 2 | G.B. Dantzig "Linear Programming and Extensions Princeton University Press", Princeton, N. |
| 3 | J., 1963. |
| | |
| | Useful Links |
| 1 | https://www.youtube.com/watch?v=_awAywLKuEQ&list=PLvfKBrFuxD065AT7q1Z0rDAj9 |
| 1 | kBnPnL0l |
| 2 | https://www.youtube.com/watch?v=wIAOApE0Q3o |
| 3 | https://www.youtube.com/watch?v=GBheyaICuGQ |
| 4 | https://www.youtube.com/watch?v=Z_8MpZeMdD4 |

| CO-PO Mapping | | | | | | | | | |
|---------------|-------------------------|---------------------|------------------|--------------|--------|---|--|--|--|
| | Programme Outcomes (PO) | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | | | |
| CO1 | 2 | | 2 | 1 | 1 | 3 | | | |
| CO2 | 3 | | 1 | | 3 | | | | |
| CO3 | 2 | 1 | 2 | | 1 | | | | |
| The stren | oth of manning | is to be written as | 1 2 3· Where 1·L | ow 2. Medium | R·Hioh | • | | | |

The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

| Walchand College of Engineering, Sangli (Government Aided Autonomous Institute) | | | | | | | |
|--|--|-----------------------------------|--|--------------------------|------------------------------|------------------------------------|--|
| AY 2023-24 | | | | | | | |
| D | | | Course | Information | <u>```</u> | | |
| Progra | amme | | M. Tech. (Mecha | anical Design Engineerin | g) | | |
| Class, | Semester | | First Year M. Teo | ch., Sem I | | | |
| Course Code //DE310 | | | | | | | |
| Course Name Product Lifecycle Management | | | | | | | |
| Desired Requisites: Concept knowledge of product design, management | | | | | | | |
| | Teaching | Scheme | | Examination Schem | e (Marks) | | |
| Lectur | re | 3 Hrs/week | MSE | ISE | ESE | Total | |
| Tutori | ial | - | 30 | 20 | 50 | 100 | |
| | | | | Credits: 3 | I | | |
| | | 1 | 1 | | | | |
| | 1 | | Course | Objectives | | | |
| 1 | To prepa | re students to de | evelop products by | technical and manageria | l and software | skills. | |
| 2 | To make | the students fan | niliar with increase | ed product complexity an | d to maintain p | product quality. | |
| 3 | To devel | op skills to iden | tify the gaps betwe | en current product devel | opment proces | s. | |
| | | Course | Outcomes (CO) w | vith Bloom's Taxonomy | Level | | |
| At the | end of the | course, the stud | lents will be able to |), | DI | DL | |
| СО | | Course | e Outcome Statem | nent/s | Bloom's Taxonomy Level | Bloom's Taxonomy Description | |
| CO1 | Discuss | the importance | and the concept | of Product Lifecycle | II | Understanding | |
| | Manager | nent and its need | l. | T:6 | | A | |
| | Exploit t | ne methodology nd Develon Proc | to set the Product luct Lifecycle Man | Lifecycle Management | III | Applying | |
| CO3 | Analyze | the recent dev | elopments to perf | form product structure | | Analysing | |
| | modellin | g with relations | nip | form product structure | IV | i mary sing | |
| | | 6 | r | | | <u> </u> | |
| Modu | le | | Module C | Contents | | Hours | |
| | Produ | ict life cycle - | - Introduction, gr | rowth, maturity & dec | line, Product | | |
| | Lifec | ycle, Managem | ent-Definition & | Overview, Background | for Product | | |
| т | Lifecycle Management-corporate challenges, Need of Product Lifecycle | | | | | <i>r</i> | |
| 1 | Management, Components/Elements of Product Lifecycle Management, | | | | | 0 | |
| | Emer | | | | | | |
| | Lifec | ycle Manageme | nt - life cycle probl | lems to be resolved. | | | |
| | Produ | ict Lifecycle Ma | anagement Life cyc | cle model- plan, design, | build, support | | |
| | & dis | pose. Threads o | f Product Lifecycle | e Management computer | aided design | | |
| | (CAI | D), engineering | data management | t (EDM), Product data | management | | |
| | (PDN | 1), computer int | egrated manufactu | ring (CIM). Weaving the | e threads into | | |
| | Produ | ict Lifecycle | Management, c | comparison of Produc | ct Lifecycle | | |
| II | Mana | gement to Eng | gineering resource | planning (ERP). Prod | uct Lifecycle | 7 | |
| | Mana | igement chara | acteristics - si | ingularity, cohesion, | traceability, | | |
| | reflec | tiveness, Infor | mation Mirroring | g Model. External dr | ivers- scale, | | |
| | comp | lexity, cycle t | imes, globalizatio | on & regulation. Interr | nal drivers - | | |
| | produ | ctivity, innova | tion, collaboration | n & quality. Boardroo | m drivers – | | |
| | incon | ne, revenues & c | costs | | | | |

| ш | Collaborative Product Development, Mapping Requirements to specifications. Part Numbering, Engineering Vaulting, Product reuse, Engineering Change Management, Bill of Material and Process Consistency. Digital Mock up and Prototype development. Virtual testing and collateral. Introduction to Digital Manufacturing. | 6 | | | | |
|----|--|-------------------------------|--|--|--|--|
| IV | Product life cycle management system- system architecture, Information models and product structure, Information model, the product information data model, the product model, functioning of the system. Reasons for the deployment of Product Lifecycle Management systems. | б | | | | |
| v | Product Data issues – Access, applications, Archiving, Availability, Change, Confidentiality. Product Workflow, The Link between Product Data and Product Workflow, Key Management Issues around Product Data and Product Workflow, Company's Product Lifecycle Management vision, The Product Lifecycle Management Strategy, Principles for Product Lifecycle Management strategy, Preparing for the Product Lifecycle Management strategy. | 7 | | | | |
| VI | Different phases of product lifecycle and corresponding technologies, Foundation technologies and standards e.g. visualization, collaboration and enterprise application integration, Core functions e.g., data vaults, document and content management, workflow and program management, Functional applications e.g., configuration management. Human resources in product lifecycle. | 7 | | | | |
| | Taythooks | | | | | |
| | Criavas Michael Broduct Lifecycle Management Driving the Newt Concretion | ofLoon | | | | |
| 1 | Thinking, McGraw-Hill, 2006. ISBN 0071452303. | | | | | |
| 2 | Antti Sääksvuori, Anselmi Immonen, Product Life Cycle Management - Spring (Nov.5, 2003) | ger, 1st Edition | | | | |
| 3 | Stark, John. Product Lifecycle Management: 21st Century Paradigm for Product Springer- Verlag, 2004. ISBN 1852338105. | et Realization, | | | | |
| 4 | Kari Ulrich and Steven D. Eppinger, Product Design & Development, McGraw International Edns, 1999. | ' Hill | | | | |
| | | | | | | |
| | References | | | | | |
| 1 | Product Design & Process Engineering, McGraw Hill – Kogalkusha Ltd., Toky | ro, 1974. | | | | |
| 2 | Effective Product Design and Development – by Stephen Rosenthol, Business Homewood 1992 ISBN 1-55623-603-4. | One Orwin, | | | | |
| 3 | Clement, Jerry; Coldrick, Andy; & Sari, John. Manufacturing Data Structures, Sons, 1992. ISBN 0471132691 | John Wiley & | | | | |
| 4 | Clements, Richard Barrett. Chapter 8 ("Design Control") and Chapter 9 ("Docu in Quality Manager's Complete Guide to ISO 9000, Prentice Hall, 1993. ISBN | ment Control") 013017534X. | | | | |
| | | | | | | |
| | Useful Links | | | | | |
| 1 | https://www.youtube.com/watch?v=MsnbqLWjlmA&list=PLeL2LKQLdbQvC | 'nx | | | | |
| 2 | https://nptel.ac.in/courses/112/107/112107217/ | | | | | |
| 3 | https://www.youtube.com/watch?v=NDcaDUKQutE&list=PLSGws_74K018y2 | ZOnbSaqW | | | | |
| 4 | https://www.youtube.com/watch?v=m-OMvTWf9mE | | | | | |

| CO-PO Mapping | | | | | | | | |
|---------------|---|---|---|---|---|---|--|--|
| | Programme Outcomes (PO) | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | | |
| CO1 | 1 | | | | 1 | 2 | | |
| CO2 | | | 2 | 3 | | 1 | | |
| CO3 | | | 2 | 3 | | 1 | | |
| The streng | The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High | | | | | | | |

Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

Walchand College of Engineering (Government Aided Autonomous Institute)

Vishrambag, Sangli-416415



Course Content for F. Y. M. Tech. Mechanical (Design Engineering)

Semester-II

2023-24

Hutarkan

glasse.

| Walchand College of Engineering, Sangli (Government Aided Autonomous Institute) | | | | | | | |
|--|---|---|--|--|--|------------|--|
| | AY 2023-24 | | | | | | |
| | | | Course l | Information | | | |
| Progra | amme | | M. Tech. (Mecha | nical Design Engineering) | | | |
| Class, Semester First Year M. Tech., Sem II | | | | | | | |
| Cours | e Code | | 7DE521 | | | | |
| Cours | e Name | | Advanced Vibrat | ion and Acoustics | | | |
| Desire | ed Requisi | tes: | | | | | |
| | | | 1 | | | | |
| | Teaching | Scheme | | Examination Scheme | (Marks) | | |
| Lectu | re | 3 Hrs/week | MSE | ISE | ESE | Total | |
| Tutor | ial | _ | 30 | 20 | 50 | 100 | |
| | | | | Credits: 3 | | | |
| | | | | | | | |
| | | | Course | Objectives | | | |
| 1 | To teach t | he fundamental | concept of dynamic | analysis of machines. | | | |
| | To train s | tudents to prepar | e mathematical mod | lel of discrete and continuou | is mass system | and to | |
| 2 | find respo | onse of models fo | or different types of e | excitations | 5 | | |
| 3 | To introd | ace students to fu | indamental concepts | s of acoustics and its measur | ement. | | |
| | | Course | Outcomes (CO) w | ith Bloom's Taxonomy I | Level | | |
| At the | end of the | course, the stud | lents will be able to |), | | | |
| | | - | | | Bloom's | _Bloom's | |
| CO | | Cours | se Outcome Staten | nent/s | Taxonomy | Taxonomy | |
| <u>CO1</u> | Evaluato | response of a SI | OF system dampa | d or undamped subjected | Level | Evaluating | |
| | to simple | arbitrary base or | force excitation. | a or undamped, subjected | V | Evaluating | |
| CO2 | Apply te | chnique of deco | oupling and orthogo | onal properties of natural | TTT | Applying | |
| | modes to | solve differential | l equations of motion | n for MDOF system. | 111 | | |
| CO3 | Explain y | various terminol | ogies used in acou | ustics and acoustic wave | | Analysing | |
| | transmiss | on, derive plan | e and spherical wave equations, and obtain | | | | |
| | sound pre | ssure level at a | given distance from | a simple sound source of | | | |
| | known su | ength. | | | | | |
| Modu | | | Modulo | Contonts | | Hours | |
| WIOUU | Tron | signt Vibration | Intouule (| | | 110015 | |
| T | Respo | onse of a singl | is le degree of freed | lom system to step and | anv arbitrarv | 6 | |
| 1 | excitation, convolution (Duhamel's) integral, impulse response function | | | | | 0 | |
| | Two | Degree of Free | dom System | | | | |
| | Free, | damped and | forced vibrations | of two degrees of freed | om systems, | | |
| II | Co-or | dinate coupling | and principal coo | rdinates, Dynamic vibration | on absorbers, | 7 | |
| | vibrat | vibration dampers and isolators, Use of Lagrange's equations to derive the | | | | | |
| | | equations of motion. | | | | | |
| | equat | ons of motion. | | | | | |
| | Multi Mode | Degree of Fre | edom System | ioneo coofficiente. Natura | 1 fraguancias | | |
| ш | Multi Mode | Degree of Fre lling of multi-I | edom System OOF systems, Influ | uence coefficients, Natura | 1 frequencies | 7 | |
| III | Multi Mode and Dunk | Degree of Fre lling of multi-I node shape de erley's method | edom System DOF systems, Influ etermination, Eige s, Rayleigh Metho | uence coefficients, Natura en value and eigen vec od. Matrix iteration meth | l frequencies tor problem, tod, Holzer's | 7 | |
| III | Multi Mode and Dunk metho | Degree of Fre lling of multi-I node shape de erley's method | edom System OOF systems, Influ etermination, Eige s, Rayleigh Metho | uence coefficients, Natura en value and eigen vec od, Matrix iteration meth | l frequencies tor problem, tod, Holzer's | 7 | |
| | Multi Mode and Dunk metho | Degree of Fre lling of multi-I node shape de erley's method od | edom System DOF systems, Influ etermination, Eige s, Rayleigh Metho uous System | uence coefficients, Natura en value and eigen vec od, Matrix iteration meth | l frequencies tor problem, tod, Holzer's | 7 | |
| | Multi Mode and Dunk metho Vibra Latera | Degree of Free Iling of multi-I mode shape de erley's method od tion of Contin al vibration of a | edom System DOF systems, Influ etermination, Eige s, Rayleigh Metho uous System string, Longitudina | uence coefficients, Natura en value and eigen vec od, Matrix iteration meth al vibration of rods, Torsic | l frequencies tor problem, nod, Holzer's onal vibration | 7 | |
| III IV | equatMultiModeandDunkmethodVibraLateraof uniti | Degree of Fre lling of multi-I node shape de erley's method od tion of Contin al vibration of a form shaft, Eule | edom System DOF systems, Influ etermination, Eige s, Rayleigh Metho uous System string, Longitudina er's equation of bea | uence coefficients, Natura en value and eigen vec od, Matrix iteration meth al vibration of rods, Torsic ams | l frequencies tor problem, nod, Holzer's | 7 7 | |

| V | Acoustics Plane acoustic waves, Sound speed, characteristic acoustic impedance of elastic media, sound intensity, dB scale, Transmission Phenomena, transmission from one fluid medium to another, normal incidence, reflection at the surface of a solid, standing wave patterns, Symmetric Spherical waves, near and far fields, simple models of sound sources, sound power, determination of sound power and intensity levels at a point due to a simple source | 6 | | | |
|----|---|-------------|--|--|--|
| VI | Psychoacoustics Speech, mechanism of hearing, thresholds of the ear – sound intensity and frequency, loudness, equal loudness levels, loudness, pitch and timbre, beats, masking by pure tones, masking by noise. | 6 | | | |
| | | | | | |
| | Textbooks | | | | |
| 1 | 1 Thomson W. T., "Theory of Vibrations with applications", George Allen and Unwin Ltd. London, 1981. | | | | |
| 2 | S.S. Rao, Addison, "Mechanical Vibrations", Wesley Publishing Co., 1990. | | | | |
| 3 | Leonard Meirovitch, "Fundamentals of vibrations", McGraw Hill International Edition | n | | | |
| | | | | | |
| | References | | | | |
| 1 | S. Timoshenko, "Vibration Problems in Engineering", Wiley, 1974. | | | | |
| 2 | Lawrence E. Kinsler and Austin R.Frey, "Fundamentals of acoustics", Wiley Eastern | Ltd., 1987. | | | |
| 3 | Michael Rettinger, "Acoustic Design and Noise Control", Vol. I & II., Chemical Publ New York, 1977 | ishing Co., | | | |
| 4 | S. Timoshenko, "Vibration Problems in Engineering", Wiley, 1974. | | | | |
| | | | | | |
| | Useful Links | | | | |
| 1 | https://nptel.ac.in/courses/112/104/112104114/ | | | | |
| 2 | https://nptel.ac.in/courses/112/103/112103112/ | | | | |
| 3 | https://nptel.ac.in/courses/112/103/112103111/ | | | | |
| 4 | https://nptel.ac.in/courses/112/104/112104026/ | | | | |

| Programme Outcomes (PO) | | | | | | | |
|-------------------------|--|--|--|--|--|--|--|
| 6 | | | | | | | |
| 3 | | | | | | | |
| 3 | | | | | | | |
| 3 | | | | | | | |
| _ | | | | | | | |

The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

| Walchand College of Engineering, Sangli (Government Aided Autonomous Institute) | | | | | | | |
|--|---|---------------------|------------------------|-------------------------------|----------|---------------|------------------|
| | AY 2023-24 | | | | | | |
| | | | Course 2 | Information | | | |
| Progra | amme | | M. Tech. (Mecha | unical Design Enginee | ring) |) | |
| Class, | Semest | er | First Year M. Teo | ch., Sem II | | | |
| Cours | e Code | - | 7DE522 | , | | | |
| Cours | e Name | | Finite Element M | fethod | | | |
| Desire | d Reau | isites: | | | | | |
| | <u></u> | | | | | | |
| | Teachii | ng Scheme | | Examination Sch | eme | (Marks) | |
| Lectu | re | 3 Hrs/week | MSE | ISE | | ESE | Total |
| Tutor | ial | - | 30 | 20 | | 50 | 100 |
| | | | | Credits | : 3 | | |
| | | | 1 | | | | |
| | | | Course | Objectives | | | |
| - | To tea | ch the fundament | als of finite eleme | ent method with emp | hasi | ze on the und | lerlying theory, |
| 1 | assum | otion, and modelin | ig issues | 1 | | | |
| 2 | To pro | ovide hands on e | xperience using fi | inite element softwar | e to | model, anal | yze and design |
| - | mecha | nical systems | | | - | | |
| At the | and of t | Course the stud | Outcomes (CO) w | vith Bloom's Taxono | my I | Level | |
| At the | | ne course, me stuc | ients will be able to |), | | Bloom's | Bloom's |
| CO | | Cours | se Outcome Statement/s | | Taxonomy | Taxonomy | |
| | | court | | | Level | Description | |
| CO1 | Apply | the concepts of fin | nite element metho | d for solving problem | s in | III | Applying |
| | the me | chanical design. | | | | | |
| CO2 | Solve | the problems in or | ne dimensional stru | ctural systems involv | ving | V | Evaluating |
| <u> </u> | bars, ti | usses, beams. | al EE formulatio | na involvina triana | 100 | VI | Creating |
| | auadri | ateral elements ar | id higher order eler | nents | lai, | V I | Creating |
| | 4 | | | | | | |
| Modu | le | | Module | Contents | | | Hours |
| | Int | roduction | | | | | |
| | His | torical Backgroun | d, Application of | FEM to mechanical e | ngin | eering design | |
| I | problems, Initial and Boundary value problems, Weighted Residual Methods, | | | | | 6 | |
| | Variational Formulation, Ritz Technique, Basic concepts of the Finite Element | | | | | | |
| | Me | thod | | | | | |
| | One Dimensional Problems | | | | | | |
| II | Sti | ffness matrices a | nd force vectors. | Assembly of Matr | ices. | Solution of | 7 |
| | pro | blems from solid | mechanics and heat | t transfer | , | | |
| | Tr | usses | | | | | |
| III | Pla | ne truss, local | and global coor | rdinate systems, str | ess | calculations, | 6 |
| | ten | perature effect on | truss members, so | lutions of practical pr | oblei | ns | |
| | | ond Order 2D Fo | uations involving | onems Scalar Variable Fund | tion | variational | |
| IV | for | mulation. Finite E | lement formulation | 1. Triangular elements | S. Sh | ape functions | 6 |
| | and | l element matrice | s and vectors. Ap | oplication to Field P | roble | ms, Thermal | - |
| | pro | blems, Quadrilate | ral elements, Highe | er Order Elements | | | |
| | Tw | o Dimensional V | ector Variable Pr | oblems | | | |
| v | Eq | uations of elastici | ty, Plane stress, pl | ane strain and axisyn | nmet | ric problems, | 6 |
| | | dy torces and te | mperature effects, | , Stress calculations | Pla | te and shell | |
| | elements. | | | | | | |

| VI | Isoparametric FormulationNatural co-ordinate systems, Isoparametric elements, Shape functions for isoparametric elements, One and two dimensions, Serendipity elementsEigen-value problems, Natural vibration of bars and beams, Methods to findeigen-values and eigen-vectors. | 7 | | | |
|--------------|---|-----------------|--|--|--|
| | | | | | |
| | Textbooks | | | | |
| 1 | Klaus Jurgen Bathe, "Finite Element Procedures" Print ice Hall of India Pv Print,2008 | rt. Ltd. Fourth | | | |
| 2 | J.N. Reddy. "Introduction to Finite Element", Tata McGraw Hill Publishing Co. | Ltd,1998 | | | |
| 3 | O.C. Zienkiewicz, "The Finite Element Method", Tata McGraw Hill Publishin revised edition ,2000 | g Co. Ltd, 5th | | | |
| | | | | | |
| | References | | | | |
| 1 | 1 T.R. Chandrupatla. "Introduction to Finite Element in Engineering", Prentice Hall, New Delhi, 2nd Edition-1997 | | | | |
| 2 | David V. Hutton, Fundamentals of finite element analysis, Tata McGraw Hill Ltd Second edition 2005 | Publishing Co. | | | |
| 3 | S. S. Rao. "Introduction to Finite Element in Engineering", Elsevier, 5th edition, | 2012. | | | |
| 4 | Cook R.D. "Concepts and applications of finite element analysis" Wiley, New 02. | York, 4th Ed. | | | |
| 5 | Logan Deryl L., "A First Course in Finite Element Method", Thomson Brook/Co | ole,5th Ed. | | | |
| | | | | | |
| Useful Links | | | | | |
| 1 | https://www.youtube.com/watch?v=KR74TQesUoQ&list=PLbMVogVj5nJRjnZ UNe7lbnB0 | A9oryBmDd | | | |
| 2 | https://www.youtube.com/watch?v=qwQcGruUGwI | | | | |
| 3 | https://www.youtube.com/results?search_query=+Boundary+Value+problems+in | n+fea+nptel | | | |
| 4 | https://www.youtube.com/watch?v=oz0bUB44LDg | | | | |

| CO-PO Mapping | | | | | | | | |
|---------------|-------------------------|---|---|---|---|---|--|--|
| | Programme Outcomes (PO) | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | | |
| CO1 | 3 | | | | | | | |
| CO2 | | | | 3 | 2 | 2 | | |
| CO3 | | 2 | 2 | | | 3 | | |

The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.

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ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

| | | Walc | hand College (Government Aidea | of Engineering, S Autonomous Institute) | angli | | | |
|--------|---------------------------------------|--------------------|-----------------------------------|--|--------------------|--------------------|--|--|
| | AY 2023-24 | | | | | | | |
| | | | Course l | nformation | | | | |
| Progr | amme | | M. Tech. (Mecha | nical Design Engineer | ng) | | | |
| Class, | Semester | | First Year M. Teo | ch., Sem II | | | | |
| Cours | se Code | | 7DE523 | | | | | |
| Cours | se Name | | Advanced Engine | ering Materials | | | | |
| Desire | ed Requisi | tes: | | | | | | |
| | | | | | | | | |
| | Teaching | Scheme | | Examination Sche | me (Marks) | | | |
| Lectu | re | 3 Hrs/week | MSE | ISE | ESE | Total | | |
| Tutor | ial | - | 30 | 20 | 50 | 100 | | |
| | | | | Credits: | 3 | | | |
| | | | | | | | | |
| | | | Course | Objectives | | | | |
| 1 | To demo | nstrate understa | nding Mechanical | properties of material | s and influence | of imperfections | | |
| - | over mec | hanical properti | es. | | | | | |
| | To demo | nstrate understar | nding phase diagram | ms and their use in pre | dicting phase tr | ansformation and | | |
| 2 | microstru | cture also unde | erstand and predic | t various types of fa | lures using co | ncept of fracture | | |
| | mechanic | es, creep and effe | ect of impact. | | | | | |
| | To recog | nize Electrical, | Thermal, Optical a | and Magnetic Propertie | es of metals, ce | ramics, polymers | | |
| 3 | and comp | posites and unde | erstand the econom | ic considerations in us | age and recycli | ng of materials in | | |
| | human us | se. | | | * • | | | |
| At the | and of the | Course the stud | Outcomes (CO) w | ith Bloom's Taxonon | iy Level | | | |
| At the | | course, me stud | | , | Bloom's | Bloom's | | |
| СО | | Cours | e Outcome Staten | nent/s | Taxonom | y Taxonomy | | |
| C01 | Apply kn | owledge of med | hanics physical ar | d chemical properties | of | Description | | |
| | materials | including meta | ls ceramics polyn | ners and composites a | nd | | | |
| | imperfect | tions and thei | r effects on me | chanical properties | properties of III | | | |
| | materials | and cause of fai | ilure. | r r r | | | | |
| CO2 | Examine | phase diagram | s in predicting pl | nase transformation a | nd | | | |
| | microstru | icture | | | V | Evaluating | | |
| CO3 | Recogniz | e Electrical, Th | ermal, Optical and | I Magnetic Properties | of | a i | | |
| | metals, co | eramics, polyme | ers and composite. | | VI | Creating | | |
| | - | | | | 1 | 1 | | |
| Modu | ıle | | Module (| Contents | | Hours | | |
| | Intro | duction, Atom | ic Structure, Inte | eratomic Bonding an | d Structure o | of | | |
| | Cryst | alline Solids: | | | | | | |
| | Histor | rical perspective | of Materials Scier | nce. Why study proper | ies of materials | 3? | | |
| т | Class | ification of mate | erials. Advanced N | laterials, Future mater | ials and moder | m 6 | | |
| | mater | ials, Atomic st | ructure. Atomic 1 | bonding in solids, Ci | ystal structure | s, | | |
| | Cryst | alline and nonci | systalline materials | . Miller indices. Aniso | ptropic elasticity | у. | | |
| | Elasti | c behaviour o | f composites. Stu | ructure and propertie | s of polymer | s. | | |
| | Structure and properties of ceramics. | | | | | | | |

| | Imperfections in Solids and Mechanical Properties of Metals, Diffusion, | | | | | | |
|----|---|------------|--|--|--|--|--|
| | Dislocations and Strengthening Mechanisms: | | | | | | |
| | Point defects. Theoretical yield point. Line defects and dislocations. Interfacial | | | | | | |
| | defects. Bulk or volume defects. Atomic vibrations; Elastic deformation. | | | | | | |
| | Plastic deformation. Interpretation of tensile stress-strain curves Yielding under | | | | | | |
| | multiavial stress. Vield criteria and macroscopic aspects of plastic deformation | | | | | | |
| II | multiaxial stress. Yield criteria and macroscopic aspects of plastic deformation. Property variability and design factors, Diffusion mechanisms. Steady and non- | | | | | | |
| | | | | | | | |
| | transformation and microstructure Dislocation and plastic deformation | | | | | | |
| | Mashaniama of strengthening in metals. Descuery normatallization and grain | | | | | | |
| | mechanisms of strengthening in metals. Recovery, recrystalization and gran | | | | | | |
| | growth. Strengthening by second phase particles. Optimum distribution of | | | | | | |
| | Phase Diagrams: | | | | | | |
| | Fuilibrium phase diagrams Dartials strengthening by precipitation | | | | | | |
| | Equinorium phase diagrams. Particle strengthening by precipitation. | - | | | | | |
| | Precipitation reactions. Kinetics of nucleation and growth. The iron-carbon | | | | | | |
| | system. Phase transformations. Transformation rate effects and 111 diagrams. | | | | | | |
| | Microstructure and property changes in iron-carbon system. | | | | | | |
| | Fracture. Ductile and brittle fracture. Fracture mechanics. Impact | | | | | | |
| IV | Iracture. Ductile | 7 | | | | | |
| | brittle transition. Fatigue. Crack initiation and propagation. Crack propagation | | | | | | |
| | rate. Creep Generalized creep benaviour. Stress and temperature effects. | | | | | | |
| | Applications and Processing of Metals and Alloys, Polymers, Ceramics, | | | | | | |
| | Trues of metals and allows. Echnication of metals. Thermal processing of | | | | | | |
| | Types of metals and alloys. Fabrication of metals. Thermal processing of | | | | | | |
| | metals. Heat treatment. Precipitation nardening. Types and applications of | - | | | | | |
| | ceramics. Fabrication and processing of ceramics, Mechanical behaviour of | | | | | | |
| | polymers. Mechanisms of deformation and strengthening of polymers. | | | | | | |
| | Crystalization, melting and glass transition. Polymer types. Polymer synthesis | | | | | | |
| | and processing, Particle reinforced composites. Fibre reinforced composites. | | | | | | |
| | Electrical Thermal Ontical and Magnetic Properties and economic | | | | | | |
| | Considerations: | | | | | | |
| | Electrical conduction Sami conductivity Super conductivity Dielectric | | | | | | |
| | Electrical conduction. Semi conductivity. Super conductivity. Dielectric | | | | | | |
| | Thermal conductivity. Thermal starson Dismogratism and Dara magnetism. | | | | | | |
| VI | Therman conductivity. Therman subsses Diamagnetism and Para magnetism. | 5 | | | | | |
| | renomagnetism. Antiferromagnetism and ferrimagnetism. Influence of | | | | | | |
| | Internet of Material Heave Economic, Environmental and Social | | | | | | |
| | issues of Material Usage - Economic considerations. Environmental and | | | | | | |
| | societal considerations. Recycling issues. Life cycle analysis and its use in | | | | | | |
| | design | | | | | | |
| | Textbooks | | | | | | |
| 1 | Materials Science and Engineering, William D. Callister, Jr. John Wiley & sons. | 07. | | | | | |
| | Modern Physical Metallurgy and Material Engineering, Science, Process, applica | tion. | | | | | |
| 2 | Smallman R.E., Bishop R J, Butterworth Heinemann, Sixth Ed., 1999. | | | | | | |
| | Essentials of Materials Science & Engineering, Donald R. Askeland, We | ndelin J. | | | | | |
| 3 | Wright,PradeepFulay | | | | | | |
| | | | | | | | |
| | References | | | | | | |
| 1 | Sidney H. Avener, Physical Metallurgy, Tata McGraw Hill Education Private Lin | mited, 2nd | | | | | |
| 1 | Edition, 1997. | | | | | | |

| 2 | George E. Dieter, Mechanical Metallurgy, Tata McGraw Hill Publication, Si Metric Edition, 3rdRevised edition, 2013. | | | | | | |
|--------------|--|--|--|--|--|--|--|
| 3 | Ashok Sharma, Rajan, Heat Treatment: Principles & Techniques, Phi Learning Pvt. Ltd-New Delhi, 2nd edition, 2011. | | | | | | |
| | | | | | | | |
| Useful Links | | | | | | | |
| | Useful Links | | | | | | |
| 1 | Useful Links https://nptel.ac.in/content/storage2/courses/112108150/pdf/PPTs/MTS_02_m.pdf | | | | | | |
| 1 2 | Useful Links https://nptel.ac.in/content/storage2/courses/112108150/pdf/PPTs/MTS_02_m.pdf https://www3.nd.edu/~amoukasi/CBE30361/Lecture_Defects_2014.pdf | | | | | | |
| 1 2 3 | Useful Links https://nptel.ac.in/content/storage2/courses/112108150/pdf/PPTs/MTS_02_m.pdf https://www3.nd.edu/~amoukasi/CBE30361/Lecture_Defects_2014.pdf https://youtu.be/7x3c8trbtQs | | | | | | |

| CO-PO Mapping | | | | | | | | | | |
|---------------|---|-------------------------|---------|---|---|---|--|--|--|--|
| | | Programme Outcomes (PO) | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | | | | |
| CO1 | 1 | | 2 | 3 | 1 | 2 | | | | |
| CO2 | | | 2 | 3 | 1 | | | | | |
| CO3 | | 1 | 2 | | 3 | 1 | | | | |
| The stren | The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High | | | | | | | | | |
| Each CO | of the course n | nust map to at least | one PO. | | | | | | | |

Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

| Walchand College of Engineering, Sangli | | | | | | | |
|---|-------------|-------------------|---------------------------|-------------------------------|--|-------------------|--|
| AY 2023-24 | | | | | | | |
| | | | Course | Information | | | |
| Progr | amme | | M. Tech. (Mecha | nical Design Engin | eering) | | |
| Class, | Semester | | First Year M. Teo | ch., Sem II | | | |
| Cours | e Code | | 7DE571 | | | | |
| Cours | e Name | | Advanced Vibrat | ion and Acoustics | Lab | | |
| Desire | ed Requisi | tes: | | | | | |
| | | | <u> </u> | | | | |
| Tea | aching Sch | eme (Hrs) | | Examination So | heme (Marks) | | |
| Practi | cal | 2 | LA1 | LA2 | ESE | Total | |
| Intera | ction | - | 30 | 30 | 40 | 100 | |
| | | | | Credi | ts: 1 | 1 | |
| | | | Course | Objectives | | | |
| | To prov | vide an oppor | tunity to student | to do work ind | ependently on a | topic/ problem | |
| 1 | experime | entation selecte | d by him/her and | encourage him/her | to think indepen | dently on his/her | |
| | own to b | ring out the con | clusion under the g | given circumstances | and limitations. | | |
| • | To enco | urage creative | thinking process | to help student t | o get confidence | by successfully | |
| | process | ng the experim | ent/mini-project, ti | nrougn observation | s, discussions and | decision making | |
| 3 | To enabl | e student for tea | chnical report writing | ng and effective pre | sentations. | | |
| | | Course | Outcomes (CO) w | vith Bloom's Taxor | omy Level | | |
| At the | end of the | course, student | s will be able to, | | U Contraction of the second se | | |
| | | | | | Bloom's | Bloom's | |
| CO | | Cours | e Outcome Staten | nent/s | Taxonomy | Taxonomy | |
| | Solve fi | ald problems by | y using different t | achniques in advar | Level III | Applying | |
| CO1 | vibratior | and acoustics | y using unrefert t | cenniques in advar | | Apprying | |
| CO2 | Verify th | e fundamental | concepts of dynami | ics of machines. | V | Evaluating | |
| CO3 | Prepare | and present | a detailed techni | ical report based | on V | Evaluating | |
| 0.05 | experime | ents/mini projec | t work | | | | |
| | | | | | | | |
| | | | Cours | e Content | | | |
| Creation | on of proto | otype/ apparatus | / small equipment/ | experimental set up | innovation of exi | sting product/ | |
| vibrati | is or simul | ation of a proce | ss/ experimental ve | erification of princip | bles in thrust areas | of advanced | |
| viorau | ions and ac | ousiles | | | | | |
| | | | Tex | t Books | | | |
| 1 | Suita | ble books based | l on the contents of | the experiments/ m | ini project | | |
| | | | | | | | |
| | | | Ref | erences | | | |
| 1 | Suita | ble books base | d on the contents | of the experiments | / mini project and | d research papers | |
| | from | Reputed nation | ai and international | journals and confe | rences. | | |
| | | | | | | | |
| | | | Tlasf | ul Linka | | | |
| 1 | Asne | er the need of th | Usef | ul Links | | | |
| 1 | As pe | er the need of th | Usef e experiments/min | ul Links i project. | | | |

| CO-PO Mapping | | | | | | | | |
|---------------|------------------|-------------------|-----------------|----------------------|-----------|---|--|--|
| | | | Programme (| Dutcomes (PO) | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | | |
| C01 | 3 | | | 1 | | | | |
| CO2 | | | 3 | | | | | |
| CO3 | | | | | 3 | 1 | | |
| The stren | gth of mapping i | s to be written a | s 1,2,3; Where, | 1:Low, 2:Mediu | m, 3:High | | | |

The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High

Course Contents for M. Tech Programme, Department of Mechanical Engineering, AY2023-24

| Assessment | | | | | | | | | |
|-----------------|---|-------------------|--|-----------|--|--|--|--|--|
| There are three | There are three components of lab assessment, LA1, LA2 and Lab ESE. | | | | | | | | |
| IMP: Lab ES | E is a separate head of | passing. LA1, LA | A2 together is treated as In-Semester Evaluat | ion. | | | | | |
| Assessment | Based on | Conducted by | Typical Schedule (for 26-week Sem) | Marks | | | | | |
| LA1 | Lab activities, | Lab Course | During Week 1 to Week 6 | 30 | | | | | |
| | attendance, journal | Faculty | Marks Submission at the end of Week 6 | 50 | | | | | |
| L A 2 | Lab activities, | Lab Course | During Week 7 to Week 12 | 20 | | | | | |
| | attendance, journal | Faculty | Marks Submission at the end of Week 12 | 50 | | | | | |
| Lob ESE | Lab activities, | Lab Course | During Week 15 to Week 18 | 40 | | | | | |
| | attendance, journal Faculty Marks Submission at the end of Week 18 | | | | | | | | |
| Week 1 indic | Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, | | | | | | | | |
| considering a | 26-week semester. Th | e actual schedule | shall be as per academic calendar. Lab activit | ities/Lab | | | | | |
| norformanaa | chall include nonformi | na avranimanta n | aini nucicat nuccontations duawings nuccuor | n min a | | | | | |

considering a 26-week semester. The actual schedule shall be as per academic calendar. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments.

| Walchand College of Engineering, Sangli (Government Aided Autonomous Institute) | | | | | | | | |
|--|--|---|--|--|--|--|--|--|
| AY 2023-24 | | | | | | | | |
| Course Information | | | | | | | | |
| Progra | amme | | M. Tech. (Mecha | nical Design Engin | eering) | | | |
| Class, | Semester | | First Year M. Teo | ch., Sem II | | | | |
| Cours | e Code | | 7DE572 | - | | | | |
| Cours | e Name | | Finite Element M | lethod Lab | | | | |
| Desire | ed Requisi | tes: | | | | | | |
| | - | | | | | | | |
| Tea | ching Sch | eme (Hrs) | | Examination S | cheme | (Marks) | | |
| Practi | cal | 2 | LA1 | LA2 |] | ESE | Total | |
| Intera | ction | | 30 | 30 | | 40 | 100 | |
| | | | | Cred | its: 1 | | | |
| | | | Course | Objectives | | | | |
| | To prov | vide an oppor | tunity to student | to do work ind | lepende | ntlv on a | topic/ problem | |
| 1 | experime | entation selecte | d by him/her and | encourage him/her | to thin | nk independ | ently on his/her | |
| | own to b | ring out the con | clusion under the g | given circumstances | and lir | nitations. | | |
| 2 | To encou | urage creative t | hinking process by | successfully comp | leting t | he experime | nts/mini-project, | |
| 2 | through (| observations, di | scussions and decis | sion making process | S. | | | |
| 3 | 10 enabl | e student for tea | Outcomes (CO) v | ig and effective pre | esentation | ons. | | |
| At the | end of the | course student | ts will be able to | | nomy L | | | |
| | Bloom's Bloom's Course Outcome Statement/s Taxonomy | | | | | | | |
| со | | Cour | se Outcome Stater | ment/s | | Taxonomy | Taxonomy | |
| CO CO1 | Solve fie method | Cour eld problems by | se Outcome Stater | ment/s hniques in finite ele | ement | Taxonomy Level III | 7 Taxonomy Description Appling | |
| CO CO1 CO2 | Solve fie method Design element | Cour eld problems by and develop s method | se Outcome Stater using different tec suitable mechanica | ment/s hniques in finite el- al systems using | ement finite | Taxonomy Level III VI | 7 Taxonomy Description Appling Creating | |
| CO CO1 CO2 CO3 | Solve fie method Design element : Prepare experime | Cour eld problems by and develop s method and present ent/mini-project | se Outcome Stater using different tec suitable mechanica a detailed techn t work | ment/s hniques in finite el- al systems using nical report base | ement finite d on | Taxonomy Level III VI V | 7 Taxonomy Description Appling Creating Evaluating | |
| CO CO1 CO2 CO3 | Solve fie method Design element Prepare experime | Cour eld problems by and develop s method and present ent/mini-project | se Outcome Stater using different tec suitable mechanica a detailed techn t work | ment/s hniques in finite ele al systems using nical report base | ement finite d on | Taxonomy Level III VI V | 7 Taxonomy Description Appling Creating Evaluating | |
| CO CO1 CO2 CO3 | Solve fie method Design element : Prepare experime | Cour eld problems by and develop s method and present ent/mini-project | se Outcome Stater using different tec suitable mechanica a detailed techn t work Cours | ment/s hniques in finite el- al systems using nical report base e Content | ement finite d on | Taxonomy Level III VI V | 7 Taxonomy Description Appling Creating Evaluating | |
| CO CO1 CO2 CO3 Creation experiment | Solve fie method Design element : Prepare experime on of FEM mental ver | Cour eld problems by and develop s method and present ent/mini-project | se Outcome Stater using different tec suitable mechanica a detailed techn t work Cours ration of existing pr aciples in thrust are | ment/s hniques in finite ele al systems using nical report base e Content roduct/ analysis or as of finite element | ement finite d on simulat methoc | Taxonomy Level III VI V ion of a prod | 7 Taxonomy Description Appling Creating Evaluating | |
| CO CO1 CO2 CO3 Creation experiment | Solve fie method Design element Prepare experime on of FEM mental ver | Cour eld problems by and develop s method and present ent/mini-project I models/ innov ification of prin | se Outcome Stater using different tec suitable mechanica a detailed techn t work Cours ration of existing pr nciples in thrust area | ment/s hniques in finite ele al systems using nical report base e Content roduct/ analysis or as of finite element | ement finite d on simulat method | Taxonomy Level III VI V ion of a prod | 7 Taxonomy Description Appling Creating Evaluating | |
| CO CO1 CO2 CO3 Creatic experim | Solve fie method Design element : Prepare experime on of FEM mental ver | Cour eld problems by and develop s method and present ent/mini-project I models/ innov ification of prin | se Outcome Stater using different tec suitable mechanica a detailed techn t work Cours vation of existing pr neiples in thrust are Tex | ment/s hniques in finite ele al systems using nical report base e Content roduct/ analysis or as of finite element t Books | ement finite d on simulat methoc | Taxonomy Level III VI V ion of a prod | 7 Taxonomy Description Appling Creating Evaluating | |
| CO1 CO2 CO3 Creation experiments | Solve fie method Design element Prepare experime on of FEM mental ver | Cour eld problems by and develop s method and present ent/mini-project I models/ innov ification of prin | se Outcome Stater using different tec suitable mechanica a detailed techn t work Cours ration of existing pr nciples in thrust area Tex I on the contents of | ment/s hniques in finite ele al systems using nical report base e Content roduct/ analysis or as of finite element t Books the experiments/ n | ement finite d on simulat method | Taxonomy Level III VI V ion of a prod | 7 Taxonomy Description Appling Creating Evaluating | |
| CO CO1 CO2 CO3 Creation experiments | Solve fie method Design element Prepare experime on of FEM mental ver | Cour eld problems by and develop s method and present ent/mini-project I models/ innov ification of prin ble books based | se Outcome Stater using different tec suitable mechanica a detailed techn t work Cours ration of existing pr neiples in thrust area Tex I on the contents of | ment/s hniques in finite ele al systems using nical report base e Content roduct/ analysis or as of finite element t Books the experiments/ n | ement finite d on simulat methoc | Taxonomy Level III VI V ion of a prod | 7 Taxonomy Description Appling Creating Evaluating | |
| CO1 CO2 CO3 Creation experiments | Solve fie method Design element Prepare experime on of FEM mental ver | Cour eld problems by and develop s method and present ent/mini-project I models/ innov ification of prin ble books based | se Outcome Stater using different tec suitable mechanica a detailed techn t work Cours ration of existing pr nciples in thrust area Tex I on the contents of Ref d on the contents | ment/s hniques in finite ele al systems using nical report base e Content roduct/ analysis or as of finite element t Books the experiments/ n erences of the experiments | ement finite d on simulat methoc | Taxonomy Level III VI V ion of a prod i. ject. | Taxonomy Description Appling Creating Evaluating cesss/case studies | |
| CO CO1 CO2 CO3 Creation experiment 1 | Solve fie method Design element Prepare experime on of FEM mental ver | Cour eld problems by and develop s method and present ent/mini-project I models/ innov ification of prin ble books based ble books based | se Outcome Stater using different tec suitable mechanica a detailed techn t work Cours ration of existing pr nciples in thrust area Tex I on the contents of Ref d on the contents al and international | ment/s hniques in finite ele al systems using nical report base e Content roduct/ analysis or as of finite element t Books the experiments/ n erences of the experiments l journals and confe | ement finite d on simulat method hini proj s/ mini erences. | Taxonomy Level III VI V ion of a prod ject. | Taxonomy Description Appling Creating Evaluating cess/case studies research papers | |
| CO1 CO2 CO3 Creation experiments 1 1 | Solve fie method Design element : Prepare experime on of FEM mental ver | Cour eld problems by and develop s method and present ent/mini-project I models/ innov ification of prin ble books based ble books based | se Outcome Stater using different tec suitable mechanica a detailed techn t work Cours ration of existing pro- nciples in thrust area Tex I on the contents of Ref d on the contents al and international | ment/s hniques in finite ele al systems using nical report base e Content roduct/ analysis or as of finite element t Books the experiments/ n ferences of the experiments l journals and confe ful Links | ement finite d on simulat method nini pro | Taxonomy Taxonomy Level III VI V ion of a prod ject. project and | Taxonomy Description Appling Creating Evaluating cess/case studies research papers | |
| CO CO1 CO2 CO3 Creation experiment 1 1 | Solve fie method Design element Prepare experime on of FEM mental ver Suita Suita from | Cour eld problems by and develop s method and present ent/mini-project I models/ innov ification of prin ble books based ble books based reputed nation | se Outcome Stater using different tec suitable mechanica a detailed techn t work Cours ration of existing pr neiples in thrust area Tex I on the contents of Ref d on the contents al and international Usef me experiments/ mir | ment/s hniques in finite ele al systems using nical report base e Content roduct/ analysis or as of finite element t Books the experiments/ n erences of the experiments l journals and confe tul Links ni project. | ement finite d on simulat method s/ mini erences. | Taxonomy Level III VI V ion of a prod ject. | Taxonomy Description Appling Creating Evaluating cess/case studies research papers | |
| CO CO1 CO2 CO3 Creation experiments 1 1 1 1 | Solve fie method Design element : Prepare experime on of FEM mental ver Suita from As pe | Cour eld problems by and develop s method and present ent/mini-project I models/ innov ification of prin ble books based ble books based reputed nation | se Outcome Stater using different tec suitable mechanica a detailed techn t work Cours ration of existing pr nciples in thrust area I on the contents of Ref d on the contents al and international Usef ne experiments/ mir | ment/s hniques in finite ele al systems using nical report base e Content roduct/ analysis or as of finite element t Books the experiments/ n finite experiments finite speriments finite experiments finit | ement finite d on simulat method s/ mini erences. | Taxonomy Taxonomy Level III VI V ion of a prod . ject. . | Taxonomy Description Appling Creating Evaluating cess/case studies research papers | |

| CO-PO Mapping | | | | | | | | | | |
|---|------------------|-------------------------|------------|---|---|---|--|--|--|--|
| | | Programme Outcomes (PO) | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | | | | |
| CO1 | 3 | | | 1 | | | | | | |
| CO2 | | | 3 | | | | | | | |
| CO3 | | | | | 3 | 1 | | | | |
| The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High | | | | | | | | | | |
| Each CO | of the course mu | ist map to at leas | st one PO. | | | | | | | |

| Assessment | | | | | | | | | | |
|-----------------|---|-------------------|---|-------|--|--|--|--|--|--|
| There are three | There are three components of lab assessment, LA1, LA2 and Lab ESE. | | | | | | | | | |
| IMP: Lab ES | E is a separate head of | passing. LA1, LA | A2 together is treated as In-Semester Evaluat | ion. | | | | | | |
| Assessment | Based on | Conducted by | Typical Schedule (for 26-week Sem) | Marks | | | | | | |
| τ. Α. 1 | Lab activities, | Lab Course | During Week 1 to Week 6 | 20 | | | | | | |
| LAI | attendance, journal | Faculty | Marks Submission at the end of Week 6 | 50 | | | | | | |
| LAC | Lab activities, | Lab Course | During Week 7 to Week 12 | 20 | | | | | | |
| LAZ | attendance, journal | Faculty | Marks Submission at the end of Week 12 | 50 | | | | | | |
| Lob ESE | Lab activities, | Lab Course | During Week 15 to Week 18 | 40 | | | | | | |
| Lab ESE | attendance, journal | Faculty | Marks Submission at the end of Week 18 | 40 | | | | | | |
| Week 1 indic | ates starting week of a | semester. The tyr | vical schedule of lab assessments is shown | | | | | | | |

Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments.

| Walchand College of Engineering, Sangli (Government Aided Autonomous Institute) | | | | | | | | | | | |
|--|----------------------------|-------------------|---|----------------------|-------------|------------------|------------------|--|--|--|--|
| AY 2023-24 | | | | | | | | | | | |
| Course Information | | | | | | | | | | | |
| Progra | amme | | M. Tech. (Mecha | nical Design Engir | neering) | | | | | | |
| Class, | Semester | | First Year M. Tec | ch., Sem II | | | | | | | |
| Cours | e Code | | 7DE545 | | | | | | | | |
| Cours | e Name | | Seminar | | | | | | | | |
| Desire | d Requisi | tes: | | | | | | | | | |
| | | | | | | | | | | | |
| | Teaching | Scheme | | Examination | Scheme (| Marks) | | | | | |
| Practi | cal | 2 Hrs/ Week | LA1 | LA2 | Lab | ESE | Total | | | | |
| Intera | ction | _ | 30 | 30 | 40 |) (| 100 | | | | |
| | | | | Cro | edits: 1 | | | | | | |
| | | | | | | | | | | | |
| | | | Cours | se Objectives | | | | | | | |
| 1 | To review | w and increase s | tudent's understan | ding of the specific | c topics. | | | | | | |
| 2 | To induc | e Learning man | agement of values. | | | | | | | | |
| 3 | To teach | how research | papers are written | n and read such p | papers cri | tically and ef | ficiently and to | | | | |
| 5 | summari | ze and review th | nem to gain an unde | erstanding of a nev | v field, in | the absence of | a textbook. | | | | |
| 4 | To teach | how to judge t | he value of differe | ent contributions an | nd identify | y promising n | ew directions in | | | | |
| | specified | area. | Qutagmag (CQ) | with Dloom's Tax | an amy I | aval | | | | | |
| At the | and of the | course the stud | lents will be able to | WITH BIOOM'S TAX | Conomy L | evel | | | | | |
| At the | | course, the stue | | , | | Bloom's | Bloom's | | | | |
| со | | Cou | rse Outcome State | ement/s | | Taxonomy | Taxonomy | | | | |
| | | | | | | Level | Description | | | | |
| CO1 | Apply th | e existing know | ledge on real life p | oroblems | | III | Applying | | | | |
| CO2 | Investiga | te the selected t | opic/ system. | | | IV | Analysing | | | | |
| CO3 | Verify th | e outcomes of t | he work have solve | ed the specified pro | oblems. | V | Evaluating | | | | |
| | | | | | | | | | | | |
| | | I | List of Experimen | ts / Lab Activities | /Topics | | | | | | |
| Conte | nts: | | | | | | | | | | |
| The se | minar wor | k should prefera | ably be a problem | with research poter | ntial, invo | lve scientific | research review, | | | | |
| individ | , generatio Jual contri | bution The set | and analysis of da minar should be b | ata, determine a s | on the ar | and preferably | be candidate is | | | | |
| interes | ted to und | ertaking the dis | sertation work Th | ne candidate has to | be in reg | ular contact y | with their guide | | | | |
| and the | e topic of t | the seminar mus | st be mutually deci | ded. The examinat | tion shall | consist of the | preparation of a | | | | |
| report | consisting | of a literature r | eview, a detailed p | oroblem statement, | case studi | ies, etc., accor | ding to the type | | | | |
| of wor | k carried of | out. The work h | as to be presented | in front of the exa | aminer pa | nel formed by | department for | | | | |
| evalua | tion. | | | | | | | | | | |
| | | | | | | | | | | | |
| 1 | a •••• | ala ha -1 1 1 | To | extbooks | | | | | | | |
| | Suita | DIE DOOKS based | on the contents of | the seminar topic | selected. | | | | | | |
| | | | n | formances | | | | | | | |
| | Suita | hle hooks hase | d on the contents | of the seminar to | nic select | ed and recear | ch papers from | | | | |
| 1 | renut | ed national and | international iourn | als and conference | s. | cu anu itstal | en papers nom | | | | |
| | Toput | | international journe | | | | | | | | |
| | | | | | | | | | | | |
| | | Useful Links | | | | | | | | | |
| 1 | As pe | r the need of the | Use e seminar topic. | eful Links | | | | | | | |

| CO-PO Mapping | | | | | | | | | | |
|---------------|------------------|-------------------------|--------------------|--------------|------------|---|--|--|--|--|
| | | Programme Outcomes (PO) | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | | | | |
| CO1 | 2 | 2 | 1 | | | | | | | |
| CO2 | 3 | | | | 1 | | | | | |
| CO3 | | 3 | | | 2 | | | | | |
| The stren | gth of mapping i | s to be written | as 1,2,3; Where, 1 | :Low, 2:Medi | um, 3:High | | | | | |
| Each CO | of the course mu | ist map to at lea | ast one PO. | | | | | | | |

| Assessment | | | | | | | | |
|---|--------------------|---------------------------|--------------------------------|-------|--|--|--|--|
| There are three components of lab assessment, LA1, LA2 and Lab ESE. | | | | | | | | |
| IMP: Lab ESE | is a separate head | of passing.(min 40 %), LA | 1+LA2 should be min 40% | | | | | |
| Assessment | Based on | Conducted by | Typical Schedule | Marks | | | | |
| | Lab activities, | | During Week 1 to Week 8 | | | | | |
| LA1 | attendance, | Lab Course Faculty | Marks Submission at the end of | 30 | | | | |
| | journal | | Week 8 | | | | | |
| | Lab activities, | | During Week 9 to Week 16 | | | | | |
| LA2 | attendance, | Lab Course Faculty | Marks Submission at the end of | 30 | | | | |
| | journal | | Week 16 | | | | | |
| | Lab activities, | Lab Course Faculty and | During Week 18 to Week 19 | | | | | |
| Lab ESE | journal/ | External Examiner as | Marks Submission at the end of | 40 | | | | |
| | performance | applicable | Week 19 | | | | | |

Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.

| Walchand College of Engineering, Sangli | | | | | | | | | |
|---|--|--|-----------------|-----------------------------------|---|-------------------------|--------------------------|--------------|-------------------------|
| | (Government Aldea Autonomous Institute) | | | | | | | | |
| | Course Information | | | | | | | | |
| Programme | 2 | | | M. Tech. (M | echanical Design E | ngineering | g) | | |
| Class, Seme | Class Semester First Year M Tech Sem II | | | | | | | | |
| Course Cod | le | | | 7DE531 | | | | | |
| Course Nan | ne | | | Fracture Med | hanics | | | | |
| Desired Red | nuisites: | | | | | | | | |
| | 1 | | | | | | | | |
| Tea | Teaching Scheme Examination Scheme (Marks) | | | | | | | | |
| Lecture | 8 | 3 Hrs/week | | MSE | ISE | ES | SE | | Total |
| Tutorial | | 5 1113/ WCCK | | 30 | 20 | 5 | 0 | | 100 |
| | | - | | 30 | 20 | <u> </u> | 0 | | 100 |
| | | | | | Cr | ealts: 5 | | | |
| | T | | | Course | e Objectives | | | | |
| 1 | To des | cribe the near fie | eld ec | uations to det | ermine the stress-st | train and l | load-displa | acem | ent fields around |
| 2 | a crack | up for linear ela | astic ulate | cases. the stress inte | nsity factor ((K) fo | r typical c | rack conf | iouro | tions |
| $\frac{2}{3}$ | To ider | tify and formula | ate th | e strain energ | v release rate (G) | i typicai C | | iguia | |
| | 101401 | Course | Out | comes (CO) | with Bloom's Taxo | onomy Le | evel | | |
| At the end o | f the cou | ırse, students wi | 11 be | able to, | | v | | | |
| ~~~ | | ~ | | | | | Bloom | 's | Bloom's |
| CO | | Cot | irse (| Jutcome Stat | cement/s | | Taxono | my | Taxonomy Description |
| | Relate | the basic concer | ots re | garding solid | materials | | III | | Applying |
| CO2 | Check | the procedures t | o car | rvout analysis | of failure | | V | | Evaluating |
| CO3 | Design | of Failure anal | ysis t | emplate | | | VI | | Creating |
| | | | | | | | | | |
| Module | | | | Modu | e Contents | | | | Hours |
| I | Int dei | roduction to Ma | ateria | l Behavior, o | verview of disloca | tion theor | y and pla | stic | 6 |
| II | Ov asp | verview of Engineers, Fracture, I | ineer Fatigu | ing Fracture | Mechanics: Kinds des of fracture failt | of failure are | es, Histor | ical | 7 |
| Ш | Su rel | rface energy, Gi ease rate of D | riffith CB | n's realization specimen, in | and analysis, Ener | gy release | e rate, Ene k tip, Cr | ergy eack | 7 |
| | res Cr | sistance stable a itical energy rele | and u | instable crack ate. Stress int | growth, R curve, ensity factor, relation | , thin and on betwee | thick pl n GI and | ate, KI | |
| IV | An eff | elastic deformation deformatio | ation gth, e | at the crack effect of plate | tip, modelling of thickness. | Plastic | Deformati | ion, | 6 |
| V | | astic plastic ana egral, applicatio | ns. F | , J-integral, d racture Tough | efinition and engir | neering ap | oproach o | t J- | 7 |
| VI | Cr. | ack tip opening all scale yieldin | disp g, Fa | lacement, rela ilure analysis- | ationship between Spectacular Failur | CTOD, K res case st | I and GI udies. | for | 6 |
| | | | | | | | | | |
| 1 | D | ashant Vumar " | Flore | Te: ents of Erects | xt Books re Mechanics". Tet | a MaC-mar | и Ц:11 Ма | | Ibi India 2000 |
| 2 | K. | Ramesh, e-Bo | ook | on Engineer | ing Fracture Mec | hanics, I | IT Madra | as, 2 | 2007. URL: |
| 3 | K. | R.Y. Simha, "F mited, 2001. | ractu | re Mechanics | for Modern Engin | eering De | esign", Un | ivers | ities Press (India) |
| | | | | | | | | | |
| | | | | Re | ferences | | | | |
| 1 | D. Do | Broek, "Elem ordrecht, 198 | nenta 86. | ry Engineeri | ng Fracture Mec | hanics", | Kluwer A | Acad | emic Publishers, |
| 2 | T.] Fr: | L. Anderson,"Fr ancis Group 20 | actur 05. | re Mechanics | - Fundamentals an | d Applica | ations", 31 | rd Ed | lition, Taylor and |

| Useful Links | | | | |
|--------------|---|--|--|--|
| 1 | https://www.youtube.com/watch?v=hnkFR5J_Ifw&list=PLfIFNJ1DPG4nwAQAY8aEi2- | | | |
| 1 | 1JPwCRj9Gq | | | |
| 2 | https://www.youtube.com/watch?v=91wnE77utoo | | | |
| 3 | https://www.youtube.com/watch?v=rKi6_ibjVPA | | | |
| 4 | https://www.youtube.com/watch?v=eGwqCwgFB1w | | | |

| | CO-PO Mapping | | | | | |
|---|---------------|-------------------------|---|---|---|---|
| | | Programme Outcomes (PO) | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 |
| CO1 | | 1 | 3 | 2 | 1 | 2 |
| CO2 | | 2 | 1 | 3 | 2 | |
| CO3 | 1 | 2 | 1 | | 1 | 2 |
| The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High | | | | | | |

Assessment (for Theory Course)

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6. For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

| Walchand College of Engineering, Sangli (Government Aided Autonomous Institute) | | | | | | | |
|--|---|---|---|---|---|-------------|--|
| | AY 2023-24 | | | | | | |
| | Course Information | | | | | | |
| Progr | Programme M. Tech. (Mechanical Design Engineering) | | | | | | |
| Class | Semester | • | First Year M Te | ch Sem II | / | | |
| Cours | e Code | | 7DF532 | | | | |
| Cours | e Coue | | Tribology in Dec | ion | | | |
| Desine | d De suria | :4.a.a. | Thubbiogy in Des | Ign | | | |
| Desire | a kequis | ites: | | | | | |
| | | <u> </u> | | | / - | | |
| | Teaching | Scheme | | Examination Scheme | (Marks) | | |
| Lectur | ·e | 3 Hrs/week | MSE | ISE | ESE | Total | |
| Tutori | al | - | 30 | 20 | 50 | 100 | |
| | | | | Credits: 3 | | | |
| | | | | | | | |
| | | | Course | Objectives | | | |
| 1 | To creat | e an awareness c | of the importance of | f tribology in design. | | | |
| 2 | To desc | ribe the material | selection for minin | nizing friction and wear in | n machinery. | | |
| 3 | To selec | t bearing and bea | aring arrangement | in machines | y | | |
| | | Course | Outcomes (CO) w | ith Bloom's Taxonomy] | Level | | |
| At the | end of the | e course, student | s will be able to, | | | | |
| | | | | | Bloom's | Bloom's | |
| CO | | Cours | e Outcome Staten | tcome Statement/s Ta | | Taxonomy | |
| | | | | | Level | Description | |
| GO1 | Apply | the basic theor | ies of friction, w | rear and lubrication to | IV | Applying | |
| COI | prediction | ons about the fri | ctional behavior of | commonly encountered | | | |
| | Soloot n | nterfaces. | iconte to suggest a | tribulagical solution to a | V | Evoluting | |
| CO2 Select materials and lubricants to suggest a tribological solution to a v | | | | Evaluating | | | |
| CO3 Design a hydrodynamic bearing using various bearing charts VI | | | | | Creating | | |
| | Design | u nj u ou j nume | | us couring charts. | | croanig | |
| Modu | le | | Module (| Contents | | Hours | |
| Moud | Iuh | rication Theory | moune | soments | | Hours | |
| I | Intro prop indu | oduction to Tril erties, Bearing stry, Lubrication erties, Lubricant | cology, Tribology construction and – introduction, b classification, Lub | in design, Bearing m Bearing Terminology, pasic modes of lubricatio pricants standards, Types of | aterials - its Tribology in n, Lubricants of additives | 6 | |
| | Fric | tion and Wear | | | | | |
| II | II Friction and wear Friction - Laws of friction, Friction classification, Causes of friction, Theories of dry friction, Friction measurement, Stick-Slip motion and friction instabilities. Wear - Wear classification, Wear between solids, Wear between solid and liquid, Factors affecting wear, Measurement of wear, Theories of Wear | | | | | 6 | |
| | Lub | rication of Bear | ings | | | | |
| | Theo | ory of hydrodyna | amic lubrication, N | Aechanism of pressure de | evelopment in | | |
| ш | oil fi | ilm, Two dimens | ional Reynold's eq | uation and its limitations, | Designing of | 8 | |
| | jour | hal bearing by | using Raimondi a | ind Boyd method, Petro | off's solution, | 0 | |
| | Para | meters of beari | ng design - Unit | bearing pressure, Tem | perature rise, | | |
| | | gui to diameter ra | uio, Kadiai clearan | ce, minimum oil-film thic | ckness. | | |
| т <i>и</i> | Intro | rouynamic inr | of hydrodynamic | thrust bearing Analysis | of flat plate | 6 | |
| | thrus | st bearing Tilting | b pad thrust hearing | and Rayleigh sten hearing | or nat plate | U | |
| | Hvd | rostatic and So | leeze Film Luhric | ation | ·o· | | |
| | Hvd | rostatic Lubricat | ion – Basic concen | ot, Advantages and limitat | ions, Viscous | | |
| v | flow | through rectang | gular slot, Load ca | rrying capacity and flow | requirement, | 7 | |
| | Ener | gy losses, Optim | um design. Hydros | static conical thrust bearing | lg , | | |
| | Squeeze Film Lubrication - Basic concept, Squeeze action between circular | | | | | | |

Course Contents for M. Tech Programme, Department of Mechanical Engineering, AY2023-24

| | and rectangular plates. | | | | | | |
|--------------|--|------------------|--|--|--|--|--|
| | Applications of Tribology | | | | | | |
| VI | Rolling contact bearing, gear teeth, Journal bearing, Gas (Air-) lubricated | 6 | | | | | |
| | bearings, Case studies in tribology | | | | | | |
| | | | | | | | |
| | Text Books | | | | | | |
| 1 | Basu, Sengupta and Ahuja, "Fundamentals of Tribology", PHI Learning, First ed | lition, 2011. | | | | | |
| 2 | Sushil Kumar Srivatsava, "Tribology in Industry", S. Chand Publisher, Revised | edition, 2001 | | | | | |
| | | | | | | | |
| | References | | | | | | |
| 1 | Majumdar B.C., "Introduction to Tribology of Bearings", S. Chand and Comp | any Ltd., First | | | | | |
| 1 | ¹ Edition, 2010. | | | | | | |
| 2 | Bharat Bhushan, "Handbook of Tribology", Krieger Publishing Company, First | Edition, 1997. | | | | | |
| | Mervin H. Jones and Douglas Scott, "Industrial Tribology - The Practical Asped | cts of Friction, | | | | | |
| 3 | Lubrication and Wear", Elsevier Scientific Publishing Company Amsterdam-Oxford-New | | | | | | |
| | York, 1991. | | | | | | |
| 4 | PrasannaSahoo, "Engineering Tribology", PHI Learning Pvt. Ltd., First Edition | , 2011. | | | | | |
| | | | | | | | |
| Useful Links | | | | | | | |
| 1 | https://nptel.ac.in/courses/112/102/112102015/ | | | | | | |
| 2 | https://nptel.ac.in/courses/112/102/112102014/ | | | | | | |
| 3 | https://nptel.ac.in/courses/112/106/112106137/ | | | | | | |
| 4 | https://nptel.ac.in/courses/113/108/113108083/ | | | | | | |

| | CO-PO Mapping | | | | | | |
|---|---------------|-------------------------|---|---|---|---|--|
| | | Programme Outcomes (PO) | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | |
| CO1 | 2 | | 1 | | | 2 | |
| CO2 | | | 2 | | | 2 | |
| CO3 | 1 | 2 | 2 | | | 3 | |
| The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High | | | | | | | |

Assessment (for Theory Course)

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

| | Walchand College of Engineering, Sangli (Government Aided Autonomous Institute) | | | | | |
|--|---|---|--|--|--|---|
| | AY 2023-24 | | | | | |
| | | | Course] | Information | | |
| Progra | ProgrammeM. Tech. (Mechanical Design Engineering) | | | | | |
| Class, | Class, Semester First Year M. Tech., Sem II | | | | | |
| Cours | e Code | | 7DE533 | | | |
| Cours | e Name | | Experimental Stre | ess Analysis | | |
| Desire | ed Requisi | tes: | Strength of mater | rial, Material Science | | |
| | | | · | | | |
| | Teaching SchemeExamination Scheme (Marks) | | | | | |
| Lectu | re | 3 Hrs/week | MSE | ISE | ESE | Total |
| Tutor | ial | - | 30 | 20 | 50 | 100 |
| | | | Cro | edits: 3 | | |
| | | | | | | |
| | | | Course | Objectives | | |
| 1 | To make | the student fam | iliar with technique | es of experimental stress | analysis. | |
| 2 | To study | strain gauge bri | dge configurations | and related instrumenta | tion to take read | lings. |
| • | To use | different polar | riscope arrangeme | ents along with auxi | iary equipmen | t required for |
| 3 | photoelas | sticity. | | - | | _ |
| | | Course | Outcomes (CO) w | ith Bloom's Taxonom | ' Level | |
| At the | end of the | course, the stud | ents will be able to |), | | |
| | | ~ | | | Bloom's | Bloom's |
| CO | | Cours | se Outcome Stater | nent/s | Taxonomy | Taxonomy |
| <u>C01</u> | Analyza | the photoelectic | CO1 Anglura the rhote electic date hy yerious methods | | | Description |
| CO2 Determine the station and strength in shortenbertine benefities. | | | data by various me | athode | III | Analycing |
| CO2 | Dotormir | the photoelastic | data by various me | ethods. | III | Analysing |
| CO2 | Determin | the strains an | data by various me | ethods. Delastic coating by usin | g V | Analysing Evaluating |
| CO2 | Determin reflection | the protoclastic the strains an polariscope. | data by various me d stresses in photo | ethods. | g V | Analysing Evaluating |
| CO2 CO3 | Determin reflection Apply va | the protocolastic the strains and polariscope. rious methods a | data by various me d stresses in photo nd instrumentation | ethods. belastic coating by usin for strain measurement | III g V III | Analysing Evaluating Applying |
| CO2 CO3 | Determir reflection Apply va | e the strains an polariscope. rious methods a | data by various me d stresses in photo nd instrumentation | ethods. Delastic coating by usin for strain measurement | g V III | Analysing Evaluating Applying |
| CO2 CO3 Modu | Determin reflection Apply va | the protocolastic the strains and polariscope. rious methods a | data by various me d stresses in photo nd instrumentation Module (| ethods. Delastic coating by usin a for strain measurement Contents | g V III | Analysing Evaluating Applying Hours |
| CO2 CO3 Modu | Determin reflection Apply va | the protocolastic the strains and polariscope. rious methods a duction to ESA | data by various me d stresses in photo nd instrumentation Module (.: Advantages of J | ethods. Delastic coating by usin of for strain measurement Contents | III V III sity of various | Analysing Evaluating Applying Hours |
| CO2 CO3 Modu | Determin reflection Apply va Ile Intro ESA | the photoenastic the strains and polariscope. rious methods a duction to ESA function to ESA | data by various me d stresses in photo nd instrumentation Module (:: , Advantages of I | ethods. Delastic coating by usin of for strain measurement Contents ESA techniques, Neces | III V III sity of various duction of few | Analysing Evaluating Applying Hours 6 |
| CO2 CO3 Modu | Determin reflection Apply va ile Introc ESA | duction to ESA methods, methods, method | data by various me d stresses in photo nd instrumentation Module (.: , Advantages of I odology of problem | ethods. Delastic coating by usin of for strain measurement Contents ESA techniques, Neces of solving by ESA. Intro | III g V g III sity of various duction of few | Analysing Evaluating Applying Hours 6 |
| CO2 CO3 Modu | Determin reflection Apply va Ile Intro ESA conce | duction to ESA methods, methods unction to ESA duction to ESA | data by various me d stresses in photo nd instrumentation Module (: , Advantages of I odology of problem es of materials | ethods. Delastic coating by usin of for strain measurement Contents ESA techniques, Neceson solving by ESA. Intro | III g V g III sity of various duction of few | Analysing Evaluating Applying Hours 6 |
| CO2 CO3 Modu | Determin reflection Apply va ile Introc ESA conce Phote | duction to ESA methods, methods be the strains and polariscope. rious methods a duction to ESA methods, metho pts of Mechanic o Elasticity: ry of Photo Elas | data by various me d stresses in photo nd instrumentation Module (: , Advantages of I odology of problem es of materials | ethods. Delastic coating by usin of for strain measurement Contents ESA techniques, Neces In solving by ESA. Intro- ted to photo elasticity. | III V III sity of various duction of few | Analysing Evaluating Applying Hours 6 |
| CO2 CO3 Modu | Determin reflection Apply va ile Intro ESA conce Phote Theon | duction to ESA methods, methods methods, methods duction to ESA methods, metho pts of Mechanic o Elasticity: ry of Photo Elas | data by various me d stresses in photo nd instrumentation Module (: , Advantages of I odology of problem es of materials sticity, Optics rela | ethods. pelastic coating by usin for strain measurement Contents ESA techniques, Neces n solving by ESA. Intro ted to photo elasticity- atural and artificial biref | III g V g V sity of various duction of few Ordinary light, ingence Stress | Analysing Evaluating Applying Hours 6 |
| CO2 CO3 Modu | Determin reflection Apply va ile Intro ESA conce Photo Theon Mono | duction to ESA methods, methods and polariscope. rious methods a duction to ESA methods, metho pts of Mechanic o Elasticity: ry of Photo Elast pehromatic light, law in two dime | data by various me d stresses in photo nd instrumentation Module (.: , Advantages of I odology of problem cs of materials sticity, Optics rela , polarized light, na | ethods. Delastic coating by usin of for strain measurement Contents ESA techniques, Neces in solving by ESA. Intro- ted to photo elasticity- atural and artificial biref | III g V g V sity of various duction of few Ordinary light, ingence, Stress value in terms | Analysing Evaluating Applying Hours 6 |
| CO2 CO3 Modu I | Determin reflection Apply va ile Introd ESA conce Photo Mono optic | duction to ESA nethods, methods a methods, methods of Mechanic of Elasticity: ry of Photo Elas ochromatic light law in two dime | data by various me d stresses in photo nd instrumentation Module (.: , Advantages of I odology of problem es of materials sticity, Optics rela , polarized light, na ensions atnormal in ffect of stressed a | ethods. pelastic coating by usin for strain measurement Contents ESA techniques, Neces n solving by ESA. Intro ted to photo elasticity- atural and artificial biref ncidence, material fringe model in plane polaries | III g V g V sity of various duction of few Ordinary light, ingence, Stress value in terms one_Isoclinics | Analysing Evaluating Applying Hours 6 7 |
| CO2 CO3 Modu I | Determin reflection Apply va Ile Intro ESA conce Photo Theon Mono optic of str | duction to ESA nethods, methods aduction to ESA duction to ESA nethods, metho pts of Mechanic o Elasticity: ry of Photo Elas ochromatic light, law in two dime ress function, E | data by various me d stresses in photo nd instrumentation Module (: , Advantages of I odology of problem cs of materials sticity, Optics rela , polarized light, na ensions atnormal in ffect of stressed 1 | ethods. pelastic coating by usin for strain measurement Contents ESA techniques, Necess a solving by ESA. Intro- ted to photo elasticity- atural and artificial biref ncidence, material fringer model in plane polarise a of model materials | III g V g V III sity of various duction of few Ordinary light, ingence, Stress value in terms ope–Isoclinics, Properties of | Analysing Evaluating Applying Hours 6 7 |
| CO2 CO3 Modu I | Determin reflection Apply va ile Introd ESA conce Phote Theon Mone optic of str Isoch | duction to ESA nethods, methods a duction to ESA nethods, methods pts of Mechanic o Elasticity: by of Photo Elast ochromatic light, law in two dime ress function, E romatics, Crite | data by various me d stresses in photo nd instrumentation Module (.: , Advantages of I odology of problem es of materials sticity, Optics rela , polarized light, na ensions atnormal in ffect of stressed 1 rion for selection | ethods. pelastic coating by usin a for strain measurement Contents ESA techniques, Necess a solving by ESA. Intro- ted to photo elasticity- atural and artificial biref incidence, material fringe model in plane polarise a of model materials, prials Casting technique | III g V g V sity of various duction of few Ordinary light, ingence, Stress value in terms ope–Isoclinics, Properties of and machining | Analysing Evaluating Applying Hours 6 |
| CO2 CO3 Modu I | Determin reflection Apply va Ile Introd ESA conce Photo Theon Mono optic of str Isoch comm | duction to ESA duction to ESA duction to ESA duction to ESA duction to ESA methods, methor of Mechanic of Mechanic of Mechanic of Photo Ela behromatic light, law in two dime ress function, E romatics, Crite nonly employed | data by various me d stresses in photo nd instrumentation Module (: , Advantages of I odology of problem cs of materials sticity, Optics rela , polarized light, na ensions atnormal in ffect of stressed 1 rion for selection photo elastic mate | ethods. pelastic coating by usin a for strain measurement Contents ESA techniques, Necess a solving by ESA. Intro- ted to photo elasticity- atural and artificial biref ncidence, material fringer model in plane polarise a of model materials, prials, Casting technique perial | III g V g V sity of various duction of few Ordinary light, ingence, Stress value in terms ope–Isoclinics, Properties of and machining | Analysing Evaluating Applying Hours 6 7 |
| CO2 CO3 Modu I II | Determin reflection Apply va ile Introd ESA conce Phote Theon Mone optic of str Isoch comm of me | duction to ESA in polariscope. rious methods a duction to ESA function to ESA methods, metho pts of Mechanic o Elasticity: ry of Photo Elan pehromatic light, law in two dime ress function, E romatics, Crite nonly employed del, Conclusion | data by various me d stresses in photo nd instrumentation Module (.: , Advantages of I odology of problem es of materials sticity, Optics rela , polarized light, na ensions atnormal in ffect of stressed 1 rion for selection photo elastic mate is pertaining to mat | ethods. pelastic coating by usin a for strain measurement Contents ESA techniques, Necess a solving by ESA. Intro- ted to photo elasticity- atural and artificial biref incidence, material fringe model in plane polarise a of model materials, prials, Casting technique rerial | III g V g V sity of various duction of few Ordinary light, ingence, Stress value in terms ope–Isoclinics, Properties of and machining | Analysing Evaluating Applying Hours 6 7 |
| CO2 CO3 Modu I | Determin reflection Apply va ile Introd ESA conce Photo Theon Mono optic of str Isoch comm of mo | duction to ESA in polariscope. rious methods a duction to ESA luction to ESA methods, methor opts of Mechanic opts of Mechanic opts of Mechanic opts of Photo Ela behromatic light, law in two dime romatics, Crite nonly employed del, Conclusion ods of Analysis mination of dim | data by various me d stresses in photo nd instrumentation Module (.: , Advantages of I odology of problem es of materials sticity, Optics rela , polarized light, na ensions atnormal in ffect of stressed 1 rion for selection photo elastic mate s pertaining to mat | ethods. pelastic coating by usin a for strain measurement Contents ESA techniques, Neces a solving by ESA. Intro- ted to photo elasticity- atural and artificial biref ncidence, material fringen model in plane polarise a of model materials, prials, Casting technique perial | III g V g V sity of various duction of few Ordinary light, ingence, Stress value in terms ope–Isoclinics, Properties of and machining | Analysing Evaluating Applying Hours 6 7 |
| CO2 CO3 Modu I II | Determin reflection Apply va Ile Intro ESA conce Photo Theon Mono optic of str Isoch comm of mo | duction to ESA in polariscope. rious methods a duction to ESA luction to ESA methods, metho pts of Mechanic o Elasticity: ry of Photo Elas ochromatic light, law in two dime romatics, Crite nonly employed del, Conclusion ods of Analysis mination of dire | data by various me d stresses in photo nd instrumentation Module (: , Advantages of I odology of problem cs of materials sticity, Optics rela , polarized light, na ensions atnormal in ffect of stressed 1 rion for selection photo elastic mate is pertaining to mat : ection of Principal N and the principal | ethods. pelastic coating by usin a for strain measurement Contents ESA techniques, Necess a solving by ESA. Intro- ted to photo elasticity- atural and artificial biref noidence, material fringen model in plane polarise a of model materials, prials, Casting technique erial stresses at given point h stresses at given point | III g V g V sity of various duction of few Ordinary light, ingence, Stress value in terms ope–Isoclinics, Properties of and machining Determination x2) at the given | Analysing Evaluating Applying Hours 6 7 |
| CO2 CO3 Modu I II | Intro Determin reflection Apply value Ile Intro ESA conce Photo Theor Mono optic of str Isoch comm of mode Deter of example | duction to ESA in polariscope. rious methods a duction to ESA duction to ESA duction to ESA methods, metho pts of Mechanic o Elasticity: ry of Photo Ela ochromatic light, law in two dime romatics, Crite nonly employed del, Conclusion ods of Analysis mination of dire act fringe order | data by various me d stresses in photo nd instrumentation Module (: , Advantages of I odology of problem es of materials sticity, Optics rela , polarized light, na ensions atnormal in ffect of stressed 1 rion for selection photo elastic mate is pertaining to mat ection of Principal N and the principal | ethods. pelastic coating by usin a for strain measurement Contents ESA techniques, Necess a solving by ESA. Intro- ted to photo elasticity- atural and artificial biref ncidence, material fringe model in plane polarise a of model materials, prials, Casting technique rerial stresses at given point l stress difference (σ1- red on Hock's Law, Fil- | III g V g V sity of various duction of few Ordinary light, ingence, Stress value in terms ope-Isoclinics, Properties of and machining Determination 52) at the given | Analysing Evaluating Applying 6 7 7 |
| CO2 CO3 Modu I II III | Determin reflection Apply va ile Intro ESA conce Phote Theon Mone of str Isoch comm of me of str Isoch comm of me | duction to ESA in polariscope. rious methods a duction to ESA luction to ESA methods, methor pts of Mechanic DElasticity: ry of Photo Ela behromatic light law in two dime ess function, E romatics, Crite nonly employed del, Conclusion ods of Analysis mination of dire act fringe order Separation me | data by various me d stresses in photo nd instrumentation Module (: , Advantages of I odology of problem cs of materials sticity, Optics rela , polarized light, na ensions atnormal in ffect of stressed 1 rion for selection photo elastic mate is pertaining to mat : ection of Principal N and the principal thods: Method bas | ethods. pelastic coating by usin a for strain measurement Contents ESA techniques, Necess a solving by ESA. Intro- ted to photo elasticity- atural and artificial biref ncidence, material fringe model in plane polarise a of model materials, prials, Casting technique perial stresses at given point l stress difference (σ 1- bed on Hook's Law, Ele- | III g V g V sity of various duction of few Ordinary light, ingence, Stress value in terms ope–Isoclinics, Properties of and machining Determination 52) at the given ctrical analogy | Analysing Evaluating Applying Hours 6 7 7 7 |
| CO2 CO3 Modu I II III | Determin reflection Apply va Ile Intro ESA conce Photo Theon Mono optic of str Isoch comm of mo Meth Deter of exa point, metho | duction to ESA in polariscope. rious methods a duction to ESA luction to ESA methods, metho of Mechanic o Elasticity: ry of Photo Elas ochromatic light, law in two dime romatics, Crite nonly employed del, Conclusion ods of Analysis mination of dire act fringe order Separation me od, Oblique inc | data by various me d stresses in photo nd instrumentation Module (.: , Advantages of I odology of problem cs of materials sticity, Optics rela , polarized light, na ensions atnormal in ffect of stressed n rion for selection photo elastic mate is pertaining to mat : ection of Principal N and the principa thods: Method bas idence method, Sh | ethods. pelastic coating by usin a for strain measurement Contents ESA techniques, Necess a solving by ESA. Intro- ted to photo elasticity- atural and artificial biref neidence, material fringen model in plane polarise a of model materials, erials, Casting technique terial stresses at given point l stress difference (σ 1- sed on Hook's Law, Ele- hear difference method. | III g V g V sity of various duction of few Ordinary light, ingence, Stress value in terms ope–Isoclinics, Properties of and machining Determination 52) at the given ctrical analogy Scaling model | Analysing Evaluating Applying Hours 6 7 7 7 |

| | Strain Measurement Using Strain Gauges: | | | | | | |
|---|---|-------------|--|--|--|--|--|
| | Introduction, types, construction and material, Gauge factor, cross or transverse | | | | | | |
| IV | sensitivity, correction for transverse strain effect, semiconductor strain gauge. | | | | | | |
| IV | Selection and Mountings of Strain Gauges: Grid, backing, adhesive, mounting | | | | | | |
| | methods, checking gauge installation, Moisture proofing. Strain | | | | | | |
| | Gauge/Circuitry: Measurement of force or load, Measurement of torque | | | | | | |
| | Application of Strain Gauges: | | | | | | |
| | Introduction, Analysis of strain gauge data by analytical and graphical | | | | | | |
| V | methods, Analysis when principal stress directions are known, Analysis when 6 | | | | | | |
| | principal stress directions are unknown, Delta rosette, Tee-rosette, Four | | | | | | |
| | element rectangular rosette, Rectangular rosette – Two and three element | | | | | | |
| | Brittle Coating and Moir Method: | | | | | | |
| VI | Brittle coating method - merits, demerits and applications, Moiré fringe | 6 | | | | | |
| V I | method - merits, demerits and applications, Birefringent coating-principle and | | | | | | |
| | working of reflection polariscope. | | | | | | |
| | | | | | | | |
| | Textbooks | | | | | | |
| 1 Dally J. W., Riley W. F. "Experimental Stress Analysis", McGraw Hill, Third Edition 1991. | | | | | | | |
| 2 | Dr.Sadhu Singh, "Experimental Stress Analysis", Khanna Publishers, Fourth Edi | tion, 2015. | | | | | |
| | | | | | | | |
| | References | V | | | | | |
| 1 | Srinath, L.S., Ragnava, M.R., Lingaian, K., Garagesna, G., Pant B., Ramachandra | l, K., | | | | | |
| | "Experimental Stress Analysis", Tata McGraw-Hill, New Delni, 1984. | 007 | | | | | |
| 2 | Abdul Muben, "Experimental Stress Analysis", DhanpatRai& Co, First edition, I | 1987. | | | | | |
| 3 | Window A. L., "Strain Gauge Techniques", Springer Publications, Second editio | n, 1992. | | | | | |
| | | | | | | | |
| 1 | Useful Links | | | | | | |
| 1 | https://www.youtube.com/watch?v=0jtv5N145q8 | VO2DVa0 | | | | | |
| 2 | https://www.youtube.com/watch/v=n50P5Csw1A1&nst=PL10JJHg1Pkviviyab. | AU3KVSU | | | | | |
| | 1 oqwSdivio4 Y I a index=8 | VO2DU 0 | | | | | |
| 3 | nttps://www.youtube.com/watch?v=Z1XYwdPznkA&list=PL16JJHgYPkvMyac | OXO3RVs0 | | | | | |
| | Y oqwSalvio4 Y I & index= $2/$ | | | | | | |
| 4 | https://www.youtube.com/watch?v=OUSDiI8UOJA&list=PL16JJHgYPkvMyab | XO3RVs0 | | | | | |
| | YoqwSdMo4YT&index=30 | | | | | | |
| | | | | | | | |

| | CO-PO Mapping | | | | | | |
|---|---------------|-------------------------|---|---|---|---|--|
| | | Programme Outcomes (PO) | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | |
| CO1 | 2 | | 2 | | | 3 | |
| CO2 | 2 | | 2 | | | 3 | |
| CO3 | 2 | | 2 | | | 3 | |
| The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High | | | | | | | |
| Each CO of the course must map to at least one PO. | | | | | | | |

Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

| Walchand College of Engineering, Sangli | | | | | | | |
|---|--|---|---|--|-----------------------------|--|------------------------------------|
| | AY 2023-24 | | | | | | |
| | Course Information | | | | | | |
| Progr | Programme M. Tech. (Mechanical Design Engineering) | | | | | | |
| Class | Somostor | | First Year M Te | ech Sem II | | <i>.</i> / | |
| Cours | a Code | | 7DF534 | | | | |
| Cours | o Nomo | | Condition Monit | oring of Machines | | | |
| Docino | d Doguisit | 0.5 | | torning of widenines | | | |
| Desire | u Kequisit | es. | | | | | |
| | Taashing | Calcone a | | Energinetian C | a h a ma a | (Maulea) | |
| Leafer | Teaching Scheme Examination Scheme (Warks) | | | | | Tatal | |
| Lectu | | 5 HIS/Week | | 15E | | ESE 50 | 10tai |
| lutor | 181 | - | | 20 | •• • | 50 | 100 |
| | | | ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ | Cred | its: 3 | | |
| | — 1 | | Course | Objectives | | 11 1 0 | 1 0 11 |
| 1 | To make Monitorir | students awa ng. | re of some meth | ods and procedu | res ap | plied for ge | eneral Condition |
| 2 | To make monitorin | students apprecing and vibration- | ate and understand based condition me | the basic idea behi onitoring, know the | nd vib | ration-based al stages of C | structural health |
| 3 | To prepar signals | re students capa | ble to apply some | basic techniques | for ana | lysis of rand | om and periodic |
| 4 | To prepa vibration- | re students aw based monitorir | are of some basic | c instrumentation | used f | or machiner | y and structural |
| | 1 | Course | Outcomes (CO) w | ith Bloom's Taxor | 10my I | Level | |
| At the | end of the | course, students | will be able to, | | v | | |
| со | | Cours | e Outcome Staten | nent/s | | Bloom's Taxonomy Level | Bloom's Taxonomy Description |
| CO1 | Calculate | the characterist | ic of problems relation | ted to vibrations | | V | Evaluating |
| CO2 | Apply kn | owledge for pre- | ventive maintenance | ce | | III | Applying |
| CO3 | Investigat mechanic | the data for all machines | troubleshooting vi | bration problems i | n the | IV | Analysing |
| | 1 | | | | | 1 | |
| Modu | le | | Module (| Contents | | | Hours |
| | Туре | s of Maintenan | ce | | | | |
| I | Types monit techni | of maintenar oring of structu iques. | nce, basic idea our and machines. | of health monitor . Critical speed of | ring an shafts | nd condition, Some basic | 6 |
| Signal ProcessingIIStudy of periodic and random signals, probability distribution, statistical properties, power spectral density functions of commonly found systems, spectral analysis7 | | | | | l, 7 | | |
| III | Fouri Fourie applic | er Transform er transform: tl ation to real sig | ne basic idea of nals, resonant frequ | Fourier transform, uencies, modes of v | , interp vibratio | pretation and | 6 |
| IV | Vibra Introd by vil and ir | ition Based Fau luction to vibra pration analysis: astruments | It Diagnosis tion-based monito Use and selection | ring, Machinery co of measurements, | onditio analys | n monitoring is procedures | <u> </u> |
| v | Appli Typic rotatin vibrat isolati | cations of Cond al applications ng machines, ion problem relation | dition Monitoring of condition mo unbalance, misali ated to the foundat | onitoring using vi gnment, faulty g ion. Transmissions | bration ears a of vib | analysis to nd bearings ration and its | 7 |
| VI | Other Other tempe | Health Monit health monite erature analysis, | oring Techniques oring techniques, Applications | acoustic emissio | n, oil | debris and | 6 |

| | Text Books | | | | |
|---|--|--|--|--|--|
| 1 | Adams M. L., Rotating Machinery Analysis - from Analysis to Troubleshooting, CRC Press, 2nd edition, 2009 | | | | |
| 2 | Cornelius S., Paresh G., Practical Machinery Vibration Analysis and Predictive Maintenance, Newnes, 1st edition, 2004 | | | | |
| 3 | Mohanty A. R., Machinery Condition Monitoring-Principles and Practices, CRC Press, 1st edition, 2015 | | | | |
| | | | | | |
| | References | | | | |
| 1 | William J. H., Davis N., Drake P. R., Condition Based Maintenance and Machine Diagnostics, Springer Netherlands , 2nd edition, 1994 | | | | |
| 2 | L.L. Faulkner, Handbook of Industrial Noise Control, Industrial press, 1st edition 1976 | | | | |
| 3 | Rao S. S., Mechanical Vibrations, Pearson education, 5th edition, 2010 | | | | |
| | | | | | |
| | Useful Links | | | | |

| | Useful Links |
|---|--|
| 1 | https://www.youtube.com/watch?v=aKcDBg8c4hk |
| 2 | https://www.youtube.com/watch?v=6dFnpz_AEyA |
| 3 | https://nptel.ac.in/courses/112/105/112105232/ |
| 4 | https://nptel.ac.in/courses/112/105/112105048/ |

| CO-PO Mapping | | | | | | | |
|---------------|-------------------------|---|---|---|---|---|--|
| | Programme Outcomes (PO) | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | |
| C01 | | | 3 | | 2 | 3 | |
| CO2 | 2 | | | | | 1 | |
| CO3 | | | | 2 | 3 | | |

The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

| | Walchand College of Engineering, Sangli (Government Aided Autonomous Institute) | | | | | | | | |
|--|--|--|--|--------------|--|--|--|--|--|
| | AY 2023-24 | | | | | | | | |
| | Course Information | | | | | | | | |
| Programme M. Tech. (Mechanical Design Engineering) | | | | | | | | | |
| Class, | Semester | First Year M. Tech., Sem II | , | | | | | | |
| Cours | Course Code 7DE535 | | | | | | | | |
| Cours | e Name | Analysis and Synthesis of Mechanisms | | | | | | | |
| Desired Requisites: Kinematics and theory of machines | | | | | | | | | |
| | 1 | | | | | | | | |
| | Teaching Scheme | Examination Scheme | (Marks) | | | | | | |
| Lectur | re 3 Hrs/week | MSE ISE | ESE | Total | | | | | |
| Tutori | ial - | 30 20 | 50 | 100 | | | | | |
| | | Credits: 3 | | | | | | | |
| | | | | | | | | | |
| | | Course Objectives | | | | | | | |
| 1 | To provide students v | vith a sound foundation in kinematic and | synthesis of | machines and | | | | | |
| | mechanisms. | | | | | | | | |
| 2 | To train the students to | apply complex number, matrices and algebra | for analysis of | mechanisms. | | | | | |
| 2 | To prepare the students | to use modern software for kinematic and dy | namic analysis | of the | | | | | |
| 3 | mechanisms | | | | | | | | |
| | Course | Outcomes (CO) with Bloom's Taxonomy | Level | | | | | | |
| At the | end of the course, the stu | dents will be able to, | 1 | | | | | | |
| СО | Course Outcome Statement/s Bloom's Taxonomy | | | | | | | | |
| CO1 | Select, configure, and | synthesize mechanical components into | | | | | | | |
| | complete systems. Use | kinematic geometry to formulate and solve | V | Evaluating | | | | | |
| | constraint equations to c | lesign linkages for specified tasks. | | | | | | | |
| CO2 | Formulate analytical e | quations describing the relative position, | N/I | Creating | | | | | |
| | velocity and acceleration | n of all moving links. | V I | Creating | | | | | |
| CO3 | Analyze and animate th | e movement of planar and spherical four-bar | | | | | | | |
| | linkages. Students will | be able to apply modern computer-based | IV | Analysing | | | | | |
| | techniques in the select | ion, analysis, and synthesis of components | IV | 7 mary sing | | | | | |
| | and their integration integration | o complete mechanical systems. | | | | | | | |
| | | | | | | | | | |
| Modu | le | Module Contents | | Hours | | | | | |
| Ι | Basic Concepts; Definitions and assumptions; planar and spatial mechanisms; kinematic pairs; degree of freedom; equivalent mechanisms; Kinematic Analysis of Planar Mechanisms. Review of graphical and analytical methods of velocity and acceleration analysis of kinematically simple mechanisms, velocity-acceleration, analysis of complex mechanisms by the normal acceleration and auxiliary-point methods | | | | | | | | |
| п | Curvature Theory: F equation, Bobillier c Applications in dwe | ixed and moving centrodes, inflection circle, onstructions, cubic of stationary curvature, B 1 mechanisms. | Euler-Savary all's point, | 7 | | | | | |
| III | Kinematic Synthesi Chebesychev spaci generation and rigid using pole method, o bar and slider- crank | s of planar mechanisms, accuracy (prec ng, types of errors, Graphical synthesis body guidance with two, three and four ac centre and circle point curves, Analytical syn mechanisms. | ision) points, for function curacy points thesis of four- | 6 | | | | | |

Course Contents for M. Tech Programme, Department of Mechanical Engineering, AY2023-24

| IV | Freudenstein's equation, synthesis for four and five accuracy points, compatibility condition, synthesis of four-bar for prescribed angular velocities and accelerations using complex numbers, three accuracy point synthesis using complex numbers. | | | | | |
|----|--|---------------|--|--|--|--|
| V | Coupler Curves: Equation of coupler curve, Robert-Chebychev theorem, double points and symmetry. 6 | | | | | |
| VI | I Kinematic Analysis of Spatial Mechanisms, Denavit-Hartenberg parameters, matrix method of analysis of spatial mechanisms. | | | | | |
| | | | | | | |
| | Textbooks | | | | | |
| 1 | R.S. Hartenberg and J. Denavit, "Kinematic Synthesis of Linkages", McGraw-Hi 1980. | ll, New York, | | | | |
| 2 | Robert L.Nortan ,"Design of Machinery', Tata McGraw Hill Edition. | | | | | |
| 3 | 3 Hamilton H.Mabie, "Mechanisms and Dynamics of Machinery", John Wiley and sons New York. | | | | | |
| | | | | | | |
| | References | | | | | |
| 1 | A. Ghosh and A.K. Mallik, "Theory of Machines and Mechanisms", Affilia | ted East-West | | | | |
| 1 | Press, New Delhi, 1988. Prentice Hall India, 1988. | | | | | |
| 2 | A.G. Erdman and G.N. Sandor, "Mechanism Design–Analysis and Synthesis", (V | /ol. 1 and 2) | | | | |
| 3 | A.S. Hall, "Kinematics and Linkage Design", Prentice Hall of India | | | | | |
| 4 | J.E. Shigley and J.J. Uicker, "Theory of Machines and Mechanisms", 2nd Edition Hill | n, McGraw- | | | | |
| | | | | | | |
| | Useful Links | | | | | |
| 1 | https://eg4.nic.in/govpoly/DFILES/EBOOKS/IR/ebookTOM_Mechanisms_and_ b6.pdf | Machines_83 | | | | |
| 2 | https://s.goessner.net/articles/CubicOfStationaryCurvature.html | | | | | |
| 3 | https://mech.iitm.ac.in/meiitm/wp-content/uploads/2016/08/Design-Stream-Cour Contents.pdf | se | | | | |
| 4 | https://eg4.nic.in/govpoly/DFILES/EBOOKS/IR/ebookTOM_Mechanisms_and_ b6.pdf | Machines_83 | | | | |

| CO-PO Mapping | | | | | | | | |
|---|-----------------|-------------------------|---------|---|---|---|--|--|
| | | Programme Outcomes (PO) | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | | |
| CO1 | 1 | | 2 | 3 | | 1 | | |
| CO2 | 1 | | | 3 | | | | |
| CO3 | 1 | | 1 | 3 | | | | |
| The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High | | | | | | | | |
| Each CO | of the course n | nust map to at least | one PO. | | | | | |

Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

| | | Walc | hand College (Government Aided | of Engineering, San l Autonomous Institute) | gli | | |
|--|---|--|--|--|--|---|--|
| | | | AY | 2023-24 | | | |
| | | | Course 1 | Information | | | |
| Progra | Programme M. Tech. (Mechanical Design Engineering) | | | | | | |
| Class, | Semester | | First Year M. Teo | ch., Sem II | | | |
| Cours | e Code | | 7DE536 | | | | |
| Cours | e Name | | Reliability Engine | eering | | | |
| Desired Requisites: | | | | | | | |
| Teaching Scheme Examination Scheme (Marks) | | | | | | | |
| Lectu | re | 3 Hrs/week | MSE | ISE | ESE | Total | |
| Tutor | ial | - | 30 | 20 | 50 | 100 | |
| | | | | Credits: 3 | I | | |
| | | 1 | | | | | |
| | | | Course | Objectives | | | |
| 1 | To prep | are the studen | ts to compute re | eliability engineering pa | rameters and | estimates for | |
| 2 | applicatio | ons in mechanic | al devices. | intainability of machines a | and systems | | |
| | To provid | the students to | apply knowledge | of probability for reliabil | ity analysis of | machines and | |
| 3 | mechanis | sms. | appry knowledge | of probability for reliabili | ity analysis of | machines and | |
| 4 | To teach | use reliability th | neory for product li | fe calculation and for main | ntenance of ma | chines and | |
| | meename | Course | Outcomes (CO) w | ith Bloom's Taxonomy I | Level | | |
| At the | end of the | course, the stud | ents will be able to |), | | | |
| CO Course Outcome Statement/s Bloom's Lavel | | | | | | | |
| CO | | Cours | se Outcome Staten | nent/s | Bloom's Taxonomy Level | Bloom's Taxonomy Description | |
| CO CO1 | Apply v | Cours | e Outcome Stater | nent/s theory for reliability | Bloom's Taxonomy Level III | Bloom's Taxonomy Description Applying | |
| CO CO1 CO2 | Apply v analysis. Evaluate | Cours various probabi reliability analy | e Outcome Staten | theory for reliability | Bloom's Taxonomy Level III V | Bloom's Taxonomy Description Applying Evaluating | |
| CO CO1 CO2 CO3 | Apply v analysis. Evaluate Design a | Cours various probabi reliability analy machine elemen | e Outcome Stater ility distributions sis of mixed and co nt based on reliabil | nent/s theory for reliability omplex systems. ity theory. | Bloom's Taxonomy Level III V VI | Bloom's Taxonomy Description Applying Evaluating Creating | |
| CO CO1 CO2 CO3 | Apply v analysis. Evaluate Design a | Cours various probabi reliability analy machine elemen | e Outcome Staten ility distributions sis of mixed and control based on reliabil | nent/s theory for reliability omplex systems. ity theory. | Bloom's Taxonomy Level III V VI | Bloom's Taxonomy Description Applying Evaluating Creating | |
| CO CO1 CO2 CO3 Modu | Apply v analysis. Evaluate Design a | Cours various probabi reliability analy machine elemen | e Outcome Staten ility distributions sis of mixed and co nt based on reliabil Module (| nent/s theory for reliability omplex systems. ity theory. Contents | Bloom's Taxonomy Level III V VI | Bloom's Taxonomy Description Applying Evaluating Creating Hours | |
| CO CO1 CO2 CO3 Modu | Apply v analysis. Evaluate Design a Ile Fund Introc densit Maint and s reliab of reli | Cours various probabi reliability analy machine elemen amental Conce luction to reliability, Failure Ra tainability, Avai ystem effectiver ility, Quality an iability. | e Outcome Staten ility distributions sis of mixed and control based on reliabil Module (pts: pility, History, Rel te, Hazard Rate ilability, PDF, CD tess, Life character d reliability assura | nent/s theory for reliability omplex systems. ity theory. Contents iability terminologies, Fa , Mean Time To Fail F, Safety and reliability, istic phases, Modes of fail nce rules, Product liability | Bloom's Taxonomy Level III V VI VI ilure, Failure ure, MTBF, Quality, Cost lure, Areas of y, Importance | Bloom's Taxonomy Description Applying Evaluating Creating Hours 6 | |
| CO CO1 CO2 CO3 Modu | Apply v analysis. Evaluate Design a Ile Fund Introc densit Maint and s reliab of rel: Basic mutua proba Norm Varia | Course various probability analy machine element amental Conce luction to reliability, Failure Ra tainability, Availy ystem effectivent ility, Quality and iability. ability and Relia probability con ally exclusive, bility distribution ally concentration and concentration and concentration ally con | e Outcome Staten ility distributions sis of mixed and contributions Module (pts: bility, History, Rel ite, Hazard Rate ilability, PDF, CD ness, Life character d reliability assura ability: cepts, Laws of pro- conditional pro- cons, Comparison cont prosent, Weibut le and Central limit | theory for reliability omplex systems. ity theory. Contents iability terminologies, Fa , Mean Time To Fail F, Safety and reliability, f istic phases, Modes of fail nce rules, Product liability obability, Introduction to in obability, Discrete and of probability distributions ill, Exponential. Standard t theorem. | Bloom's Taxonomy Level III V VI ilure, Failure ure, MTBF, Quality, Cost lure, Areas of y, Importance ndependence, continuous s - Binomial, rd deviation, | Bloom's Taxonomy Description Applying Evaluating Creating Hours 6 7 | |

| IV | Maintainability and Availability: Objectives of maintenance, Types of maintenance, Maintainability, Factors | 6 | | | |
|----|---|-----------------|--|--|--|
| | affecting maintainability, System down time, Availability - innerent, achieved | | | | |
| | Poliobility in Design & Development: | | | | |
| | Failure mode effects analysis Severity/Criticality analysis FMFCA examples | | | | |
| | RPN. Ishikawa diagram for failure representation. Fault tree construction. | _ | | | |
| | Basic symbols development of functional reliability Block diagram, Fault tree | 7 | | | |
| | analysis, Fault tree evaluation techniques, Minimal cut set method, Delphi | | | | |
| | methods, Monte Carlo evaluation. | | | | |
| | Reliability Testing: | | | | |
| | Introduction to reliability testing, Stress strength interaction, Introduction to | | | | |
| VI | Markov model. Testing for Reliability and Durability- Accelerated Life | 6 | | | |
| | Testing and Highly Accelerated Life Testing (HALT), Highly Accelerated | | | | |
| | Stress Screening (HASS). | | | | |
| | | | | | |
| 1 | | 1 1004 | | | |
| | Balagurusmy E., "Reliability Engineering", Tata McGraw-Hill Publishing Co. Li Diralini Alassandra "Daliability Engineering", Springen Carrette Edision, 2012 | .d., 1984. | | | |
| | Moderree M. Keminskiy M. "Poliobility Engineering and Pick Analysis A Pre- | otical Guide" | | | |
| 3 | 3 Modarres M, Kaminskiy M, "Reliability Engineering and Risk Analysis-A Practical Guide CRC Press, Second Edition, 2010. | | | | |
| | | | | | |
| | References | | | | |
| 1 | Ebiting Charles E., "Introduction to Reliability and Maintainability Engineering" Inc., Second edition, 2009. | , Waveland Pr | | | |
| 2 | Kapoor K.C., Lamberson L.R., "Reliability in Engineering Design", John Wiley edition 1977 | v & Sons, First | | | |
| 3 | Rao S.S., "Reliability Based Design", Tata McGraw Hills, 1st edition, 1980. | | | | |
| | | | | | |
| | Useful Links | | | | |
| 1 | https://www.tce.edu/sites/default/files/PDF/Reliability-Engg.pdf | | | | |
| 2 | https://nptel.ac.in/courses/111/104/111104079/ | | | | |
| 3 | https://nptel.ac.in/courses/112/105/112105232/ | | | | |
| 4 | https://nptel.ac.in/content/storage2/courses/112101005/downloads/Module_5_Lepdf | cture_3_final. | | | |

| | CO-PO Mapping | | | | | | | |
|------------|----------------|-------------------------|-------------------|-----------------|--------|---|--|--|
| | | Programme Outcomes (PO) | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | | |
| CO1 | 2 | | 2 | | | 2 | | |
| CO2 | 3 | | 2 | | | 2 | | |
| CO3 | 3 | | 2 | | | 3 | | |
| The streng | gth of mapping | is to be written as | 1,2,3; Where, 1:L | ow, 2:Medium, 3 | 3:High | | | |

Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

| Walchand College of Engineering, Sangli (Government Aided Autonomous Institute) | | | | | | | | | |
|--|--|--|---|---|--|------------------------------------|--|--|--|
| | AY 2023-24 | | | | | | | | |
| | | | Course l | Information | | | | | |
| Progra | amme | | M. Tech. (Mecha | nical Design Engine | ering) | | | | |
| Class, | Semester | | First Year M. Teo | ch., Sem II | | | | | |
| Cours | e Code | | 7OE503 | | | | | | |
| Cours | e Name | | OE: Industrial Pro | oduct Design | | | | | |
| Desire | d Requisit | es: | | | | | | | |
| | | | 1 | | | | | | |
| | Teaching Scheme Examination Scheme (Marks) | | | | | | | | |
| Lectu | re | 3 Hrs/week | MSE | ISE | ESE | Total | | | |
| Tutor | ial | - | 30 | 20 | 50 | 100 | | | |
| | | | | Credi | ts: 3 | | | | |
| | | | Course | Objectives | | | | | |
| 1 | To prepar | e the students to | succeed as design | er in industry /techn | ical profession. | | | | |
| 2 | To provid | le students the k | nowledge of steps | involved in design a | nd developments of | of industrial | | | |
| - | Product. | h a atra 1 1 | | | | a maada - f | | | |
| 3 | Society. | ne students to ge | enerate the idea for | new product develo | pment based on th | e needs of | | | |
| 4 | To prepar Product. | e the students to | o use knowledge of | ergonomics, aesthe | etics for developme | ent of industrial | | | |
| 5 | To prepar For devel | e the students to opment of indus | o use knowledge of strial Product. | materials, economi | cs, value analysis, | standardization | | | |
| | | Course | Outcomes (CO) w | ith Bloom's Taxon | omy Level | | | | |
| At the | end of the | course, students | will be able to, | | | | | | |
| со | | Course | Outcome Stateme | ent/s | Bloom's Taxonomy | Bloom's Taxonomy Description | | | |
| | Demonstr | ate an ability to | recognize the nee | d of society to desig | m III | Applying | | | |
| CO1 | the produ | cts as per their r | requirements. | | , | | | | |
| CO2 | Recomme product. | end appropriate | process to apply a | esthetical concepts | to V | Evaluating | | | |
| CO3 | Design ar | nd develop the p | roducts by using st | andardization. | VI | Creating | | | |
| | | | | | | | | | |
| Modu | le | | Module (| Contents | | Hours | | | |
| Ι | Approach to industrial product based on idea generation and innovations to meet the creative process involved in idea marketing, designers, mind- criticism, design process, creation needs of the developing society. Design and development process of industrial products, various steps such as Ergonomics and aesthetic requirements of product design, quality and maintainability consideration in product design, Use of modelling technique, prototype designs, conceptual design | | | | | 0 - 1 s 8 y e | | | |
| II | General design situations, setting specifications, requirements and ratings, their importance in the design, Study of market requirements and manufacturing aspects of industrial designs. Aspects of ergonomic design of machine tools, testing equipment's, instruments, automobiles, process equipment etc. Convention of style, from and colour of industrial design.8 | | | | | | | | |
| III | Desig requir inforn | n of Consume ements, body of nation, conversion | er Product, Func limensions. Ergon ons for style, forms | ctions and use st omic consideration s, colours. | andard and lega s, interpretation o | 1 f 6 | | | |
| IV | Aesth purpo contra produ seeing | etic Concepts se, style and en ast and continu ct: visual effect g, influence of 1 | Concept of unity avironment, Aesthe ity, proportion, rl of line and from, ine and form, Con | and order with vetic expressions of s hythm, radiation. H , mechanics of seei uponents of style, B | ariety, concept of symmetry, balance From and style of ng', psychology of asic factors, Effect | f , f 7 f t | | | |

| | of colour on product appearance, colour composition, conversion of colours of | |
|----|--|-------------|
| | clighteering products. | |
| | Economic Considerations Selection of material, Design for production, use of | |
| V | standardization, value analysis and cost reduction, maintenance aspects in design. | 5 |
| | Design Organization Structure, Designer position, Drawing office procedure, | |
| VI | Standardization, record keeping, legal procedure of Design patents. | 5 |
| | | |
| | | |
| | Text Books | |
| 1 | W. H. Mayall, "Industrial Design for Engineers", Illife, 1967. | |
| 2 | Hearn Buck. "Problems of Product Design and Development", Pergamon press, J | an 1, 1963. |
| 3 | Charles H. Flueriche, "Industrial Designs in Engineering", Design council, 1983. | |
| | | |
| | References | |
| 1 | Ezia Manzim "Material of Invention", Cambridge Mass: MIT press, 1989. | |
| 2 | Percy H. Hill "The Science of Engineering Design", Holt McDougal, 1970 | |
| | | |
| | Useful Links | |
| 1 | https://www.youtube.com/watch?v=ANBqFUrUfOY | |
| 2 | https://www.youtube.com/watch?v=0W_wGUf59UU | |
| 3 | https://www.youtube.com/watch?v=HN9GtL21rb4&list=PLSGws_74K018yZOr | bSaqWJZ837 |
| | QyBB7vu | |
| 4 | https://youtu.be/oUeK6ZsCo8I | |

| CO-PO Mapping | | | | | | | | | |
|---------------|-----------------------------------|---|---|---|---|---|--|--|--|
| | Programme Outcomes (PO) | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | | | |
| CO1 | 3 | | | | | | | | |
| CO2 | 3 | | | 1 | | | | | |
| CO3 | 3 | | 2 | | 2 | | | | |
| CO3 | CO3 3 2 2 | | | | | | | | |

The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High Each CO of the course must map to at least one PO.

Assessment (for Theory Course)

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.