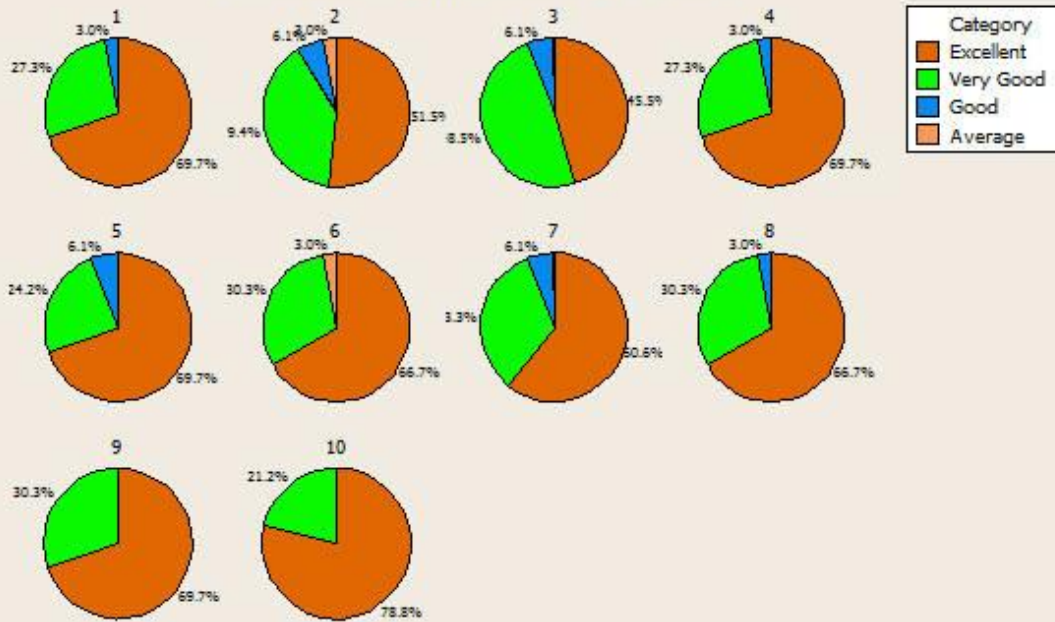
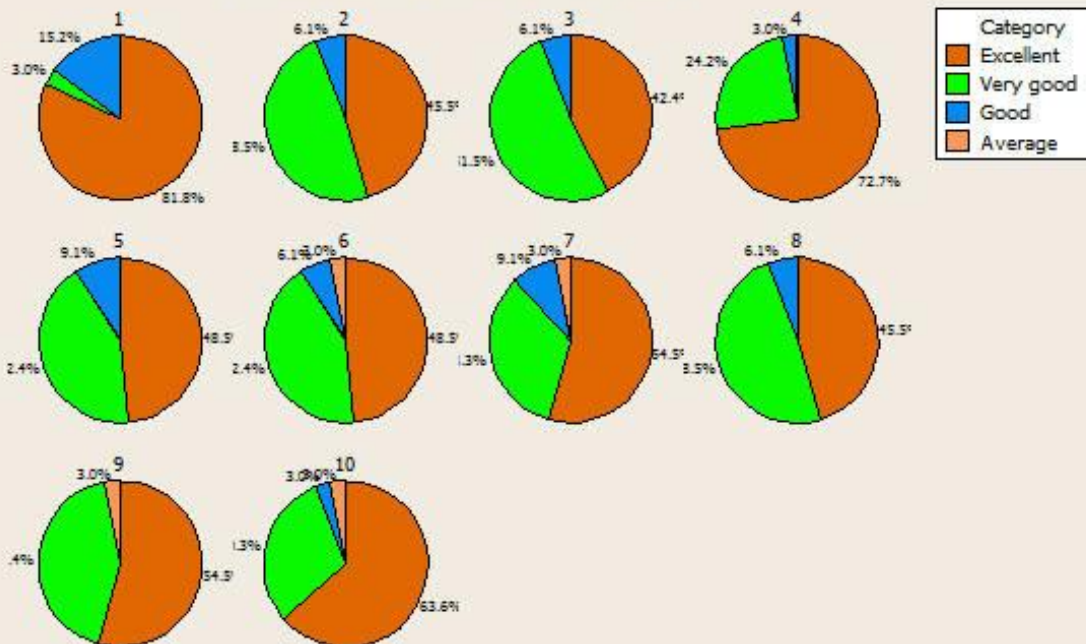




Feedback on Higher Studies (IEM)

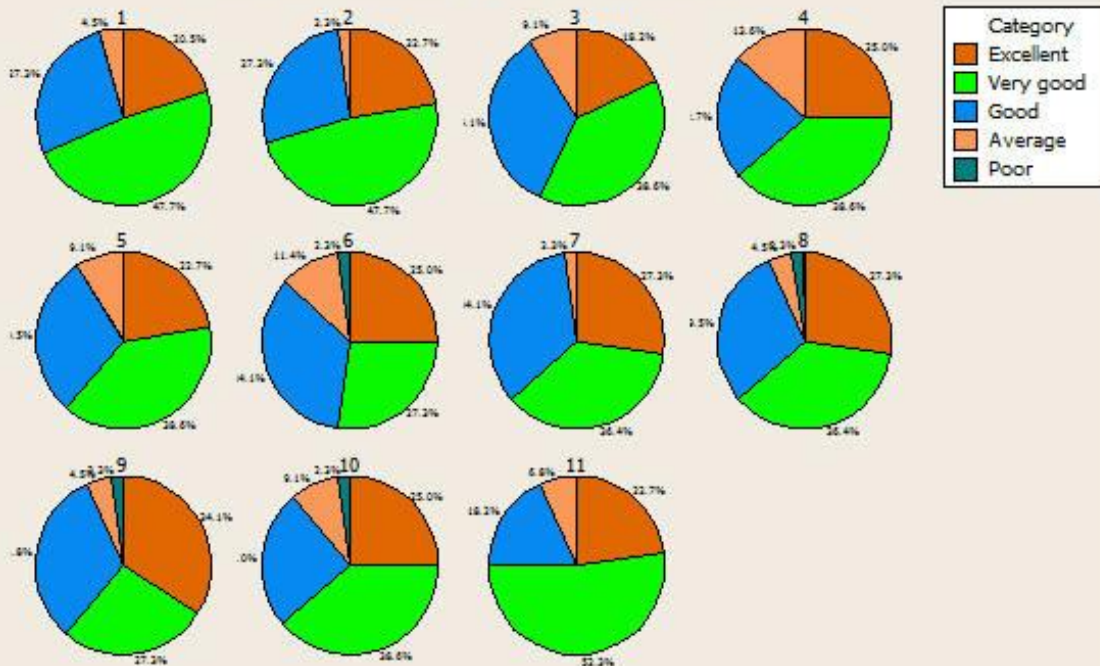


Feedback on Placement (IEM)

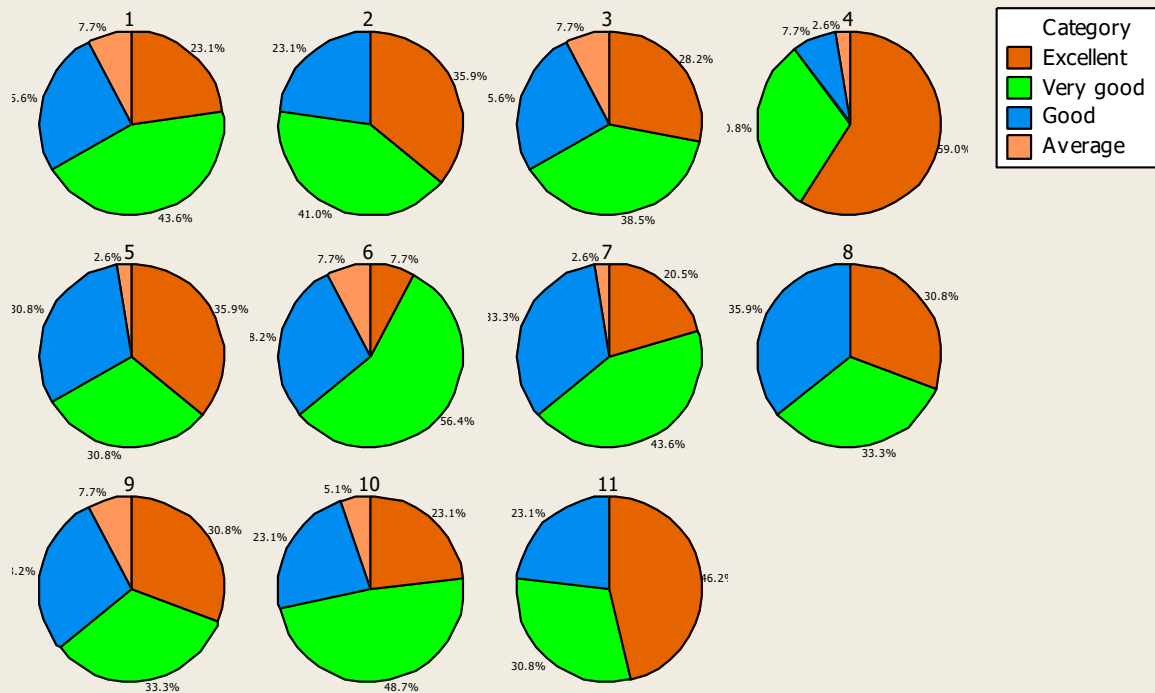




Feedback on Curriculum (QAR) (IEM)

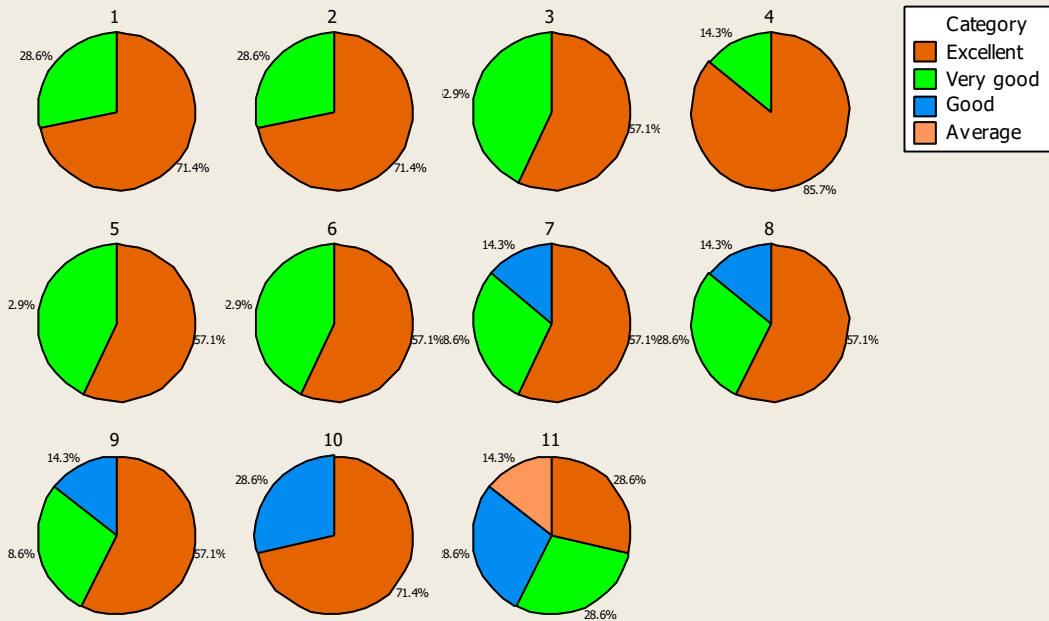


Feedback on Curriculum (MMM) (IEM)

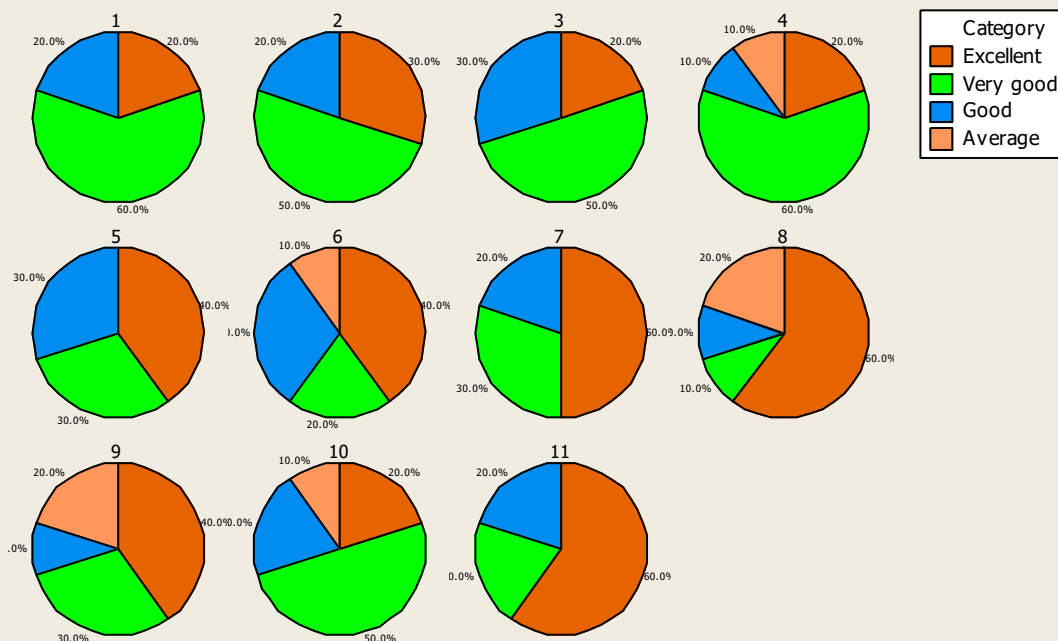


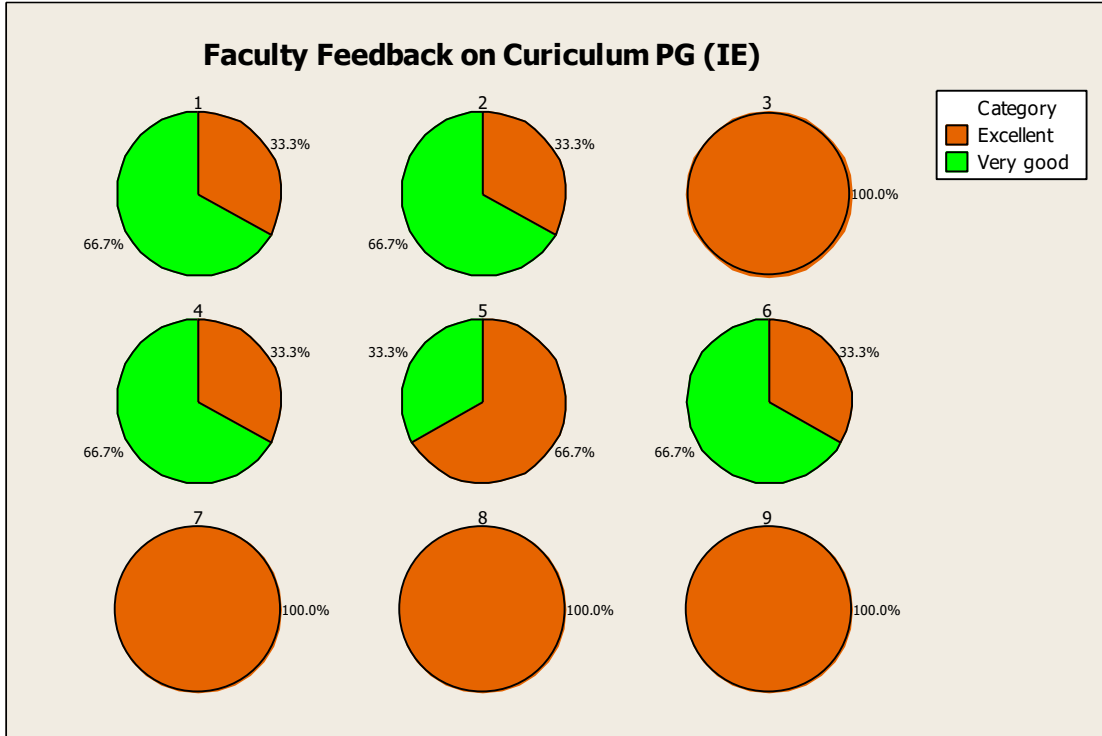


Feedback Course Curriculum PG 1st Sem (IE)



Feedback on Curriculum PG 3rd sem (IE)





**Action taken based on the analysis of students' and faculty feedback on curriculum for the academic year 2018-19(UG)**

Department regularly collects feedback on curriculum from the students', faculty and alumni. Also, department invites two student representatives from the final year to interact with board of studies members and give their opinion regarding the curriculum. Board of Studies meeting held on 9th March 2019, the committee consisting of industry representatives, alumni and students. After having had discussions with the students and based on the feedback analysis, members of board of studies suggested/recommended the following;

Recommendations	Action Taken
Faculty were of the opinion that some of the mechanical engineering subjects can be merged to make provision for introducing more industrial engineering subjects	Two courses Theory of Machines and Design of Machine Elements are combined into one course with title Mechanisms and Machine Design is introduced in 4 th semester. Thermodynamics and Fluid Mechanics are combined to form a new subject Fluid and Thermal systems. Big Data Analytics subject is introduced. Materials Management is introduced.
Student survey revealed that more practical courses are required to be introduced	An additional Lab was introduced in 5 th semester

Action taken based on the analysis of students' and faculty feedback on curriculum for the academic year 2018-19(PG)

Department regularly collects feedback on curriculum from the students', faculty and alumni. Also, department invites two student representatives from the final year to interact with board of studies members and give their opinion regarding the curriculum. Board of Studies meeting held on 9th March 2019, the committee consisting of industry representatives, alumni and students. After having had discussions with the students and based on the feedback analysis, members of board of studies suggested/recommended the following;

Recommendations	Action Taken
Faculty survey and student survey revealed that the syllabus is satisfactory and no necessity to change. However as per the university regulations number of credits has been reduced from 200 credits to 175 credits, accordingly minor changes have been done in the syllabus.	No action has been taken The feedback on the change in syllabus will be collected and analyzed after the completion of the course in the year 2021-22.



DEPARTMENT OF INDUSTRIAL ENGINEERING AND MANAGEMENT

14th (XIV) BOS AUTONOMOUS MEETING

Date : 09 - 03 - 2019 Time : 9:30 AM Venue : H.O.D'S Chamber

Members Present:

1) Dr. G.S. Prakash - BOS Chairman, Professor & Head, Dept. of IEM, Ramaiah Institute of Technology, B'lore. -

2) Dr. Rathnaraj - Professor, Dept. of IEM, BMS College of Engineering, Bengaluru. -

3) Sri. V. Nanda Kumar - Senior Consultant, DET - NORSKEVERITAS AS, B'lore.-

4) Mr. Narasimha Murthy. M.A - Head of Quality Management & Delivery Excellence
M/S. Infineon Technologies, Bengaluru, Karnataka. -

4) Dr. N.S. Narahani - Professor & Head, Dept. of Industrial Engineering & Management
R.V. College of Engineering, Bangalore -

5) Dr. N. Nagesh - Chairman & Professor, Dept. of Industrial & Production Engineering,
University BDI College of Engineering, Davanagere.

6) Dr. N. Venkataratnam Naidu - Principal & Professor, Dept. of IEM, Ramaiah Institute of
Technology, B'lore. -

7) Sri. A. Balakrishna - Associate Professor, Dept. of IEM, Ramaiah Institute of Technology,
B'lore. -

8) Dr. C.S. Chethan Kumar - Associate Professor, Dept. of IEM, Ramaiah Institute of
Technology, B'lore. -

9) Dr. M. Shilpa - Associate Professor, Dept. of IEM, Ramaiah Institute of Technology, B'lore.

10) Dr. M. Rajesh - Associate Professor, Dept. of IEM, Ramaiah Institute of Technology,
B'lore. -

11) Sri. M.R. Shivakumar - Asst. Professor, Dept. of IEM, Ramaiah Institute of Technology,
B'lore. -

Members who could not present:

1) Dr. Jagadeesh. P.Ganjiigatti - Professor & Head, Dept. of IEM, Siddaganga Institute of
Technology, Tumakuru.



The BoS meeting commenced at 9.30AM.

- 1) Chairman welcomed the BoS members to the meeting and introduced all the members.
- 2) Chairman stated that as per the new VTU guidelines, a student has to complete 175 credits to obtain BE degree. Of this, 40 credits are for the first year courses and 135 credits are for 3rd to 8th semesters.
- 3) As per the agenda, the members discussed and deliberated the scheme from 3rd to 8th semester and approved the scheme with the following suggestions:
 - a) Title of Elements of Power Systems is changed to Fluid and Thermal Systems.
 - b) Inventory Management, title is changed to Materials Management & syllabus is prepared for the changed title.
 - c) For some of the courses, titles are changed/modified keeping in mind the present industry needs.
 - d) Two courses 'Theory of Machines' and 'Design of Machine Elements' are combined into one course with title 'Mechanisms & Machine Design'. The syllabus for this subject is prepared considering the GATE syllabus.
 - e) Facilities Planning & Design is made core subject and introduced for 3 credits in 4th semester and syllabus for this subject is prepared.
 - f) Computer Integrated Manufacturing and Robotics is made Professional Elective and introduced in 5th semester.
 - g) In 5th semester, Operations Management course is introduced as a core subject.
 - h) In 6th semester, Supply Chain Management is introduced as core subject.
 - i) Simulation Modeling and Analysis and its lab is now shifted from 7th semester to 6th semester.
 - j) In 7th semester Financial Accounting and Costing has been changed to Financial Accounting and Management.
- 4) Scheme for III to VIII Semester as per 175 credits is approved.
- 5) Syllabus for III & IV Semester is approved.



- 6) Credit equivalence for the students Nikhil Inson Prakash (USN: 1MSE3MABU2) & Abhishek N (USN: 1MSE3MAB00) is approved.
- 7) Credits equivalence for lateral entry students presently studying in 8th semester (2016 batch) is approved.
- 8) Credit equivalence - Glen Semantra is approved (change of college).
- 9) PO attainment is obtained through e-sutra and PO attainment is discussed.
- 10) M.Tech syllabus has been ratified by the Board for 2018-19 batch (88 credits).
- 11) Department achievements were presented to the BoS members.

Since there was no other points on the agenda, the meeting concluded with vote of thanks by the HoD at 1.00 PM.

G.S. Prakash
CHAIRMAN
 BOE, BOS UG/PG/Programme
 Dept. of Industrial Engg. & Management
 RAMAIAH INSTITUTE OF TECHNOLOGY
 (Autonomous Institute, affiliated to VTU)
 Bengaluru - 560054

- 1) Dr. G.S. Prakash - *G.S. Prakash*
- 3) Sri. V. Nanda Kumar - *V. Nanda Kumar*
09/03/19
- 5) Dr. N.S. Narahari - *N. Narahari*
9/3/19
- 7) Dr. N. Venkataratnam Naidu -
- 9) Dr. C.S. Chethan Kumar - *C.S. Chethan Kumar*
- 11) Dr. M. Rajesh - *M. Rajesh*

- 2) Dr. Rathnaraj - *Rathnaraj*
21/3/2019
- 4) Mr. Narasimha Murthy, M.A - *N. Murthy*
- 6) Dr. N. Nagesha - *N. Nagesha*
9/3/19
- 8) Sri. A. Balakrishna - *A. Balakrishna*
9/3/19
- 10) Dr. M. Shilpa - *M. Shilpa*
9/3/19
- 12) Sri. M.R. Shivakumar - *M.R. Shivakumar*

FLUID AND THERMAL SYSTEMS

Course Code: IM35

Credit:4: 0: 0

Contact Hours: 56

Course Content**Unit I**

Properties of fluids: Introduction to fluid mechanics and its applications, properties of fluids, viscosity, thermodynamics properties, surface tension, capillarity, vapor pressure and cavitation.

Fluid pressure: Fluid pressure at a point, pascal's law, pressure variation in a static fluid, absolute, gauge, atmosphere and vacuum pressure. Manometers, simple and differential manometers

Fluid Kinematics: Types of fluid flow – introduction, continuity equation in three dimensions (Cartesian co-ordinate system only)

Unit II

Fluid Dynamics : Introduction, equations of motion, Euler's equation of motion, Bernoulli's equation from Euler's equation, limitation of Bernoulli's equation, fluid flow measurements, venturi – meter, vertical orifice meter, pitot tube.

Flow through pipes: Frictional loss in pipe flow, Darcy's – equation and Chezy's equation for loss of head due to friction in pipes, hydraulic gradient line and total energy line.

Unit III

Fundamental Concepts & Definitions: Thermodynamics-definition and applications. Microscopic and macroscopic view point. System-types of systems, boundary, Thermodynamic properties- intensive and extensive properties,. Thermodynamic state, path, process, cyclic and non-cyclic processes, quasi-static process, point and path functions. Thermodynamic equilibrium, Temperature-zeroth law of thermodynamics, concepts, temperature measurement scales.

Work & Heat: Definition of displacement work and its limitations, similarities and dissimilarities of heat and work. Expressions for displacement work in various processes through P-V diagrams

Unit IV

First Law of Thermodynamics: Joule's experiments, Statement of the First law of thermodynamics-cyclic and non-cyclic processes, Energy-energy as a property, modes of energy, specific heat at constant volume, enthalpy, specific heat at constant pressure, Energy of an isolated system. Extension of the First law to control volume; Mass balance, steady state-steady flow energy equation, Important applications-Nozzle and diffuser, throttling device, turbine and compressor, heat exchanger.

Unit V

Second Law of Thermodynamics: Thermal reservoirs, Devices- heat engine, heat pump and refrigerator -schematic representation and efficiency. Kelvin-Planck statement and Clausius' statement of Second law of thermodynamics; PMM1 and PMM2, Reversible and irreversible processes; factors that make a process irreversible, reversible heat engines, Carnot cycle, Carnot principles. Thermodynamic temperature scale.

Air Standard Cycle: Efficiencies of Otto cycle, Diesel cycle, Dual cycle, Brayton cycle.

Heat Transfer: Basic applications of conduction, convection and radiation.

Text Books

1. Fluid Mechanics by Dr. Bansal. RK Lakshmi publications, 4th edition 2011
2. Fluid Mechanics by stecter, 1st edition 2005
3. Fluid Mechanics and hydraulics, by Jagadishlal, Metropolitan book co-Ltd 4th edition 2004
4. P.K. Nag –Basic and Applied Thermodynamics, Tata McGraw Hill, 3rd Edition. 2003
5. Yunus A. Cengel and Michael A. Boles –Thermodynamics an engineering approach, Tata McGraw hill Pub. 2006
6. Rajput –Engineering Thermodynamics, Laxmi Publication pvt Ltd., 3rd Edition. 2007.

Reference books

1. Fluid Mechanics by Modi and Seth, 5th edition 2004
2. Engineering Fluid Mechanics by Dr. K.L.Kumar, revised edition 2009.S Chand & Co
3. Fluid Mechanics and fluid power Engineering by Kumar .D.S, Kataria& Sons, 2nd edition 2004.
4. J.B.Jones and G.A.Hawkin –Engineering Thermodynamics, John Wiley and Sons.
5. S.C.Gupta –Thermodynamics, PersonEdu.Pvt.Ltd., 1st Edition, .2005.

Course outcomes

At the end of the course, students will be able to

1. Understand the basic principles and applications of properties of fluid and fluid statics. (PO-1,2,3)(PSO1)
2. Apply basic concepts of fluid dynamics, friction in pipe flows, fluid flow measurements (PO:1,2,3,4) (PSO1)
3. Apply the concepts of heat and work in thermodynamics devices. (PO:1, 2) (PSO1, 2)
4. Apply the first laws to the thermodynamic system. (PO-1, 2, 3) (PSO1, 2)
5. Solve engineering problems by utilizing laws of thermodynamics in devices. (PO-1, 2, 3) (PSO1, 2)

MATERIALS MANAGEMENT

Course Code: IM44

Credit:4: 0: 0

Contact Hours: 56

Course Content**Unit I**

Inventory Fundamentals: Operating Environment. Material Flow. Aggregate Inventory Management. Item Inventory Management. Inventory and Flow of Material. Supply and Demand Patterns. Functions of Inventories. Objectives of Inventory Management. Inventory Costs.

Unit II

Purchasing: Supply Chain Concept. Supply Chain Metrics. Establishing Specifications. Functional Specification Description. Selecting Suppliers. Price Determination. Impact of MRP on Purchasing. Organisational Implications of SCM.

Unit III

Order Quantities: Financial Statements and Inventory. Making the Production Plan. ABC Inventory Control. Economic Order Quantity (EOQ). Variations of EOQ Model. Quantity Discounts. Use of EOQ when Costs are not known. Period Order Quantity (POQ).

Unit IV

Independent Demand Ordering Systems: Order Point System. Determining Safety Stock. Determining Service Levels. Different Forecast and Lead Time Intervals. Determining when Order Point is reached. Periodic Review System. Distribution Inventory.

Unit V

Physical Inventory and Warehouse Management: Warehousing Management. Physical Control and Security. Inventory Record and Accuracy.

Physical Distribution: Physical Distribution System. Interfaces. Transportation. Legal Types of Carriage. Transportation Cost Elements. Warehousing. Packaging. Materials Handling. Multi-Warehouse Systems.

Textbook

1. Steve Chapman & Tony Arnold – Introduction to Materials Management, Pearson, 2016.

References

1. P Gopalakrishna & M Sundaresan – Materials Management: An Integrated Approach, PHI, 2012.
2. A K Dutta – Materials Management: Procedures, Text and Cases, PHI, 2009.
3. S D Sharma – Operations Research, 4th edition, 2009.
4. Kanti Swaroop – Operations Research, S Chand, 2001.

Course Outcomes

At the end of the course, students will be able to

1. Identify the fundamental concepts of materials management. (PO-1,2,3) (PSO1,2)
2. Design a basic purchasing system. (PO-1,2,3)(PSO1,2)
3. Design basic inventory control systems. (PO-1,2,3)(PSO1,2)
4. Design advanced inventory control systems. (PO-1,2,3)(PSO1,2)
5. Design a basic warehousing system. (PO-1,2,3)(PSO1,2)

MECHANISMS AND MACHINE DESIGN

Course Code: IM45

Credit:3: 1: 0

Contact Hours: 56

Course Content

Unit I

Introduction, Kinematic chain and Inversions: Definitions, Link or element, , kinematic chain, mechanisms, inversion, machine, grubler's criterion mobility of mechanisms, four bar chain, single slider crank chain & double slider crank chain & their inversions.

Kinematic mechanisms: Quick return motion mechanism –Whitworth mechanism Intermittent motion mechanism – Geneva mechanism, Pantograph, Ackerman's steering gear mechanism, condition for correct steering.

Unit II

Balancing of Machinery: Balancing of rotating masses: Balancing of several masses in the same plane, balancing of masses rotating at different planes – Analytical method. Tabular Column method.

Gyroscope: Vectorial representation, right hand thumb rule, gyroscopic couple. Gyroscopic effect on aero plane, Gyroscopic effect on ship. Gyroscopic effect on Two wheelers

Cams: Types of cams, followers. Displacement, velocity and acceleration time curves for cam profiles, follower motions including SHM, Uniform velocity, uniform acceleration & retardation and cycloidal motions.

Unit III

Design for Static Strength and Impact strength: Static strength; Static loads and factor of safety; Theories of failure -Maximum normal stress theory, maximum shear stress theory, Distortion energy theory; Stress concentration, Determination of Stress concentration factor.

Variable Stresses in machine parts: Fatigue strength, S -N diagram, cyclic loading, High cycle fatigue, Endurance limit, effect of loading on endurance limit. Modifying factors -size effect, surface effect, Stress concentration effects; fatigue stress concentration factors, combined steady and fluctuating stresses, Goodman's and Soderberg's relationship.

Unit IV

Design of springs: Types of springs -stresses in Coil springs of circular cross sections. Tension and compression springs. Fluctuating load, Leaf springs. Stresses in Leaf springs. Equalized stresses in leaf springs.**Design of Mechanical Joints:** Riveted Joints -Types, rivet materials, Failures of Riveted joints (Problems on Longitudinal joints only), Welded Joints -Types, Strength of butt and fillet welds. Eccentrically loaded welds. Cotter joint and knuckle joints.



Unit V

Types of gear trains, problems on simple, compound and epicyclic gear trains, tabular column method only.

Design of Gears and gear trains: Introduction to Spur gears. Design of spur gear, Lewi's equation, Lewi's form factor-dynamic and wear load.

Text Books

1. Shigley, Joseph Edminister -Theory of Machines, Oxford university press 2011.
2. Sadhu Singh -Theory of Machines, Pearson Education, 2008.
3. R. S. Khurmi & J. K. Gupta -Theory of machines, Eurasia Publishing House, 2008
4. Joseph Edward Shigley -Mechanical Engineering Design, Tata McGraw Hill, 7th edition, 2008.
5. Robert .L. Norton -Machine Design, Pearson Education Asia, 3rd edition, 2009.

Design Data Hand Books

1. K. Lingaiah -Design Data Hand Book, Suma Publications, 2nd edition 2006, Vol.1& Vol.2.

References

1. Thomas Bevan -Theory of Machines, Peasson – 2011
2. Ballaney -Theory of Machines, Khanna Publication – 2003
3. R S Khurmi and J K Gupta -A text book of Machine Design, Eurasia Publishing House, 13th edition, 2005.
4. V B Bahandri – Design of Machine Elements, Tata McGraw Hill publishing co, Ltd., 2nd Edition, 2008.
5. R. K. Jain -Machine Design, Khanna Publications, 2nd edition, 2002.
6. JBK Das & P L Srinivasmuthy -Design of Machine Elements Volumes I & II, Sapna book house, 2nd edition, 2012.

Course outcomes

At the end of the course, students will be able

1. Determine the mobility of kinematic mechanisms and understand their applications.(PO-1, 2) (PSO1)
2. Analyze the rotating masses and determine the balancing forces in a machine. (PO-1, 2, 3)(PSO1, 2)
3. Apply the gyroscopic principles and effects on aeroplane, ship and two wheeler and designing of CAMS (PO-1, 2, 3)(PSO1, 2)
4. Design liquid proof riveted/welded joints taking into account the efficiency of the joint and design of springs based on applications. (PO-1, 2, 11) (PSO1)
5. Design suitable sized gears as per the standard design procedure and also test for safety of design and apply the law of gearing and determine the suitable gear train combination based on the application. (PO-1, 2, 3, 11) (PSO1, 2)

BIG DATA ANALYTICS

Course Code: IME19

Credit:4:0:0 :0

Hours: 56

Contact

Course Content**Unit I**

Introduction to Big data & Descriptive Analytics: Data Science: Definition, Skills for Data Science, Data scientist, Characteristics of BIG Data, Relationship between data science and big data, Categorization of Analytical methods

Data Visualization (no analytical treatment): Effective Design Techniques (Data-Ink ratio), Tables: Table Design Principles, Bubble Chart, Heat Maps, Stars, Chernoff Faces, Advanced Charts : Parallel Coordinates Plot, Tree maps, Geographic Information Systems Charts, Data Dashboard
Sample Geometry for Multivariate data: Computing Mean Vector of Multivariate Data, Computation of Generalized variance, covariance, Sample Standard Deviation, Sample correlation matrix and Sample Covariance Multivariate Normal Density : Bivariate Normal Distribution, Multivariate Normal distribution, Mahanobolis Distance, properties of Multivariate normal density function

Unit II**Transforming data & Inferences about multivariate data:**

Cleaning and Transforming Data: Missing Data, Detecting and Handling of Outliers, Checking for Normality: Q-Q Plot for Multivariate Normality, KS test, Shaipro Wilks test, Homoscedastic, Data Transformation : Power Transformation, logic transformation, Fisher transformation, Transformation of multivariate observation Hotelling's T^2 test for simple multivariate data, Hotelling's T^2 test for two sample for different multivariate populations, Interval estimation of means for multivariate data: One at a time confidence interval, simultaneous confidence methods, Bonferroni method

Unit III

Data Reduction Technique :Principal components methods : Procedure for computation of principal components (Non Analytical Treatment), Summarizing Sample Variation by principal components : Variance of Components, Scree Plot; Standardization of Principal Components Factor Analysis: Assumptions of factor analysis, Orthogonal factor model : Common Factors, specific factors, factor loading, Estimation of Parameters of model using PCA (Non analytical methods (Only Procedure)), Communalities, Factor Rotation (Varimax method), Estimation of Factor Scores

Unit IV**Predictive analytics (Supervised Learning Methods):**

Multiple Linear Regression Analysis for Non Categorical variables and Categorical variables : Building a regression model, multi co linearity, variable selection procedure (Non analytical) : Stepwise, forward and backward regression.

Classification Accuracy, k-Nearest Neighbors (Simple Problems), Classification and Regression Trees

Unit V

Unsupervised Learning: Cluster Analysis (Simple Problems) :Measures of Association for Continuous Variables (Euclidean Distance, Canberra Metric, Czekanowski Coefficient), Measures of Association for Binary Variables : Similarity coefficients for clustering items; Agglomerative Hierarchical Clustering : single linkage, complete linkage, average linkage; Cluster Description; Non Hierarchical Clustering Methods : K means method (Simple Problems)

Note : Large Multivariate Data is explained using SYSTAT/R/Minitab/Excel/SPSS Softwares

Text books

1. Applied Multivariate Statistical Analysis (6th Edition) 6th Edition Richard A.Johnson (Author), Dean W. Wichern (Author), Eastern Economy Edition,2015
2. Essentials of Business Analytics 1st Edition, by Jeffrey D.Camm (Author), James J. Cochran (Author), Michael J. Fry (Author), Jeffrey W. Ohlmann (Author), David R. Anderson (Author), Jan2014.

References

1. Multivariate Data Analysis: Joseph F. Hair Jr (Author), William C. Black (Author), BarryJ. Babin (Author), Rolph E. Anderson (Author), Pearson Education Limited, 2013.
2. Statistical and Machine-Learning, Data Mining Techniques for Better Predictive ModelingTechniques and Analysis of Big Data: Bruce Ratner, Second Edition, CRCPress Taylor & FrancisGroup.
3. The Elements of Statistical Learning, Data Mining, Inference, and Prediction, TrevorHastie, Robert Tinsirani, JeromeFriedman.

Course outcomes

At the end of the course, student will be able to

1. Identify and visualize multivariate data and relate to various real time applications(PO:1,2,4,5 & PSO:1,2)
2. Conduct Statistical Testing of Multivariate Data (PO:1,2 & PSO:1,2)
3. Apply data reduction techniques to real time data (PO:1,2,4,5 & PSO:1,2)
4. Apply and Analyze predictive models to real time data (PO:1,2,4,5 & PSO:1,2)
5. Develop clustering methods for real time data (PO:1,2,3,5 & PSO:1,2)



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