E.G.S. PILLAY ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi | Affiliated to Anna University, Chennai

Accredited by NAAC with 'A' Grade | Accredited by NBA (CSE, EEE, MECH)

NAGAPATTINAM – 611 002

B.E MECHANICAL ENGINEERING

Third Year – Fifth Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1902ME501	Heat and Mass Transfer	3	2	0	4	40	60	100
1902ME502	Design of Machine Elements	3	2	0	4	40	60	100
1902ME503	Kinematics of Machines	3	2	0	4	40	60	100
1902ME504	CAD	3	0	0	3	40	60	100
	PC Elective -I	3	0	0	3	40	60	100
Laboratory Course								
1902ME551	Computer Aided Design And Analysis Laboratory	0	0	2	1	50	50	100
1902ME552	Heat and Mass Transfer laboratory	0	0	2	1	50	50	100
1904GE551	Life Skills: Aptitude I	0	0	2	1	100	-	100
Audit Course								
1902MCX03	Essence of Indian Traditional Knowledge	2	0	0	0	100	-	100

L – Lecture | T – Tutorial | P – Practical | CA – Continuous Assessment | ES – End Semester

1902ME501	HEAT AND MASS TRANSFER	L	T	P	C
		3	2	0	4

MODULE I   CONDUCTION   **12 Hours**

General Differential equation of Heat Conduction– Cartesian and Polar Coordinates – One Dimensional Steady State Heat Conduction –– plane and Composite Systems – Conduction with Internal Heat Generation – Extended Surfaces – Unsteady Heat Conduction – Lumped Analysis – Semi Infinite and Infinite Solids –Use of Heisler"s charts.

MODULE II   CONVECTION   **12 Hours**

Free and Forced Convection - Hydrodynamic andThermal Boundary Layer. Free and ForcedConvection during external flow over Plates and Cylinders and Internal flow through tubes .

MODULE III   PHASE CHANGE HEAT TRANSFER AND HEAT EXCHANGERS   **12 Hours**

Nusselt"s theory of condensation - Regimes of Pool boiling and Flow boiling. Correlations in boiling and condensation. Heat Exchanger Types - Overall Heat Transfer Coefficient – Fouling Factors - Analysis – LMTD method - NTU method.

MODULE IV   RADIATION   **12 Hours**

Black Body Radiation – Grey body radiation - Shape Factor – Electrical Analogy – Radiation Shields. Radiation through gases.

MODULE V   MASS TRANSFER   **12 Hours**

Basic Concepts – Diffusion Mass Transfer – Fick"s Law of Diffusion – Steady state Molecular Diffusion– Convective Mass Transfer – Momentum, Heat and Mass Transfer Analogy –Convective Mass Transfer Correlations.

TOTAL: 60 HOURS

REFERENCES:

1.   Frank P. Incropera and David P. Dewitt, "Fundamentals of Heat and Mass Transfer", John Wiley & Sons, sixth edtion 2018.

2.   Venkateshan. S.P., "Heat Transfer", Ane Books, New Delhi, 2004.

3.   Ghoshdastidar, P.S, "Heat Transfer", Oxford, 2004,

4.   Nag, P.K., "Heat Transfer", Tata McGraw Hill, New Delhi, 2002

5.   Holman, J.P., "Heat and Mass Transfer", Tata McGraw Hill, 2000

1902ME502	DESIGN OF MACHINE ELEMENTS	L	T	P	C
		3	2	0	4

MODULE I   STEADY AND VARIABLE STRESSES   **12 Hours**

Introduction to the design process - Design of straight and curved beams – „C" Frame and Crane hook. Stress concentration - Design for variable loading - Soderberg, Goodman, Gerber methods and combined stresses - Theories of failure.

MODULE II   DESIGN OF SHAFTS AND COUPLINGS   **12 Hours**

Design of shafts based on strength, rigidity and critical speed. Design of rigid flange coupling - Design of flexible coupling.

MODULE III   DESIGN OF JOINTS   **12 Hours**

Design of bolted joints - stresses due to static loading, eccentrically loading. Design of welded joints - Butt and Fillet welded Joints - Strength of parallel and traverse fillet welded Joints

MODULE IV   DESIGN OF SPRINGS   **12 Hours**

Types, End connections and design parameters. Design of helical springs - Circular and noncircular wire - Concentric springs. Design of leaf and torsional springs under constant and varying loads

MODULE V   DESIGN OF BEARINGS   **12 Hours**

Types and selection criteria - Design of journal bearings - Design of rolling contact bearing Ball and roller bearing.

TOTAL: 60 HOURS

REFERENCES:

1. V. B. Bhandari, Design of Machine Elements, Tata McGraw-Hill Publishing Company Pvt. Ltd., New Delhi, 2010.
2. Faculty of Mechanical Engineering, PSG College of Technology, Design Data Book, M/s.KalaikathirAchchagam, 2013.
3. J. E. Shigley and C. R. Mischke, Mechanical Engineering Design, Tata McGraw-Hill Publishing Company Pvt. Ltd., New Delhi, 2011.
4. R. C. Juvinall and K. M. Marshek, Fundamentals of Machine Component Design, John Wiley & Sons, New Delhi, 2011.
5. R. L. Norton, Design of Machinery, Tata McGraw-Hill Publishing Company Pvt. Ltd., New Delhi, 2004.
6. http://nptel.ac.in/courses/112105124/

1902ME503	KINEMATICS OF MACHINES	L	T	P	C
		3	2	0	4

MODULE I   FUNDAMENTALS OF MECHANISMS   12 Hours

Basic Terminology - Kinematic link, Pair, joints, Structure, Machine, Degree of freedom, Grubler & Kutzbach Criterion - Inversions of four bar mechanism, Mechanical advantage - Transmission Angle, Inversion of single slider and double slider crank mechanisms. Common Mechanisms - Straight line mechanism, Dwell mechanism.

MODULE II   KINEMATIC ANALYSIS OF MECHANISMS   12 Hours

Relative velocity of kinematic link, Rubbing Velocity of kinematic pair, Construction of velocity and acceleration diagram by graphical method (Relative Velocity Method), Four bar mechanism, slider crank mechanisms and complex mechanism.

MODULE III   CAM AND FOLLOWER MECHANISMS   12 Hours

Introduction - Terminology, Classifications, Types of follower motion - Uniform Velocity Motion, Simple Harmonic Motion, Uniform Acceleration and Retardation Motion and Cycloidal Motion- Construction of cam profile - Knife edge follower, Roller and flat faced follower.

MODULE IV   GEAR AND GEAR TRAIN   12 Hours

Gears - Terminology, Law of gearing, Length of path of contact, Length of arc of contact, contact ratio- Interference and undercutting. Gear trains- Speed ratio, train value. Simple gear train, compound gear train, Epicyclic gear train- speed calculation by tabular method.

MODULE V   FRICTION DRIVES   12 Hours

Introduction-Friction clutch, types -single plate, Multi plate and cone clutch. Flat Belt Drives Velocity, slip, creep and Centrifugal effect of belt, length of open and cross belt drives, Maximum power transmitted, ratio of driving tension in flat belt drives - V Belt drives.

TOTAL: 60 HOURS

REFERENCES:

1. S. S. Rattan, Theory of Machines, Tata McGraw Hill Publishing Company Pvt. Ltd, New Delhi,2014.
2. J. J. Uicker, G. R. Pennock and J. E. Shigley, Theory of Machines and Mechanisms, Oxford University Press, New York,2011.
3. Ballaney P L, Theory of Machines and Mechanisms, Khanna Publishers, New Delhi,2005.
4. Sadhu Singh, Theory of Machines, Pearson Education, Second Edition,2012.
5. Rao J S and Dukkipati, Mechanism and Machine Theory, Wiley- Eastern Ltd., New Delhi,2006.
6.   http://nptel.ac.in/courses/112104121/1

1902ME504	CAD	L	T	P	C
		3	0	0	3

MODULE I FUNDAMENTALS OF COMPUTER GRAPHICS 09 Hours

Product cycle, Sequential and Concurrent Engineering, CAD - Architecture, Tools, applications - Coordinate systems - Two and Three-dimensional Transformations - Translation - Scaling - Reflection - Rotation, Windowing - clipping and Viewing.

MODULE II GEOMETRIC MODELING 09 Hours

Representation of curves - Hermite, Bezier, B-Spline and rational curves - Surface Modeling - surface patch - Bezier and B spline surface. Solid Modelling - Boundary representation(B-Rep) and Constructive Solid Geometry(CSG)

MODULEIII VISUAL REALISM 09 Hours

Hidden line removal algorithm - Priority and Area oriented algorithms. Hidden Surface removal algorithm - Depth buffer and Warnock's algorithms. Hidden solid removal algorithm, Ray Tracing algorithm, Shading and Coloring - types. Computer Animation.

MODULE IV ASSEMBLY OF PARTS 09 Hours

Assembly modeling - Interference of Positions and orientations - CAD Tolerance Analysis - geometrical Mass Properties - degree of freedom - Constraints and Simulation concepts.

MODULE V CAD STANDARDS 09 Hours

Standards for computer graphics- Graphical kernel system (GKS)- Standards for exchange images- Open Graphics Library(OpenGL)-Data exchange standards- IGES,STEP,CALS,etc.- communication standards.

TOTAL: 45 HOURS

REFERENCES:

1. Ibrahim Zied, CAD/CAM-Theory and Practice, Tata McGraw Hall Publishing CompanyPvt. Ltd., New Delhi, 2009.
2. Donald Hearn, M. Pauline Baker, Computer Graphics, Prentice Hall of India, New Delhi, 2014.
3. Richard M. Lueptow, Graphics Concepts for Computer-Aided Design, Pearson EducationIndia, 2006.
4. William M. Neumann, Robert F. Sproul, Principles of Computer Graphics, Tata McGraw Hall Publishing Company Pvt Ltd., New Delhi, 2005.
5. Mikell P. Groover, Emory W. Zimmers, CAD/CAM Computer-Aided Design and Manufacturing, Prentice Hall of India, New Delhi, 2007.

1902ME551	COMPUTER AIDED DESIGN AND ANALYSISLABORATORY	L	T	P	C
		0	0	2	1

LIST OF EXPERIMENTS:

Creation of 3D assembly model of following machine elements

EXPERIMENT 1   **3 hours**
    Flange Coupling

EXPERIMENT 2   **3 hours**
    Knuckle joint

EXPERIMENT 3   **3 hours**
    Screw Jack

EXPERIMENT 4   **3 hours**
    Universal Joint

EXPERIMENT 5   **3 hours**
    Stuffing box

EXPERIMENT 6   **3 hours**
    Connecting rod

  Creation of model and Analysis using software

EXPERIMENT 7   **2 hours**
    Stress and deflection analysis in beams with different support conditions.

EXPERIMENT 8   **2hours**
    Stress analysis of bracket.

EXPERIMENT 9   **2 hours**
    Thermal stress analysis of mixed boundary.

EXPERIMENT 10   **2 hours**
    Model analysis of Beams.

EXPERIMENT 11   **2 hours**
    Harmonic analysis of simple systems.

EXPERIMENT 12   **2 hours**
    Stress analysis of 3D beam.

                                            Total: **30 hours**

REFERENCES:

1. Ibrahim Zeid, CAD/ CAM Theory and Practice, McGraw Hill, 2007
2. Mikell P. Groover and Emory W. Zimmer, CAD/ CAM – Computer aided design and manufacturing, Pearson Education,1987
3. T. R. Chandrupatla and A. D. Belagundu, Introduction to Finite Elements in Engineering, Pearson Education, 2012
4. Finite Element Analysis Theory and Applications with Ansys, SaeedMoaveni, Pearson Education, 2014.

1902ME552	HEAT AND MASS TRANSFER LABORATORY	L	T	P	C
		0	0	2	1

LIST OF EXPERIMENTS:

Determination of thermal conductivity of insulating powder.

Determination of thermal conductivity of guarded hot plate.

Determination of thermal conductivity of materials in lagged pipe.

Determination of heat transfer co-efficient through composite wall.

Determination of heat transfer co-efficient by natural convection.

Determination of heat transfer co-efficient by forced convection

Determination of heat transfer co-efficient in a parallel and counter flow heat exchanger.

Determination of heat transfer co-efficient and effectiveness from Pin-Fin by natural convection.

Determination of heat transfer co-efficient and effectiveness from Pin-Fin by forced convection.

Determination of Stefan-Boltzmann constant.

Determination of emissivity using emissivity apparatus.

Determination of performance in a fluidized bed cooling tower

Total: 30 Hours

REFERENCES:

1. Frank P. Incropera and David P. Dewitt, "Fundamentals of Heat and Mass Transfer", John Wiley & Sons, 1998.
2. Kothandaraman, C.P., "Fundamentals of Heat and Mass Transfer", New Age International, New Delhi, 1998.
3. Nag, P.K., "Heat Transfer", Tata McGraw Hill, New Delhi, 2002
4. Ozisik, M.N., "Heat Transfer", McGraw Hill Book Co., 1994.
5. R.C. Sachdeva, "Fundamentals of Engineering Heat & Mass transfer", New Age International Publishers, 2009

1904GE551	**LIFE SKILLS: APTITUDE – 1**	**L**	**T**	**P**	**C**
		0	**0**	**2**	**1**

MODULE I   INTRODUCTION TO NUMBER SYSTEM, BASIC SHORTCUTS OF   6 Hours
ADDITION, MULTIPLICATION, DIVISION

Classification of numbers – Types of Numbers - Divisibility rules - Finding the units digit - Finding remainders in divisions involving higher powers - LCM and HCF Models - Fractions and Digits – Square, Square roots – Cube, Cube roots – Shortcuts of addition, multiplication, Division.

MODULE II   RATIO AND PROPORTION, AVERAGES   6 Hours

Definition of Ratio - Properties of Ratios - Comparison of Ratios - Problems on Ratios - Compound Ratio - Problems on Proportion, Mean proportional and Continued Proportion   Definition of Average - Rules of Average - Problems on Average - Problems on Weighted Average - Finding average using assumed mean method.

MODULE III   PERCENTAGES, PROFIT AND LOSS   6 Hours

Introduction Percentage - Converting a percentage into decimals - Converting a Decimal into a percentage - Percentage equivalent of fractions - Problems on percentages - Problems on Profit and Loss percentage- Relation between Cost Price and Selling price - Discount and Marked Price - Two different articles sold at same Cost Price - Two different articles sold at same Selling Price - Gain% / Loss% on Selling Price.

MODULE IV   CODING AND DECODING, DIRECTION SENSE   6 Hours

Coding using same set of letters - Coding using different set of letters - Coding into a number - Problems on R-model - Solving problems by drawing the paths - Finding the net distance travelled - Finding the direction - Problems on clocks - Problems on shadows - Problems on direction sense using symbols and notations.

MODULE V   NUMBER AND LETTER SERIES NUMBER AND LETTER ANALOGIES,   6 Hours
ODD MAN OUT

Difference series - Product series - Squares series - Cubes series - Alternate series - Combination series - Miscellaneous series - Place values of letters - Definition of Analogy - Problems on number analogy - Problems on letter analogy - Problems on verbal analogy - Problems on number Odd man out - Problems on letter Odd man out - Problems on verbal Odd man out

TOTAL   30 Hours

REFERENCES:
1. Arun Sharma, „How to Prepare for Quantitative Aptitude for the CAT", 7th edition, McGraw Hills publication, 2016.
2. Arun Sharma, „How to Prepare for Logical Reasoning for CAT", 4th edition, McGraw Hills publication, 2017.
3. R S Agarwal, „A modern approach to Logical reasoning", revised edition, S.Chand publication, 2017.
4. R S Agarwal, „Quantitative Aptitude for Competitive Examinations", revised edition, S.Chand publication, 2017.
5. Rajesh Verma, "Fast Track Objective Arithmetic", 3rd edition, Arihant publication, 2018.
6. B.S. Sijwalii and InduSijwali, "A New Approach to REASONING Verbal & Non-Verbal", 2nd edition, Arihnat publication, 2014.

ASSESSMENT PATTERN :
1. Two tests will be conducted (25 * 2) - 50 marks
2. Five assignments will be conducted (5*10)   - 50 Marks.

1902MCX03	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	L	T	P	C
		2	0	0	0

MODULE I   INTRODUCTION TO CULTURE   **6 Hours**

Culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India

MODULE II   INDIAN LANGUAGES, CULTURE AND LITERATURE   **6 Hours**

Indian Languages and Literature-I: the role of Sanskrit, significance of scriptures to current society, Indian philosophies, other Sanskrit literature, literature of south India Indian Languages and Literature-II: Northern Indian languages & literature

MODULE III   RELIGION AND PHILOSOPHY   **6 Hours**

Religion and Philosophy in ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (selected movements only)

MODULE IV   FINE ARTS IN INDIA (ART, TECHNOLOGY& ENGINEERING)   **6 Hours**

Indian Painting, Indian handicrafts, Music, divisions of Indian classic music, modern Indian music, Dance and Drama, Indian Architecture (ancient, medieval and modern), Science and Technology in India, development of science in ancient, medieval and modern India

MODULE V   EDUCATION SYSTEM IN INDIA   **6 Hours**

Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India.

                                                                TOTAL   30 Hours

REFERENCES:

1. KapilKapoor, "Text and Interpretation: The India Tradition",ISBN: 81246033375, 2005

2. "Science in Samskrit", SamskritaBharti Publisher, ISBN 13: 978-8187276333, 2007

3. NCERT, "Position paper on Arts, Music, Dance and Theatre", ISBN 81-7450 494-X, 200

4. S. Narain, "Examinations in ancient India", Arya Book Depot, 1993

5. SatyaPrakash, "Founders of Sciences in Ancient India", Vijay Kumar Publisher, 1989

6. M. Hiriyanna, "Essentials of Indian Philosophy", MotilalBanarsidass Publishers, ISBN 13: 978- 8120810990, 2014