

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 – Sixth Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1701MGX01	Professional Ethics	3	0	0	3	40	60	100
1702ME601	Finite Element Analysis	2	2	0	3	40	60	100
1702ME602	Gas Dynamics and Jet Propulsion	2	2	0	3	40	60	100
1702ME603	Dynamics of Machines	3	0	0	3	40	60	100
	Elective III	3	0	0	3	40	60	100
	Elective IV (Open)	3	0	0	3	40	60	100
Laboratory Course								
1702ME651	Dynamics of Machines Laboratory	0	0	2	1	50	50	100
1702ME652	Computer Aided Analysis Laboratory	0	0	2	1	50	50	100
1704ME653	Mini Project II	0	0	2	1	100	-	100
1704ME654	Industrial Visit Presentation	0	0	0	1	100	-	100
1704GE651	Life Skills: Aptitude II	0	0	2	1	100	-	100

1701MGX01

PROFESSIONAL ETHICS

L	T	P	C
3	0	0	3

UNIT I HUMAN VALUES

9 Hours

Morals and Ethics - Honesty - Integrity - Values - Work Ethic - Civic Virtue - Respect for Others - Living Peacefully - Caring and Sharing - Self-Confidence - Courage - Co-operation - Commitment - Empathy.

UNIT II ENGINEERING ETHICS AND PROFESSIONALISM

9 Hours

Scope of 'Engineering Ethics'- Variety of moral issues - Types of inquiry - Accepting and sharing responsibility - Ethical dilemmas - Moral autonomy - Kohlberg's and Gilligan's theory - Consensus and controversy - Profession and Professionalism - Models of Professional Roles - Right action theories - Senses of corporate responsibility - Codes of ethics: Importance - justification - limitation - Abuse - Sample codes NSPE - IEEE - Institution of Engineers (India).

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION

9 Hours

Engineering as experimentation - Engineers as responsible experimenters - Balanced outlook on law - Cautious optimism - Safety and risk - Assessing and reducing risk - Safe exits - The Challenger case study - Bhopal Gas Tragedy - The Three Mile Island and Chernobyl.

UNIT IV WORKPLACE RESPONSIBILITIES AND RIGHTS

9 Hours

Fundamental Rights - Responsibilities and Duties of Indian Citizens - Teamwork - Ethical corporate climate - Collegiality and loyalty - Managing conflict - Respect for authority - Collective bargaining - Confidentiality - Conflicts of interest - Occupational crime - Professional rights - Employee rights

UNIT V GLOBAL ISSUES

9 Hours

Multinational corporations: Technology transfer and appropriate technology - International rights promoting morally just measures - Environmental ethics: Engineering, ecology - economics - Human and sentient centred - and bio and eco centric ethics - Computer ethics and internet - Engineers as managers - Consulting engineers - Engineers as expert witnesses and advisors - Moral leadership.

TOTAL: 45 HOURS

FOR FURTHER READING/SEMINAR/CBS

1. Sample code of ethics like IETE, ASME, ASCE, Indian Institute of Materials Management.
2. Virtues for life

REFERENCES:

1. Mike W Martin and Roland Schinzinger, Ethics in Engineering, 4th edition, Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi, 2014.
2. M Govindarajan, S Natarajan and V S Senthil Kumar, Engineering Ethics, PHI Learning Private Ltd, New Delhi, 2012.
3. R S Naagarazan, A text book on professional ethics and human values, New age international limited, New Delhi, 2006.
4. Charles E Harris, Michael S Protchard and Michael J Rabins, Engineering Ethics - Concepts and Cases, Wadsworth Thompson Learning, United States, 2005.
5. <http://www.slideworld.org/slidestag.aspx/human-values-and-Professional-ethics>.

1702ME602	GAS DYNAMICS AND JET PROPULSION	L	T	P	C
		2	2	0	3

UNIT I COMPRESSIBLE FLOW FUNDAMENTALS 12 Hours

Introduction to compressible flow - Integral and differential forms of conservation equations, velocity of sound, Mach number, various regimes of flow, wave propagation, Mach cone and Mach angle- Stagnation state - stagnation enthalpy, stagnation temperature, stagnation pressure and stagnation density - critical state - reference velocities, reference Mach number. Effect of Mach number on compressibility.

UNIT II FLOW THROUGH VARIABLE AREA DUCTS 12 Hours

Isentropic flow through variable area ducts - effect of area change on flow parameters, area ratio as a function of Mach number, impulse function, mass flow rate equations, choking flow, effect of back pressure on performance of convergent and De level nozzle.

UNIT III FLOW THROUGH CONSTANT AREA DUCTS 12 Hours

Flow in constant area ducts with friction (Fanno flow) Governing equations, fanno curves and Fanno flow equations, variation of flow properties, variation of Mach number with duct length. Flow in constant area ducts with simple stagnation temperature change (Rayleigh Flow) - Governing equations, Rayleigh line and Rayleigh flow equation, variation of flow properties, maximum heat transfer in Rayleigh flow.

UNIT IV FLOW WITH NORMAL SHOCK 12 Hours

Governing equations - variation of flow properties like static pressure, static temperature, density, stagnation pressure and entropy across the normal shock - Prandtl equation - Rankine Hugoniot equation. Impossibility of shock in subsonic flows, flow in convergent and divergent nozzle with normal shock - normal shock in Fanno and Rayleigh flows.

UNIT V AIRCRAFT AND ROCKET PROPULSION 12 Hours

Aircraft propulsion - types of jet engines, energy flow through jet engines. Performance of turbo jet engines - thrust, thrust power, propulsive and overall efficiencies - thrust augmentation in turbo jet engine. Ram jet, Scram jet and Pulse jet engines. Rocket Propulsion - Classification of rocket engines. Propellants - solid, liquid and hybrid propellants, rocket engines thrust equation, effective jet velocity, specific impulse. Rocket engine performance.

TOTAL: 60 HOURS

FOR FURTHER READING/SEMINAR/CBS

Case Study: Advanced Aircraft Engines, select Fuel for Air-craft engines.

REFERENCES:

- 1.Hill. P. and C. Peterson, "Mechanics and Thermodynamics of Propulsion", Addison – Wesley Publishing company, 1992.
- 2.Zucrow. N.J., "Aircraft and Missile Propulsion", Vol.1 & II, John Wiley, 1975.
- 3.Zucrow. N.J., "Principles of Jet Propulsion and Gas Turbines", John Wiley, New York, 1970.
- 4.Sutton. G.P., "Rocket Propulsion Elements", John wiley, New York,1986,.
- 5.Shapiro. A.H.," Dynamics and Thermodynamics of Compressible fluid Flow", John Wiley, New York,1953.
- 6.Ganesan. V., "Gas Turbines", Tata McGraw Hill Publishing Co., New Delhi, 1999.
- 7.Somasundaram. PR.S.L., "Gas Dynamics and Jet Propulsions", New Age International Publishers, 1996.
- 8.Babu. V., "Fundamentals of Gas Dynamics", ANE Books India, 2008.
- 9.Cohen. H., G.E.C. Rogers and Saravanamutto, "Gas Turbine Theory", Longman Group Ltd., 1980.

1702ME603

DYNAMICS OF MACHINES

L	T	P	C
3	0	0	3

UNIT I DYNAMIC FORCE ANALYSIS OF MECHANISMS 9 Hours

Principle of superposition, Condition for dynamic analysis, Dynamic analysis of four bar & slider crank mechanism - Engine force analysis. Turning moment diagram for steam & IC Engine. Energy stored in flywheel, Dimension of flywheel rim, Flywheel in punching press.

UNIT II BALANCING 9 Hours

Introduction - Static balancing and dynamic balancing, Balancing of Rotating mass several masses in same and different plane. Balancing of reciprocating mass Swaying couple, Tractive force, Hammer Blow. Balancing of coupled locomotives.

UNIT III GOVERNOR AND GYROSCOPE 9 Hours

Governor Terminology, working principle, Types - Watt, Porter and Proell governor, Characteristics of Governor-sensitiveness, Hunting, Ichoromisn, Stability. Gyroscope- Gyroscopic effect, gyroscopic couple, gyroscopic effect on aero planes and naval ships.

UNIT IV FUNDAMENTAL OF VIBRATION 9 Hours

Introduction-Terminology, Classification, elements of vibration, free undamped vibration, Free Damped vibration (Viscus Damping) - Damping ratio and logarithmic decrement. Force damped vibration - Magnification factor. Vibration isolation and transmissibility.

UNIT V TRANSVERSE AND TORSIONAL VIBRATION 9 Hours

Transverse vibration of shafts and beams Shaft carrying several loads, whirling of shafts. Torsional vibration- effect of inertia on torsional vibration-Torsionally equivalent Shaft, single rotor, two rotors and three rotors system.

TOTAL: 45 HOURS

FOR FURTHER READING/SEMINAR/CBS

Turning moment balancing of W, V8, V12 engine, Instruments for dynamic measurements, vibration and noise standards, Mutifilar systems.

REFERENCES:

- 1.Uicker, J.J., Pennock G.R and Shigley, J.E., "Theory of Machines and Mechanisms",3rd Edition, Oxford University Press, 2009.
- 2.Rattan, S.S, "Theory of Machines", 3rd Edition, Tata McGraw-Hill, 2009
- 3.Thomas Bevan, "Theory of Machines", 3rd Edition, CBS Publishers and Distributors, 2005.
- 4.Cleghorn. W. L, "Mechanisms of Machines", Oxford University Press, 2005
- 5.Benson H. Tongue, "Principles of Vibrations", Oxford University Press, 2nd Edition, 2007
- 6.<http://nptel.ac.in/12106166>.

1702ME651

DYNAMICS OF MACHINES LABORATORY

L	T	P	C
0	0	2	1

LIST OF EXPERIMENTS:

1. Determination of mass moment of inertia of axisymmetric bodies using turn table apparatus
2. Determine the characteristics and effort of Watt, Porter Proell and Hartnell Governors.
3. Exercise on Balancing of reciprocating masses.
4. Exercise on Balancing of four rotating masses placed on different plane.
5. Analyze the gyroscopic effect using Gyroscope and verify its laws.
6. Determination of critical speed of shaft with concentrated loads by Whirling of shaft & vibration table apparatus.
7. Determine the moment of inertia of object by Bifilar suspension, Trifilar & method of oscillation.
8. Kinematic analysis of cam model, Epicyclic gear train and differential model.
9. Determination of natural frequency of single degree of freedom system & two rotor system.
10. Determine the frequency of forced vibration using Cantilever beam.

Total: 30 Hours

1702ME652

COMPUTER AIDED ANALYSIS LABORATORY

L	T	P	C
0	0	2	1

LIST OF EXPERIMENTS:

1. Stress analysis using link elements in Trusses, cables etc.
2. Stress and deflection analysis in beams with different support conditions.
3. Stress analysis of plate with hole.
4. Stress analysis of axi – symmetric components.
5. Thermal stress analysis of conduction boundary.
6. Thermal stress analysis of mixed boundary.
7. Model analysis of Beams.
8. Harmonic analysis of simple systems.
9. Plane stress analysis of plate.
10. Stress analysis of 3D beam.
11. Stress analysis of bracket.

Total: 30 Hours

1704ME653

MINI PROJECT II (Design and CAD modeling)

L	T	P	C
0	0	2	1

GUIDELINE FOR REVIEW AND EVALUATION:

The students may be grouped into 2 to 4 and work under a project supervisor. The device / system / component(s) to be designed and developed using modeling software, may be decided in consultation with the supervisor and if possible with an industry. A project report to be submitted by the group and the soft copy of the model, which will be reviewed and evaluated for internal assessment by a Committee constituted by the Head of the Department. At the end of the semester examination the project work is evaluated based on oral presentation and the project report examined by the internal examiner constituted by the Head of the Department.

Total: 30 Hours

1704ME654

INDUSTRIAL VISIT PRESENTATION

L	T	P	C
0	0	2	1

In order to provide the experiential learning to the students, shall take efforts to arrange at least two industrial visit / field visits in a year. A presentation based on Industrial visits shall be made in this semester and suitable credit may be awarded.

ASSESSMENT PATTERN : Continuous Assessment (100 Marks)

Distribution of marks for Continuous Assessment	Mark
Test	40
Presentation / Quiz / Group Discussion	40
Report	20
Total	100
Grades (Excellent / Good / Satisfactory / Not Satisfactory)	

1704GE651

LIFE SKILLS: APTITUDE II

L	T	P	C
0	0	2	1

COURSE OBJECTIVES:

1. To brush up problem solving skill and to improve intellectual skill of the students.
2. To be able to critically evaluate various real life situations by resorting to Analysis of key issues and factors.
3. To be able to demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.
4. To enhance analytical ability of students.
5. To augment logical and critical thinking of Students.

UNIT I PARTNERSHIP, MIXTURES AND ALLEGATIONS, PROBLEM ON AGES, SIMPLE INTEREST, COMPOUND INTEREST 6 Hours

Introduction Partnership - Relation between capitals, Period of investments and Shares- Problems on mixtures - Allegation rule - Problems on Allegation – Problems on ages - Definitions Simple Interest - Problems on interest and amount - Problems when rate of interest and time period are numerically equal - Definition and formula for amount in compound interest - Difference between simple interest and compound interest for 2 years on the same principle and time period.

UNIT II BLOOD RELATIONS, , CLOCKS, CALENDARS 6 Hours

Defining the various relations among the members of a family - Solving Blood Relation puzzles - Solving the problems on Blood Relations using symbols and notations - Finding the angle when the time is given - Finding the time when the angle is known - Relation between Angle, Minutes and Hours - Exceptional cases in clocks - Definition of a Leap Year - Finding the number of Odd days - Framing the year code for centuries - Finding the day of any random calendar date .

UNIT III TIME AND DISTANCE, TIME AND WORK 6 Hours

Relation between speed, distance and time - Converting kmph into m/s and vice versa - Problems on average speed - Problems on relative speed - Problems on trains - Problems on boats and streams - Problems on circular tracks - Problems on races - Problems on Unitary method - Relation between Men, Days, Hours and Work - Problems on Man-Day-Hours method - Problems on alternate days - Problems on Pipes and Cisterns.

UNIT IV DATA INTERPRETATION AND DATA SUFFICIENCY 6 Hours

Problems on tabular form - Problems on Line Graphs - Problems on Bar Graphs - Problems on Pie Charts - Different models in Data Sufficiency - Problems on data redundancy

UNIT V ANALYTICAL AND CRITICAL REASONING 6 Hours

Problems on Linear arrangement - Problems on Circular arrangement - Problems on Double line-up - Problems on Selections - Problems on Comparisons - Finding the Implications for compound statements - Finding the Negations for compound statements- Problems on assumption - Problems on conclusions - Problems on inferences - Problems on strengthening and weakening of arguments .

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. Sijwali and Indu Sijwali, "A New Approach to REASONING Verbal & Non-Verbal", 2nd edition, Arihant publication, 2014.

ASSESSMENT PATTERN:

1. Two tests will be conducted (25×2) - 50 marks.
2. Five assignments will be conducted (5×10) - 50 marks.

