

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI

(Autonomous)

Course structure for Four Year Regular B.Tech. Degree Program

(Effective for the batches admitted from 2020-21)

MECHANICAL ENGINEERING (ME)

INDUCTION PROGRAM (3 Weeks duration)

- ❖ Physical activity
- ❖ Creative Arts
- ❖ Universal Human Values
- ❖ Literary
- ❖ Proficiency Modules
- ❖ Lectures by Eminent People
- ❖ Visits to local Areas
- ❖ Familiarization to Dept./Branch & Innovations

Semester I (First year)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		C	CIE	SEE
1	Basic Science course	20ABS9901	Algebra and Calculus	3	0	0	3	30	70	100
2	Basic Science courses	20ABS9903	Engineering Physics	3	0	0	3	30	70	100
3	Engineering Science Courses	20AES0202	Basics of Electrical & Electronics Engineering	3	0	0	3	30	70	100
4	Engineering Science Courses	20AES0301	Engineering Graphics	1	0	4	3	30	70	100
5	Engineering Science Courses	20AES0501	Problem Solving and Programming	3	0	0	3	30	70	100
6	Engineering Science Courses (LAB)	20ABS9910	Engineering Physics Lab	0	0	3	1.5	30	70	100
7	Basic Science course (LAB)	20AES0204	Basics of Electrical & Electronics Engineering Lab	0	0	3	1.5	30	70	100
8	Engineering Science Courses (LAB)	20AES0503	Problem Solving and Programming Lab	0	0	3	1.5	30	70	100
Total credits							19.5	240	560	800

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Year : I

Semester : I

Branch of Study : Common to all

Subject Code	Subject Name	L	T	P	Credits
20ABS9901	Algebra & Calculus	3	0	0	3

Course Outcomes:

1. Develop the use of matrix algebra techniques that is needed by engineers for practical applications
2. Utilize mean value theorems to real life problems
3. Familiarize with functions of several variables which is useful in optimization
4. Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional coordinate systems
5. Students will become familiar with 3- dimensional coordinate systems and also learn the utilization of special functions

UNIT I

Matrix Operations and Solving Systems of Linear Equations: Rank of a matrix by echelon form, solving system of homogeneous and non-homogeneous equations linear equations. Eigen values and Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, diagonalization of a matrix, quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical forms by orthogonal transformation.

UNIT II

Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin's theorems with remainders (without proof);

UNIT III

Multivariable calculus: Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

UNIT IV

Double Integrals: Double integrals, change of order of integration, double integration in polar coordinates, areas enclosed by plane curves.

UNIT V

Multiple Integrals and Special Functions: Evaluation of triple integrals, change of variables between Cartesian, cylindrical and spherical polar co-ordinates, Beta and Gamma functions and their properties, relation between beta and gamma functions.

Textbooks:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.

References:

1. Dr. T. K. V Iyengar, B.Krishna Gandhi, S. Ranganatham and M.V.S.S.N Prasad, Mathematics-1, S.Chand publications.
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
3. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
4. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 201.

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List of COs	PO no. and keyword	Competency	Performance Indicator
CO 1	PO1: Engineering knowledge	1.1	1.1.1
CO 2	PO1: Engineering knowledge	1.1	1.1.1
CO 3	PO1: Engineering knowledge	1.1	1.1.1
CO 4	PO2 : Problem analysis	2.1	2.1.3
CO 5	PO2 : Problem analysis	2.1	2.1.3

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Year : I

Semester : I

Branch of Study : ME

Subject Code	Subject Name	L	T	P	Credits
20ABS9903	Engineering Physics	3	0	0	3

Course Outcomes:

1. Explain physics applied to solve engineering problems
2. Apply the principles of acoustics in designing of buildings
3. Explains the applications of ultrasonic in various engineering fields
4. Apply electromagnetic wave propagation in different Optical Fibers and the concepts of lasers in various applications.
5. Explains the concepts of dielectric and magnetic materials and Identify the sensors for various engineering applications

UNIT I

Mechanics: Basic laws of vectors and scalars – rotational frames-conservative forces- $F = -\text{grad}V$, torque and angular momentum-Newton's laws in inertial and linear accelerating non-inertial frames of reference-rotating frame of reference with constant angular velocity-qualitative explanation of Foucault's pendulum-rigid body-angular velocity vector-center of mass-gravitation and Kepler's Law (Qualitative).

UNIT II

Crystallography And Ultrasonics: Crystallography – Introduction – Space Lattice – Unit Cell – Lattice Parameters – Bravais Lattice – Crystal Systems – Packing Fractions of SC, BCC and FCC. X-Ray Diffraction – Bragg's Law – Powder Method.

Ultrasonics: Introduction, Properties and Production by magnetostriction & piezoelectric methods - acoustic grating-Non Destructive Testing-pulse echo system through transmission and reflection modes-A,B and C-scan displays, Medical applications.

UNIT III

Dielectric and Magnetic Materials: Dielectric polarizability, Susceptibility and Dielectric constant-Types of polarizations: Electronic, Ionic, Orientation Polarizations (Qualitative)-Frequency dependence of polarization-Lorentz (internal) field-Claussius-Mosotti equation-Applications of Dielectrics.

Introduction-Magnetic dipole moment – Magnetization – Magnetic susceptibility and permeability – Origin of permanent magnetic moment – Classification of Magnetic materials-Domain Concepts of ferromagnetism – Hysteresis – soft and hard magnetic materials-Magnetic device applications.

UNIT IV

Lasers and Fiber Optics: Introduction-Characteristics of Laser – Spontaneous and Stimulated emission of radiation-Einstein's coefficients-Population inversion-Pumping Mechanisms -He- Ne laser, Nd-YAG laser-Semiconductor laser-Applications of laser.

Introduction to Optical Fibers – Total Internal Reflection-Construction of optical fibers, Critical angle of propagation – Acceptance angle – Numerical Aperture-Classification of fibers based on Refractive index profile & modes – Propagation of electromagnetic wave through optical fiber-importance of V number-Block Diagram of Fiber optic Communication system-Medical Applications.

UNIT V

Nanomaterials: Introduction – Significance of nanoscale and types of nanomaterials – Physical properties, optical, thermal, mechanical and magnetic properties – Synthesis of nanomaterials by Top down and bottom up approaches, ball mill, chemical vapour deposition and sol-gel – Applications of nanomaterials.

Textbooks:

1. M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy". A Text book of Engineering Physics"- S.Chand Publications, 11th Edition 2019

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2. Shatendra Sharma, Jyotsna Sharma, “Engineering Physics”, Pearson Education, 2018

References:

1. K.Thyagarajan “Engineering Physics”,-Mc Graw Hill Publishing Company Ltd,2016
2. MKVarma “Introduction to Mechanics”-Universities Press-2015.
3. D.K. Bhattacharya and A.Bhaskaran,“Engineering Physics”-Oxford Publications-2015
4. IanRSinclair,Sensor andTransducers,3rd eds,2001,Elsevier(Newnes)

COs	PO no. and keyword	Competency	Performance Indicator
CO 1	PO1 : Engineering knowledge	1.2	1.2.1
CO 2	PO1 : Engineering knowledge	1.2	1.2.1
CO 3	PO1 : Engineering knowledge	1.2	1.2.1
CO 4	PO1 : Engineering knowledge	1.2	1.2.1
CO 5	PO1 : Engineering knowledge	1.2	1.2.1

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MECHANICAL ENGINEERING (ME)

Year: I

Semester : II

Branch of Study : ME

Subject Code	Subject Name	L	T	P	Credits
20AES0202	Basics of Electrical & Electronics Engineering	3	0	0	3

Course Outcomes: Students should be able to

CO 1: Apply concepts of KVL/KCL in solving DC circuits

CO 2: Illustrate working principles of induction motor - DC Motor

CO 3: Identify type of electrical machine based on their operation

CO 4: Describe operation and characteristics of diodes and transistors.

CO 5: Make use of diodes and transistors in simple, typical circuit applications.

CO 6: Understand operation of basic op-amp circuits.

PART-A (Electrical Engineering)

UNIT I

DC & AC Circuits: Electrical circuit elements (R - L and C) - Kirchoff laws - Series and parallel connection of resistances with DC excitation. Superposition Theorem - Representation of sinusoidal waveforms - peak and rms values - phasor representation - real power - reactive power - apparent power - power factor - Analysis of single-phase ac circuits consisting of RL - RC - RLC series circuits.

UNIT II

DC & AC Machines: Principle and operation of DC Generator - EMF equations - OCC characteristics of DC generator – principle and operation of DC Motor – Performance Characteristics of DC Motor - Speed control of DC Motor – Principle and operation of Single Phase Transformer - OC and SC test on transformer - principle and operation of Induction Motor [Elementary treatment only]

UNIT III

Basics of Power Systems: Layout & operation of Hydro, Thermal, Nuclear Stations - Solar & wind generating stations – Typical AC Power Supply scheme – Elements of Transmission line – Types of Distribution systems: Primary & Secondary distribution systems.

Text Books:

1. D. P. Kothari and I. J. Nagrath - "Basic Electrical Engineering" - Tata McGraw Hill - 2010.
2. V.K. Mehta & Rohit Mehta, "Principles of Power System" – S.Chand – 2018.

References:

1. L. S. Bobrow - "Fundamentals of Electrical Engineering" - Oxford University Press - 2011.
2. E. Hughes - "Electrical and Electronics Technology" - Pearson - 2010.
3. C.L. Wadhwa – "Generation Distribution and Utilization of Electrical Energy", 3rd Edition, New Age International Publications.

PART-B (Electronics Engineering)

UNIT I

Analog Electronics: Overview of Semiconductors, PN junction diode, Zener diode, Applications of diode as switch and rectifier, Zener diode as regulator, special purpose diodes: schottky diode, tunnel diode, varactor diode, photodiode, phototransistor and LED.

BJT construction, operation, configuration and characteristics, JFET and MOSFET construction, operation, characteristics (CS configuration), applications

Operational Amplifiers: Introduction, block diagram, basic op-amp circuits: Inverting, Non Inverting, summer, subtractor, voltage follower.

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UNIT II

Digital Electronics: Introduction, Switching and Logic Levels, Digital Waveform, characteristics of digital ICs, logic gates, number systems, combinational circuits - adders, multiplexers, decoders; introduction to sequential circuits, flip flops, shift register, binary counter.

UNIT III

Communication Systems: Introduction, Elements of Communication Systems, EM spectrum, basics of electronic communication, Amplitude and Frequency modulation, Pulse modulation, Communication receivers, Examples of communication systems: Microwave & Satellite, Fibre optic, Television, mobile communication (block diagram approach).

Text Books:

1. D.P. Kothari, I.J.Nagrath, Basic Electronics, 2nd edition, McGraw Hill Education(India)Private Limited
2. S.K. Bhattacharya, Basic Electrical and Electronics Engineering, 2nd edition, Pearson India Private Limited.

References:

1. R. Muthu subramanian, S. Salivahanan, “Basic Electrical and Electronics Engineering”, Tata McGraw-Hill Education, Reprint 2012.
2. David Bell, Electronic Devices and Circuits: Oxford University Press, 5th edition. 2008.

Note: This table also should be in portrait only

List of COs	PO no. and keyword	Competency	Performance Indicator
CO1	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO2	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO3	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO4	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO5	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO6	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1

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Year: I

Semester: I/II

Branch of Study: Common to all Branches

Subject Code	Subject Name	L	T	P	Credits
20AES0301	Engineering Graphics	1	0	4	3

Course Outcomes:

- CO: 1 Draw various curves applied in engineering.
 CO: 2 Show projections of solids and sections graphically.
 CO: 3 Draw the development of surfaces of solids.
 CO: 4 Use computers as a drafting tool.
 CO: 5 Draw isometric and orthographic.

Unit I: Introduction to Engineering graphics: Principles of Engineering Graphics and their significance- Conventions in drawing-lettering - BIS conventions.

- a) Conic sections including the rectangular hyperbola- general method only,
 b) Cycloid, epicycloids and hypocycloid

Unit II: Projection of points, lines: Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line, traces.

Unit III: Projections of Planes: Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line. Projections of regular plane surfaces.

Projections of Solids: Projections of regular solids inclined to one or both planes by rotational or auxiliary views method.

Unit IV: Sections of solids: Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone. True shapes of the sections.

Development of surfaces: Development of surfaces of right regular solids-prism, cylinder, pyramid, cone and their sectional parts.

Unit V: Orthographic Projections: Systems of projections, conventions and application to orthographic projections.

Isometric Projections: Principles of isometric projection- Isometric scale; Isometric views: lines, planes, figures, simple and compound solids.

Text Books and Reference Books:

1. K.L.Narayana & P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers
2. N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers
3. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill
4. Shah and Rana, Engineering Drawing, 2/e, Pearson Education
5. Basant Agarwal & C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill

Additional Sources

YouTube: [http://sewor,Carleton.ca,kardos/88403/drawings.html](http://sewor.Carleton.ca/kardos/88403/drawings.html) conic sections-online, red woods.edu

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CO: 1	PO 1: Engineering knowledge	1.3	1.3.1
CO: 2	PO 3: Design/Development of Solutions	3.2	3.2.1
CO: 3	PO 1: Engineering knowledge	1.3	1.3.1
CO: 4	PO 3: Design/Development of Solutions	3.2	3.2.2
CO: 5	PO 5: Problem analysis	5.1	5.1.1

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Year : I

Semester : I

Branch of Study : Common to All

Subject Code	Subject Name	L	T	P	Credits
20AES0501	Problem Solving and Programming	3	0	0	3

Course outcomes: Student should be able to

1. Create interactive visual programs using Scratch.
2. Develop flowcharts using raptor to solve the given problems.
3. Develop Python programs for numerical and text based problems
4. Develop graphics and event based programming using Python
5. Develop Python programs using beautiful Pythonic idiomatic practices

UNIT I

Visual Programming through Scratch and App Inventor: Introduction to programming concepts with scratch, Scratch environment, sprites looks and motion, Angles and directions, repetition and variation, changing costumes, adding background, Input/Output, variables and operators. Working with sounds and sprite communication and creating stories, App Generation.

UNIT II

Flowchart design through Raptor: Flow chart symbols, Input/Output, Assignment, operators, conditional if, repetition, function and sub charts. Example problems(section 1) – Finding maximum of 3 numbers, Unit converters, Interest calculators, multiplication tables, GCD of 2 numbers

Example problems (section 2) - Fibonacci generation, prime number generation. Minimum, Maximum and average of n numbers, Linear search, Binary Search.

UNIT III

Introduction to Python: Python – Numbers, Strings, Variables, operators, expressions, statements, String operations, Math function calls, Input / Output statements, Conditional If, while and for loops, User defined Functions, parameters to functions, recursive functions, Turtle Graphics.

UNIT IV

Data Structures and Idiomatic Programming in Python: Lists, Tuples, Dictionaries, Strings, Files and their libraries. Beautiful Idiomatic approach to solve programming problems.

UNIT V

Event driven Programming: Turtle Bar Chart, Event Driven programming. Key press events, Mouse events, timer events.

Text Books:

<https://www.cse.msu.edu/~stockman/ITEC/Scratch/BGC2011Scratch-Rev1.pdf>

<https://nostarch.com/scratchplayground>

<http://fusecontent.education.vic.gov.au/9f79537a-66fc-4070-a5ce>

<e3aa315888a1/scratchreferenceguide14.pdf>

<https://raptor.martincarlisle.com/>

<http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf>

https://zhanxw.com/blog/wp-content/uploads/2013/03/BeautifulCode_2.pdf

<http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf>

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List of COs	PO no. and keyword	Competency	Performance Indicator
CO1	PO3: Design/Development of Solutions	3.1	3.1.4
CO2	PO3: Design/Development of Solutions	3.1	3.1.4
CO3	PO2: Problem analysis	2.2	2.2.2
CO4	PO2: Problem analysis	2.2	2.2.2
	PO3: Design/Development of Solutions	3.1	3.1.4
CO5	PO3: Design/Development of Solutions	3.1	3.1.4

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MECHANICAL ENGINEERING (ME)

Year: I

Semester : II

Branch of Study : ME

Subject Code	Subject Name	L	T	P	Credits
20ABS9910	Engineering Physics Lab	0	0	3	1.5

Course Outcomes:

1. Operate various optical instruments and Estimate wavelength of laser and particles size using laser.
2. Estimate the susceptibility and related magnetic parameters of magnetic materials and plot the intensity of the magnetic field of circular coil carrying current with distance.
3. Evaluate the acceptance angle of an optical fiber and numerical aperture and determine magnetic susceptibility of the material and its losses by B-H curve.
4. Identify the type of semiconductor i.e., n-type or p-type using Hall effect.
5. Apply the concepts of sensors for various applications.

List of Experiments

1. Determination of wavelength of LASER light using diffraction grating.
2. Determination of particle size using LASER.
3. Determination of spring constant of springs using Coupled Oscillator.
4. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.
5. Determination of Dielectric constant of dielectric material using charging and discharging of capacitor.
6. Magnetic field along the axis of a circular coil carrying current.
7. Rigidity modulus of material of a wire-dynamic method (Torsional pendulum)
8. Study the variation of B versus H by magnetizing the magnetic material (B-H curve)
9. To determine the numerical aperture of a given optical fiber and hence to find its acceptance angle
10. Measurement of magnetic susceptibility by Gouy's method
11. Determination of ultrasonic velocity in liquid (Acoustic grating)
12. Determination of pressure variation using Strain Guage sensor
13. Determination of temperature change using Strain Guage sensor.
14. Determination of pressure variations using optical fiber sensors.
15. Determination of temperature changes using optical fiber sensors.

References:

1. S. Balasubramanian, M.N.Srinivasan, "A Text book of Practical Physics"-S Chand Publishers, 2017.
2. <http://vlab.amrita.edu/index.php-VirtualLabs>, Amrita University.

List of COs	PO no. and keyword	Competency	Performance Indicator
CO 1	PO 4: Conduct Investigations of complex problems	4.3	4.3.3
CO 2	PO 4: Conduct Investigations of complex problems	4.3	4.3.1
CO 3	PO 4: Conduct Investigations of complex problems	4.3	4.3.1
CO 4	PO 4: Conduct Investigations of complex problems	4.3	4.3.2
CO 5	PO 4: Conduct Investigations of complex problems	4.3	4.3.2

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Year: I

Semester: II

Branch of Study: CE,ME &CSE

Subject Code	Subject Name	L	T	P	Credits
20AES0204	Basics of Electrical & Electronics Engineering Lab	0	0	3	1.5

Course Objectives:
Students should be

able to

CO1: Verify Kirchoff's Laws & Superposition theorem for dc supply

CO2: Analyze the performance of AC and DC Machines by testing.

CO3: Study I – V Characteristics of PV Cell & Perform speed control of dc shunt motor

CO4: Ability to operate diodes for finding V-I Characteristics.

CO5: Ability to construct and operate rectifiers without & with filters

CO6: Ability to construct and operate BJT & FET Characteristics.

List of Experiments:**PART-A**

1. Verification of Kirchoff laws.
2. Verification of Superposition Theorem.
3. Open circuit characteristics of a DC Shunt Generator.
4. Speed control of DC Shunt Motor.
5. OC & SC test of 1 – Phase Transformer.
6. Brake test on 3 - Phase Induction Motor.
7. Brake test on DC Shunt Motor

PART-B

1. PN Junction Diode Characteristics.
2. Zener Diode Characteristics.
3. Rectifiers (With and Without Filter).
4. BJT Characteristics (CB Configuration).
5. BJT Characteristics (CE Configuration).
6. FET Characteristics (CS Configuration).

CO	PO	CI	PI
CO1	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO2	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO3	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO4	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1
CO5	PO1	1.3	1.3.1
	PO2	2.3	2.3.1
	PO3	3.3	3.3.1

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Semester : I

Branch of Study : Common to all

Subject Code	Subject Name	L	T	P	Credits
20AES0503	Problem Solving and Programming Lab	0	0	3	1.5

Course outcomes: Student should be able to

1. Create interactive visual programs using Scratch.
 2. Develop flowcharts using raptor to solve the given problems.
 3. Develop Python programs for numerical and text-based problems
 4. Develop graphics and event-based programming using Python
 5. Develop Python programs using beautiful Pythonic idiomatic practices
1. Design a script in Scratch to make a sprite to draw geometrical shapes such as Circle, Triangle, Square, Pentagon.
 2. Design a script in Scratch to make a sprite to ask the user to enter two different numbers and an arithmetic operator and then calculate and display the result.
 3. Design a Memory Game in Scratch which allows the user to identify positions of similar objects in a 3 x 3 matrix.
 4. Construct flowcharts to
 - a. calculate the maximum, minimum and average of N numbers
 - b. develop a calculator to convert time, distance, area, volume and temperature from one unit to another.
 5. Construct flowcharts with separate procedures to
 - a. calculate simple and compound interest for various parameters specified by the user
 - b. calculate the greatest common divisor using iteration and recursion for two numbers as specified by the user
 6. Construct flowcharts with procedures to
 - a. generate first N numbers in the Fibonacci series
 - b. generate N Prime numbers
 7. Design a flowchart to perform Linear search on list of N unsorted numbers(Iterative and recursive)
 8. Design a flowchart to perform Binary search on list of N sorted numbers(Iterative and recursive)
 9. Design a flowchart to determine the number of characters and lines in a text file specified by the user
 10. Design a Python script to convert a Binary number to Decimal number and verify if it is a Perfect number.
 11. Design a Python script to determine if a given string is a Palindrome using recursion
 12. Design a Python script to sort numbers specified in a text file using lists.
 13. Design a Python script to determine the difference in date for given two dates in YYYY:MM:DD format($0 \leq YYYY \leq 9999, 1 \leq MM \leq 12, 1 \leq DD \leq 31$) following the leap year rules.
 14. Design a Python Script to determine the Square Root of a given number without using inbuilt functions in Python.
 15. Design a Python Script to determine the time difference between two given times in HH:MM:SS format.($0 \leq HH \leq 23, 0 \leq MM \leq 59, 0 \leq SS \leq 59$)
 16. Design a Python Script to find the value of (Sine, Cosine, Log, PI, e) of a given number using infinite series of the function.
 17. Design a Python Script to convert a given number to words
 18. Design a Python Script to convert a given number to roman number.
 19. Design a Python Script to generate the frequency count of words in a text file.
 20. Design a Python Script to print a spiral pattern for a 2-dimensional matrix.
 21. Design a Python Script to implement Gaussian Elimination method.
 22. Design a Python script to generate statistical reports (Minimum, Maximum, Count, Average, Sum etc.) on public datasets.
 23. Design a Python script using the Turtle graphics library to construct a turtle bar chart representing the grades obtained by N students read from a file categorising them into distinction, first class, second class, third class and failed.

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(Autonomous)

Course structure for Four Year Regular B.Tech. Degree Program

(Effective for the batches admitted from 2020-21)

MECHANICAL ENGINEERING (ME)

Text Book:<http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf>

List of COs	PO no. and keyword	Competency	Performance Indicator
CO1	PO3: Design/Development of Solutions	3.1	3.1.4
CO2	PO3: Design/Development of Solutions	3.1	3.1.4
CO3	PO2: Problem analysis	2.2	2.2.2
CO4	PO2: Problem analysis	2.2	2.2.2
	PO3: Design/Development of Solutions	3.1	3.1.4
CO5	PO3: Design/Development of Solutions	3.1	3.1.4