GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY: NELLORE

(AUTONOMOUS)

NELLORE–524317 (A.P) INDIA

B.TECH IN MECHANICAL ENGINEERING
(ACCREDITATED BY NBA)
COURSE STRUCTURE AND SYLLABI
UNDER RG 22 REGULATIONS

GEETHANJALI INSTITUTE OF SCIENCE AND TECHNOLOGY
(AUTONOMOUS)
NELLORE – 524137 (A.P) INDIA
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Mechanical Engineering
II B.TECH.

S.No.	Course Code	Course Name	Category	L	T	P	Credits
Semester-IV (Theory–5, Lab–3,Skill course-1, Mandatory course-1)							
1.	22A0019T	Transforms and Probability distribution	BSC	2	1	0	3
2.	22A0312T	Applied Thermal Engineering	PCC	2	1	0	3
3.	22A0314T	Strength of Materials	PCC	2	1	0	3
4.	22A0316T	Fluid Mechanics and Hydraulic Machinery	PCC	2	1	0	3
5.	22A0021T	Universal Human Values	HSSC	3	0	0	3
6.	22A0315P	Strength of Materials Lab	PCC	0	0	3	1.5
7.	22A0317P	Fluid Mechanics and Hydraulic Machinery Lab	PCC	0	0	3	1.5
8	22A0313P	Applied Thermal Engineering Lab	PCC	0	0	3	1.5
9.	22A0517P	**Skill oriented course** Python Programming	SOC	1	0	2	2
10.	22A0029M	**Mandatory Non credit course–II** Constitution of India	MC	3	0	0	0
						Total	**21.5**
4 Weeks Community service Project is mandatory during Summer vacation							

Distribution of Credits among the Category of Courses		
S.No	**Category of courses introduced**	**Credits Assigned**
1	Basic Science Courses (1T)	3
2	Professional Core Courses (3T+3L)	13.5
3	Humanities and Social Science Courses (1T)	3
4	Skill Oriented Course – 1 (T+P)	2
5	Mandatory Non Credit Course (1T)	0
	Total Credits	21.5

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Transforms & Probability Distributions					
(Common to EEE , ME)					
Course Code	**L:T:P:S**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
22A0019T	2: 1:0:0	3	CIE: 30 SEE:70	3Hours	BSC

Course Objectives:

- Our emphasis will be more on conceptual understanding and application of Fourier series,Fourier, Z and Laplace transforms and random variables and probability distributions.

Syllabus	Total Hours:45

Module - I	Laplace Transforms	9 Hrs

Definition-Laplace transform of standard functions-existence of Laplace Transform – Inverse transform– First shifting Theorem, Transforms of derivatives and integrals – Unit step function – Second shiftingtheorem – Dirac's delta function – Convolution theorem – Laplace transform of Periodic function.

Differentiation and integration of transform – Application of Laplace transforms to ordinary differentialequations of first and second order.

Module - II	Fourier series	9 Hrs

Determination of Fourier coefficients (Euler's) – Dirichlet conditions for the existence of Fourier series – functions having discontinuity-Fourier series of Even and odd functions – Fourier series in an arbitrary interval – Half-range Fourier sine and cosine expansions-Parseval's formula- Complex form of Fourier series.

Module - III	Fourier transforms	9 Hrs

Fourier integral theorem (without proof) – Fourier sine and cosine integrals-complex form of Fourier integral. Fourier transform – Fourier sine and cosine transforms – Properties – Inversetransforms – convolution theorem.

Module - IV	Z Transforms	9 Hrs

Z-transform – Inverse z-transform – Properties – Damping rule – Shifting rule – Initial and finalvalue theorems. Convolution theorem – Solution of difference equations by z-transforms.

Module - V	Random Variables & Probability Distributions	9 Hrs

Random variables (discrete and continuous), Probability density functions, properties Discrete distribution: Binomial, Poisson approximation to the binomial distribution and their properties.Continuous distribution: Normal distribution and their properties.

Course Outcomes (CO):
Student will be able to
- Understand the concept of Laplace transforms, find the Laplace transforms of differentfunctions and apply Laplace transforms to solve Differential Equations.
- Find the Fourier series expression for the different periodic functions.
- Find Fourier Sine and cosine integrals. Understand Fourier transforms. Apply propertiesof Fourier transforms.
- Understand Z transforms, apply Z transforms, to solve difference equations.
- Explain the notion of random variable, distribution functions, apply Binomial,Poisson distribution and normal distributions for real data to compute probabilities.

Text Books:

1. B.S.Grewal , "Higher Engineering Mathematics", Khanna publishers.
2. Mathematics II by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad S. Chand publication.
3. Probability & Statistics by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad S. Chand publication.

Reference Books:

1. B.V.Ramana, "Higher Engineering Mathematics", Mc Graw Hill publishers.
2. Mathematical Methods by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad S. Chand publication.
3. Mathematical Foundations of Statistics by K. C. Kapoor & Gupta, S. Chand Publications.

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Applied Thermal Engineering					
Course Code	**L:T:P:S**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
22A0311T	**2: 1:0:0**	**3**	**CIE: 30 SEE:70**	**3Hours**	**PCC**

Course Objectives:

- To introduce students to the Working Principles of IC engines.
- To teach combustion process in SI and CI engines.
- To impart knowledge on different types of compressors.
- To familiarize concepts of thermodynamic cycles used in steam power plants and gas turbines
- To impart knowledge on the working of nozzles, turbines, refrigeration and air conditioning.

Syllabus		Total Hours:42
UNIT - I	**IC Engines**	**10 Hrs**

Working and classification of IC engines, comparison of two stroke and four stroke engines, comparisonof SI and CI Engines.

Combustion in IC Engines: SI engine: stages of combustion, normal combustion, abnormal combustion, variables effecting ignition lag, Flame propagation and knocking. CI engine: stages of combustion, normal combustion, abnormal combustion, variables effecting delay period and knocking.

Testing and Performance of IC Engines: Methods of testing IC Engines, performance analysis of ICEngines.

UNIT - II	**Air compressors**	**8 Hrs**

Reciprocating Compressor: Single stage reciprocating compressors, work required, effect of clearance in compressors, volumetric efficiency, multi stage compressor, effect of inter cooling in multi stage compressors, compressor performance.

Rotary Compressor: Working principle of a rolling piston type compressor (fixed vane type), multi vane type compressors, characteristics of rotary vane type compressor, working principle of centrifugal and axial flow compressors.

UNIT - III	**Vapour & Gas Power Cycles**	**8 Hrs**

Vapour power cycle, simple Rankine cycle, mean temp of heat addition, thermodynamic variableseffecting efficiency, Rankine cycle – reheating and regeneration.

Simple gas turbine plant, Brayton cycle, closed cycle and open cycle for gas turbines, condition for optimum pressure ratio, actual cycle. Methods to improve performance: regeneration, intercooling and reheating.

UNIT - IV	Nozzles & Steam Turbines	8 Hrs

Type of nozzles - gas and steam nozzles. Compressible flow through nozzle- condition for maximumdischarge - Nozzle efficiency - Super saturation.

Steam Turbines - impulse turbine and reaction turbine – compounding of impulse turbines - velocitydiagrams in impulse and reaction turbines, blade efficiency, degree of reaction.

UNIT - V	Refrigeration & Air-Conditioning	8 Hrs

Refrigeration: Bell-Coleman cycle - vapour compression cycle, sub cooling and super heating-vapourabsorption cycle, properties of common refrigerants.

Principles of Psychrometry and Air Conditioning: Psychometric properties, psychometric processes,summer and winter air conditioning systems.

Course Outcomes (CO):

On completion of this course, student will be able to
- Understand the working of IC engines with combustion process. (L1)
- Select compressors for different applications. (L2)
- Use T-s diagram in vapour power and gas power cycles. (L3)
- Evaluate the relative performance of different steam turbines (L6)
- Select appropriate refrigerant for different applications. (L6)

Textbooks:
1. Mahesh V Rathore, Thermal Engineering, Tata McGraw Hill 2017
2. M.L.Mathur and F.S.Mehta, Thermal Engineering, Jain brothers,2014

Reference Books:
1. Ganesan V, Internal Combustion Engines, Tata McGraw Hill, 2017.
2. Yahya, S. M., Turbines, Compressors and Fans, 4/e, Tata McGraw Hill, 2010.
3. Nag P.K, Engineering Thermodynamics, 4/e, Tata McGraw-Hill, 2008.
4. Onkar Singh, Thermal Turbomachines, 3/e, Wiley India, 2014.
5. C.P.Arora, Refrigeration and Air Conditioning, Tata McGraw-Hill, 2000

Web links:
1. https://nptel.ac.in/courses/112/103/112103307/
2. https://nptel.ac.in/courses/112/103/112103275/

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Strength of Materials					
Course Code	**L:T:P:S**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
22A0313T	**2: 1:0:0**	**3**	**CIE: 30 SEE:70**	**3Hours**	**PCC**

Course Objectives:

- Understand the basics of stresses and strains
- Draw the shear force and bending moment drawings of various beams.
- Understand the Behaviour of members and Torsional forces
- Understand the Behaviour of cylinders
- Understand the stresses developing in curved beams.

Syllabus		Total Hours:42
UNIT - I	**Analysis of stress and strain**	**10 Hrs**

Types of external loads - self weight - internal stresses - normal and shear stresses - strain - Hooke's law - Poisson's ratio - relationship between elastic constants - stress strain diagrams working stress - elongation of bars of constant and varying sections - Stress on inclined planes for axial and biaxial stress fields - principal stresses - Mohr's circle of stress - principal strains - strain rosette – principal stress/strain problem as an eigen value problem.

UNIT - II	**Bending moment and shear force**	**8 Hrs**

Different types of beams - shear force and bending moment diagrams for simply supported, overhanging and cantilever beams - relationship connecting intensity of loading, shearing force and bending moment - shear force and bending moment diagrams for statically determinate plane frames.

UNIT - III	**Torsion and Springs**	**8 Hrs**

Torsion formulation stresses and deformation in circular and hollows shafts – Stepped shafts– Deflection in shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs, carriage springs.

UNIT - IV	**Thin Cylinders, Spheres and Thick Cylinders**	**8 Hrs**

Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses and deformation in thin cylinders – spherical shells subjected to internal pressure – Deformation in spherical shells – Lame"s theory – Application of theories of failure.

UNIT - V	**Bending of curved bars & Unsymmetrical Bending**	**8 Hrs**

Stresses in bars of small initial curvature, Winkler-Bach theory, Stresses in bars of large initial curvature, Deflection of Crane hooks, Chain links, circular rings, stresses in circular rings.

Introduction to unsymmetrical bending, Stresses and deflection in unsymmetrical bending, Shear center for angle, Channel and I-sections.

Course Outcomes (CO):

On completion of this course, student will be able to
- Evaluate stresses and strains
- To draw the SF and BM diagrams for various beams under different loading conditions
- Determine the resistance and deformation in machine members subjected to torsional loads and springs.
- Analyze and design thin, thick cylinders.
- Analysis of stresses in curved bars.

Textbooks:
1. J. M. Gere and S. P. Timoshenko, Mechanics of Material, CBS publisher, 2018
2. Popov, E.P., Mechanics of Materials, Prentice Hall India, New Delhi, 2002.

Reference Books:
1. Advanced Mechanics of Materials–A. P. Boresi and O. M. Sidebottom–John Wiley & Sons
2. Strength of Materials – R. K. Rajput – S. Chand & Company
3. Beer, F.P.,Johnston, E.R. and DeWolf, J.T.,Mechanics of Materials, 3rd ed., Tata McGraw-Hill
4. Strength of Material – Dr. Sadhu Singh – Khanna Publishers
5. Strength of Material, Vol. I and II – S. P. Timoshenko – EWP Press

Web links:
1. https://nptel.ac.in/courses/112/107/112107146/
2. https://ocw.mit.edu/courses/materials-science-and-engineering/3-11-mechanics-of-materials-fall-1999/
3. https://www.coursera.org/courses?query=mechanics%20of%20materials
4. https://www.udemy.com/course/strengthofmaterials/

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Fluid Mechanics and Hydraulic Machinery					
Course Code	**L:T:P:S**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
22A0315T	**2: 1:0:0**	**3**	**CIE: 30 SEE:70**	**3Hours**	**PCC**

Course Objectives:

- To impart ability to solve engineering problems in fluid mechanics
- To explain basics of statics, kinematics and dynamics of fluids and various measuring techniques of hydrostatic forces on objects.
- To enable the students measure quantities of fluid flowing in pipes.
- To impart knowledge on design of turbines and pumps.

Syllabus		Total Hours:42
UNIT - I	**Introduction to Fluid Statics**	**10 Hrs**

Distinction between a fluid and a solid - characteristics of fluids - Fluid Pressure: Pressure at a point, Pascal's law, pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U Tube Differential Manometer. pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces.

UNIT - II	**Fluid kinematics and Dynamics**	**8 Hrs**

Classification of fluid flow - Stream line, path line, streak line and stream tube; stream function, velocity potential function. One, two and three - dimensional continuity equations in Cartesiancoordinates.

Fluid Dynamics: Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation: Venturimeter, Orifice meter and Pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Vortex Flow – Free and Forced.

UNIT - III	**Analysis of Pipe Flow**	**8 Hrs**

Energy losses in pipelines; Darcy – Weisbach equation; Minor losses in pipelines; Hydraulic Grade Line and Total Energy Line; Concept of equivalent length – Pipes in Parallel and Series. Laminar Flow- Laminar flow through: circular pipes. Stoke's law, Measurement of viscosity. Reynolds experiment, Transition from laminar to turbulent flow. Resistance to flow of fluid in smooth and rough pipes-Moody's diagram.

UNIT - IV	**Hydraulic Turbines**	**8 Hrs**

Impact of Jets- Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes -velocity triangles at inlet and outlet - Work done and efficiency - Hydraulic Turbines: Classification of turbines; pelton wheel and its design. Francis turbine and its design - efficiency - Draft tube: theory- characteristic curves of hydraulic turbines

UNIT - V	**Hydraulic Pump**	**8 Hrs**

Working principles of a centrifugal pump, work done by impeller; heads, losses and efficiencies; minimum starting speed; Priming; specific speed; limitation of suction lift, net positive suction head (NPSH); Performance and characteristic curves; Multistage centrifugal

pumps; troubles and remedies – Introduction to Reciprocating Pump- Cavitation - Cavitation effects;

Course Outcomes (CO):

On completion of this course, student will be able to
- Familiarize basic terms used in fluid mechanics.
- Understand the principles of fluid statics, kinematics and dynamics.
- Understand flow characteristics and classify the flows and estimate various losses in flow through pipes.
- Design of different types of turbines.
- Design of different types of centrifugal and multistage pumps.

Textbooks:
1. P. M. Modi and S. M. Seth, "Hydraulics and Fluid Mechanics", Standard Book House
2. K. Subrahmanya, "Theory and Applications of Fluid Mechanics", Tata McGraw Hill

Reference Books:
1. R. K. Bansal, A text of "Fluid Mechanics and Hydraulic Machines", Laxmi Publications (P) Ltd., New Delhi.
2. K. Subramanya, Open channel Flow, Tata McGraw Hill.
3. N. Narayana Pillai, Principles of "Fluid Mechanics and Fluid Machines", Universities Press Pvt Ltd, Hyderabad. 3rd Edition 2009.
4. C. S. P. Ojha, R. Berndtsson and P. N. Chadramouli, "Fluid Mechanics and Machinery", Oxford University Press, 2010.
5. Banga& Sharma, "Hydraulic Machines", Khanna Publishers.

Web links:
1. https://www.coursera.org/courses?query=fluid%20mechanics
2. https://www.udemy.com/topic/fluid-mechanics/
3. https://onlinecourses.nptel.ac.in/noc21_ce31/preview
4. https://ocw.mit.edu/courses/aeronautics-and-astronautics/16-01-unified-engineering-i-ii-iii- iv-fall-2005-spring-2006/fluid-mechanics/
5. http://lms.msitonline.org/mod/folder/view.php?id=138

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Universal Human Values					
(Common to all branches of Engineering)					
Course Code	**L:T:P:S**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
22A0021T	**3: 0:0:0**	**3**	**CIE: 30 SEE:70**	**3Hours**	**HSSC**

Course Objectives:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society andnature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

Syllabus		Total Hours:48
Module-I	**Course Introduction - Need, Basic Guidelines, Content and Process for Value Education**	**10 Hrs**

Purpose and motivation for the course, recapitulation from Universal Human Values-I

Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration

Continuous Happiness and Prosperity- A look at basic Human Aspirations

Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment ofaspirations of every human being with their correct priority

Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario

Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

Module-II	**Understanding Harmony in the Human Being - Harmony in Myself!**	**9 Hrs**

Understanding human being as a co-existence of the sentient 'I' and the material 'Body'

Understanding the needs of Self ('I') and 'Body' - happiness and physical facility

Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)

Understanding the characteristics and activities of 'I' and harmony in 'I'

Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail

Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

Module-III	Understanding Harmony in the Family and Society-Harmony in Human-Human Relationship	10 Hrs

Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship

Understanding the meaning of Trust; Difference between intention and competence

Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship

Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals

Visualizing a universal harmonious order in society- Undivided Society, Universal Order-from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

Module-IV	Understanding the Nature and Existence hole existence as Coexis	9 Hrs

Understanding the harmony in the Nature

Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature

Understanding Existence as Co-existence of mutually interacting units in all-pervasive space

Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can beused), pollution, depletion of resources and role of technology etc.

Module-V	Implications of the above Holistic Understanding of Harmony on Professional Ethics	10 Hrs

Natural acceptance of human values

Definitiveness of Ethical Huma

Conduct

Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco- friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

Case studies of typical holistic technologies, management models and production systemsStrategy for transition from the present state to Universal Human Order:

a. At the level of individual: as socially and ecologically responsible engineers, technologists andmanagers

b. At the level of society: as mutually enriching institutions and organizationsSum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. Todiscuss the conduct as an engineer or scientist etc.

Course Outcomes (CO):
On completion of this course, student will be able to   • Students are expected to become more aware of themselves, and their surroundings (family, society, nature)   • They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.   • They would have better critical ability.   • They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).   • It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.
Textbooks:
1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd   2. Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1   3. 3. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values andProfessional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2
Reference Books:
1. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.   2. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.The Story of Stuff (Book).   3. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"   4. E. FSchumacher. "Small is Beautiful"Slow is Beautiful –Cecile Andrews   5. J C Kumarappa "Economy of Permanence" Pandit Sunderlal "Bharat Mein Angreji Raj" Dharampal, "Rediscovering India"   6. Mohandas K. Gandhi, "Hind Swaraj or Indian Home Rule"India Wins Freedom - Maulana Abdul Kalam Azad Vivekananda - Romain Rolland(English)   7. Gandhi - Romain Rolland (English)

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Strength of Materials Lab					
Course Code	**L:T:P:S**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
22A0314P	**0: 0:3:0**	**1.5**	**CIE: 30 SEE:70**	**3Hours**	**PCC**

Course Objectives:

- By performing this laboratory, the student will be able to know the structural behavior of various materials

Syllabus	**Total Hours:45**
1. Tension test. 2. Bending test on (Steel/Wood) Cantilever beam. 3. Bending test on simply supported beam. 4. Torsion test. 5. Vickers Hardness Test 6. Rockwell Hardness Test 7. Brinell Hardness Test 8. Compression test on Open coiled springs 9. Tension test on Closely coiled springs 10. Compression test on wood/ concrete 11. Izod Impact test on metals 12. Charpy Impact test on metals 13. Continuous beam – deflection test. Note : Any 12 of the above equipments	

Course Outcomes (CO):

On completion of this course, student will be able to

- By performing the various tests in this laboratory the student will be able to know the structural behavior of various structural elements when subjected to external loads

Reference Books:

1. Strength of Materials Lab Manual by Anand Jayakumar A , Notion Press

Web links:

1. http://sm-nitk.vlabs.ac.in/#

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Fluid Mechanics and Hydraulic Machinery Lab					
Course Code	**L:T:P:S**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
22A0309P	**0: 0:3:0**	**1.5**	**CIE: 30 SEE:70**	**3Hours**	**PCC**

Course Objectives:

- By performing this laboratory, the student will be able to know the fluid flow measurements by considering different types flow measurement devices and working principles of various pumps and motors.

Syllabus	**Total Hours:45**

1. Verification of Bernoulli's equation.
2. Calibration of Venturi meter.
3. Calibration of Orifice meter
4. Determination of Coefficient of discharge for a small orifice by constant head method.
5. Determination of Coefficient of discharge for a small orifice by variable head method.
6. Determination of Coefficient of discharge for an external mouth piece by Constant headmethod.
7. Determination of Coefficient of discharge for an external mouth piece by variable headmethod.
8. Calibration of contracted Rectangular Notch.
9. Calibration of contracted Triangular Notch. Determination of friction factor
10. Determination of loss of head in a sudden contraction.
11. Determination of loss of head in a sudden Expansion.
12. Performance test on Impulse turbines
13. Performance test on reaction turbines (Francis and Kaplan Turbines)
14. Impact of jet
15. Performance test on centrifugal pumps, determination of operating point and efficiency

Course Outcomes (CO):

On completion of this course, student will be able to

- By performing the various tests in this laboratory the student will be able to know the principles of discharge measuring devices and head loss due to sudden contraction and expansion in pipes and working principles of various pumps and motors.

Reference Books:

1. Fluid Mechanics & Hydraulic Machines A Lab Manual by Ts Desmukh (Author), Laxmi Publications (P) Ltd
2. Fluid Mechanics & Machinery Laboratory Manual by N Kumara Swamy (Author), Charotar Books Distributors
3. Lab. Manual of Fluid Mechanics & Machines by Gupta, Chandra (Author), cbspd (Publisher)

Web links:

1. **http://eerc03-iiith.vlabs.ac.in/**

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Applied Thermal Engineering Lab					
Course Code	**L:T:P:S**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
22A0312P	**0: 0:3:0**	**1.5**	**CIE: 30 SEE:70**	**3Hours**	**PCC**

Course Objectives:

- Understand the functioning and performance of I.C. Engines.
- To find heat losses in various engines.

Syllabus	**Total Hours:45**

1. Valve timing diagram of 4 – stroke diesel engine.
2. Port timing diagram of 2 – stroke petrol engine.
3. Assembly and disassembly of petrol and diesel engines.
4. Performance of 2 – stroke single cylinder petrol engine.
5. Performance of 4 – stroke single cylinder diesel engine.
6. Morse test on multi cylinder petrol engine.
7. Performance of two stage reciprocating air compressor.
8. Performance of heat pump.
9. Performance of Refrigeration system.
10. Performance of Air conditioning system.
11. Determination of nozzle characteristics.
12. Exhaust gas analysis.

Note : Any 10 of the above experiments

Course Outcomes (CO):
At the end of the course, students will be able to

- Explain different working cycles of engine.
- Describe various types of combustion chambers in I.C. Engines.
- Evaluate heat balance sheet of I.C. Engine.
- Illustrate the working of refrigeration and air conditioning systems.

Reference Books:

1. Abdul Matheen, Heat Transfer Laboratory Manual, Laxmi Publications; 2/e, 2007.

Online Learning Resources/Virtual Labs:

1. https://sites.google.com/view/vlab-bnmitmech/home/heat-transfer-lab
2. https://www.iare.ac.in/sites/default/files/lab1/IARE_HT_LAB_MANUAL.pdf
3. https://mrcet.com/downloads/digital_notes/ME/III%20year/(R18A0388)Heat%20Transfer%20Lab.pdf
4. https://mrcet.com/downloads/ME/Mech%20III-II.pdf

GEETHANJALI INSTITUTE OF SCIENCE AND TECHNOLOGY
(AUTONOMOUS)
NELLORE – 524137 (A.P) INDIA

Python Programming					
Course Code	**L:T:P:S**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
22A0517P	**1: 0:2:0**	**2**	**CIE: 30 SEE:70**	**3Hours**	**SOC**

Course Objectives:

- Acquire programming skills in core Python
- To understand the importance of Object-oriented Programming
- Develop the skill of designing graphical-user interfaces (GUI) in Python.
- Develop the ability to write database applications in Python.

Syllabus	Total Hours: 36

Introduction to Python: Features of Python, Data types, Operators, Input and output, Control Statements, Looping statements

Python Data Structures: Lists, Dictionaries, Tuples.

Strings: Creating strings and basic operations on strings, string testing methods.

Functions: Defining a function- Calling a function- Types of functions-Function Arguments-Anonymous functions- Global and local variables

OOPS Concepts; Classes and objects- Attributes- Inheritance- Overloading- Overriding- Data hiding

Modules and Packages: Standard modules-Importing own module as well as external modules Understanding Packages Powerful Lamda function in python Programming using functions, modulesand external packages

Working with Data in Python: Printing on screen- Reading data from keyboard- Opening and closingfile- Reading and writing files- Functions-Loading Data with Pandas-Numpy

Tasks:

1. OPERATORS

a. Read a list of numbers and write a program to check whether a particular element is present or notusing membership operators.

b. Read your name and age and write a program to display the year in which you will turn 100 yearsold.

c. Read radius and height of a cone and write a program to find the volume of a cone.

d. Write a program to compute distance between two points taking input from the user (Hint: usePythagorean theorem)

2. CONTROL STRUCTURES

a. Read your email id and write a program to display the no of vowels, consonants, digits and white spaces in it using if…elif…else statement.

b. Write a program to create and display a dictionary by storing the antonyms of words. Find the antonym of a particular word given by the user from the dictionary using while loop.

c. Write a Program to find the sum of a Series 1/1! + 2/2! + 3/3! + 4/4! +…….+ n/n!. (Input :n = 5, Output : 2.70833)

d. In number theory, an abundant number or excessive number is a number for which the sum of its proper divisors is greater than the number itself. Write a program to find out, if the given number is abundant. (Input: 12, Sum of divisors of 12 = 1 + 2 + 3 + 4 + 6 = 16, sum of divisors 16 > original number 12)

3: LIST

a. Read a list of numbers and print the numbers divisible by x but not by y (Assume x = 4 and y = 5).

b. Read a list of numbers and print the sum of odd integers and even integers from the list.(Ex: [23, 10,15, 14, 63], odd numbers sum = 101, even numbers sum = 24)

c. Read a list of numbers and print numbers present in odd index position. (Ex: [10, 25, 30, 47, 56, 84,96], The numbers in odd index position: 25 47 84).

d. Read a list of numbers and remove the duplicate numbers from it. (Ex: Enter a list with duplicateelements: 10 20 40 10 50 30 20 10 80, The unique list is: [10, 20, 30, 40, 50, 80])

4: TUPLE

a. Given a list of tuples. Write a program to find tuples which have all elements divisible by K from alist of tuples. test_list = [(6, 24, 12), (60, 12, 6), (12, 18, 21)], K = 6, Output : [(6, 24, 12), (60, 12, 6)]

b. Given a list of tuples. Write a program to filter all uppercase characters tuples from given list of tuples. (Input: test_list = [("GFG", "IS", "BEST"), ("GFg", "AVERAGE"), ("GfG",), ("Gfg", "CS")],Output : [("GFG", "IS", "BEST")]).

c. Given a tuple and a list as input, write a program to count the occurrences of all items of the list inthe tuple. (Input : tuple = ('a', 'a', 'c', 'b', 'd'), list = ['a', 'b'], Output : 3)

5: SET

a. Write a program to generate and print a dictionary that contains a number (between 1 and n) in theform (x, x*x).

b. Write a program to perform union, intersection and difference using Set A and Set B.

c. Write a program to count number of vowels using sets in given string (Input : "Hello World", Output:No. of vowels : 3)

d. Write a program to form concatenated string by taking uncommon characters from two strings usingset concept (Input : S1 = "aacdb", S2 = "gafd", Output : "cbgf").

6: DICTIONARY

a. Write a program to do the following operations:

i. Create a empty dictionary with dict() method

ii. Add elements one at a time

iii. Update existing key"s value

iv. Access an element using a key and also get() method

v. Deleting a key value using del() method

b. Write a program to create a dictionary and apply the following methods:
i. pop() method
ii. popitem() method
iii. clear() method
c. Given a dictionary, write a program to find the sum of all items in the dictionary.
d. Write a program to merge two dictionaries using update() method.

7: STRINGS

a. Given a string, write a program to check if the string is symmetrical and palindrome or not. A string is said to be symmetrical if both the halves of the string are the same and a string is said to be a palindrome string if one half of the string is the reverse of the other half or if a string appears same when read forward or backward.
b. Write a program to read a string and count the number of vowel letters and print all letters except 'e' and 's'.
c. Write a program to read a line of text and remove the initial word from given text. (Hint: Use split() method, Input : India is my country. Output : is my country)
d. Write a program to read a string and count how many times each letter appears. (Histogram).

8: USER DEFINED FUNCTIONS

a. A generator is a function that produces a sequence of results instead of a single value. Write a generator function for Fibonacci numbers up to n.
b. Write a function merge_dict(dict1, dict2) to merge two Python dictionaries.
c. Write a fact() function to compute the factorial of a given positive number.
d. Given a list of n elements, write a linear_search() function to search a given element x in a list.

9: BUILT-IN FUNCTIONS

a. Write a program to demonstrate the working of built-in statistical functions mean(), mode(), median() by importing statistics library.
b. Write a program to demonstrate the working of built-in trignometric functions sin(), cos(), tan(), hypot(), degrees(), radians() by importing math module.
c. Write a program to demonstrate the working of built-in Logarithmic and Power functions exp(), log(), log2(), log10(), pow() by importing math module.
d. Write a program to demonstrate the working of built-in numeric functions ceil(), floor(), fabs(), factorial(), gcd() by importing math module.

10. CLASS AND OBJECTS

a. Write a program to create a BankAccount class. Your class should support the following methods for
   i) Deposit
   ii) Withdraw
   iii) GetBalanace
   iv) PinChange

b. Create a Savings Account class that behaves just like a Bank Account, but also has an interest rateand a method that increases the balance by the appropriate amount of interest (Hint:use Inheritance).

c. Write a program to create an employee class and store the employee name, id, age, and salary using the constructor. Display the employee details by invoking employee_info() method and also using dictionary (_dict_).

d. Access modifiers in Python are used to modify the default scope of variables. Write a program to demonstrate the 3 types of access modifiers: public, private and protected.

11. FILE HANDLING

a. . Write a program to read a filename from the user, open the file (say firstFile.txt) and then performthe following operations:
   i. Count the sentences in the file.
   ii. Count the words in the file.
   iii. Count the characters in the file.

b. . Create a new file (Hello.txt) and copy the text to other file called target.txt. The target.txt file shouldstore only lower case alphabets and display the number of lines copied.

c..Write a Python program to store N student's records containing name, roll number and branch. Printthe given branch student's details only.

Course Outcomes (CO):

Students should be able to
- Understand various data types like lists, tuples, strings etc
- Able to create practical and contemporary applications using Functions
- Explore the use of Object oriented concepts to solve Real-life problems
- Utilize Python packages in developing software applications
- Solve mathematical problems using Python programming language

References:

1. Reema Thareja, "Python Programming - Using Problem Solving Approach", Oxford Press, 1st Edition, 2017.
2. Michael H Goldwasser, David Letscher, "Object Oriented Programming in Python", Prentice Hall, 1st Edition, 2007.
3. Yashavant Kanetkar, Aditya Kanetkar, "Let us Python", BPB publication, 1st Edition, 2019.
4. Ashok Kamthane, Amit Kamthane, "Programming and Problem Solving with Python", McGraw Hill Education (India) Private Limited, 2018.
5. Taneja Sheetal, Kumar Naveen, "Python Programming – A modular approach", Pearson, 2017

Web References:

1. https://realpython.com/python3-object-oriented-programming/
2. https://python.swaroopch.com/oop.html
3. https://python-textbok.readthedocs.io/en/1.0/Object_Oriented_Programming.html
4. https://www.programiz.com/python-programming/
5. https://www.geeksforgeeks.org/python-programming-language/

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Constitution of India					
Mandatory Non credit course–II					
Course Code	**L:T:P:S**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
22A0029M	**3: 0:0:0**	**0**	**CIE: 30 SEE:70**	**3Hours**	**MC**

Course Objectives:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and Election Commission of India.
- To understand the central-state relation in financial and administrative control

Syllabus		Total Hours:48
Module-I	**Introduction to Indian Constitution**	**10 Hrs**

Introduction to Indian Constitution – Constitution -Meaning of the term - Indian Constitution Sources and constitutional history - Features– Citizenship – Preamble - Fundamental Rights and Duties - Directive Principles of State Policy.

Module-II	Union Government and its Administration Structure of the Indian Union	**9 Hrs**

Union Government and its Administration Structure of the Indian Union - Federalism – Centre State relationship – President's Role, power and position - PM and Council of ministers - Cabinet and Central Secretariat –Lok Sabha - Rajya Sabha - The Supreme Court and High Court - Powers and Functions

Module-III	**State Government and its Administration**	**10 Hrs**

State Government and its Administration - Governor - Role and Position -CM and Council of ministers - State Secretariat-Organization Structure and Functions.

Module-IV	**Local Administration**	**10 Hrs**

Local Administration - District's Administration Head - Role and Importance - Municipalities - Mayor and role of Elected Representatives -CEO of Municipal Corporation Pachayati Raj - Functions– PRI –Zilla Parishath - Elected officials and their roles – CEO,Zilla Parishath - Block level Organizational Hierarchy - (Different departments) - Village level - Role of Elected and Appointed officials - Importance of grass root democracy

Module-V	**Election Commission**	**9 Hrs**

Election Commission - Election Commission- Role of Chief Election Commissioner and Election Commissionerate - State Election Commission -Functions of Commissions for the welfare of SC/ST/OBC and Women

Course Outcomes (CO):

On completion of this course, student will be able to

- Understand historical background of the constitution making and its importance for building a democratic India.
- Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
- Understand the value of the fundamental rights and duties for becoming good citizen of India.
- Analyze the decentralization of power between central, state and local self-government
- Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy

Textbooks:
1. Durga Das Basu, "Introduction to the Constitution of India", Prentice – Hall of India Pvt. Ltd.. New Delhi
2. Subash Kashyap, "Indian Constitution", National Book Trust 3. R R Gaur, R Asthana, G P

Reference Books:
1. H.M.Sreevai, "Constitutional Law of India", 4th edition in 3 volumes
2. J.A. Siwach, "Dynamics of Indian Government & Politics"
3. M.V. Pylee, "Indian Constitution", Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
4. J.C. Johri, Indian Government and Politics Hans
5. M.V. Pylee, "Indian Constitution)

E-Resources:
1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture- details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution