St. Martin's Engineering College

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DEPARTMENT OF MECHANICAL ENGINEERING

I YEAR I SEMESTER

S. No.	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1.	MA101BS	Matrices and Calculus	3	1	0	4	40	60	100
2.	AP102BS	Applied Physics	3	1	0	4	40	60	100
3.	CS104ES	C Programming and Data structures	3	0	0	3	40	60	100
4.	ME107ES	Engineering Workshop	0	1	3	2.5	40	60	100
5.	EN104HS	English for Skill Enhancement	2	0	0	2	40	60	100
6.	ME109ES	Elements of Mechanical Engineering	0	0	2	1	50	-	50
7.	AP103BS	Applied Physics Laboratory	0	0	3	1.5	40	60	100
8.	EN105HS	English Language and Communication Skills Laboratory	0	0	2	1	40	60	100
9.	CS103ES	C Programming and Data Structures Laboratory	0	0	2	1	40	60	100
		Induction Programme	-	-	-	-	-	-	-
		Total	11	3	12	20	370	480	850
10.	*CH109MC	Environmental Science	3	0	0	0	100	0	100

I YEAR II SEMESTER

S. No.	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1	MA201BS	Ordinary Differential Equations and Vector Calculus	3	1	0	4	40	60	100
2	CH202BS	Engineering Chemistry	3	1	0	4	40	60	100
3	ME208ES	Computer Aided Engineering Graphics	1	0	4	3	40	60	100
4	ME209ES	Engineering Mechanics	3	0	0	3	40	60	100

5	ME210PC	Engineering Materials	2	0	0	2	40	60	100
6	CS205ES	Python Programming Laboratory	0	1	2	2	40	60	100
7	CH204BS	Engineering Chemistry Laboratory	0	0	2	1	40	60	100
8	ME211PC	Fuels & Lubricants Laboratory	0	0	2	1	40	60	100
		Total	**12**	**3**	**10**	**20**	**320**	**480**	**800**

DEPARTMENT OF MECHANICAL ENGINEERING

II YEAR I SEMESTER

S. No.	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1.	PS301BS	Probability, Statistics & Complex Variables	3	1	0	4	40	60	100
2.	ME302PC	Mechanics of Solids	3	0	0	3	40	60	100
3.	ME303PC	Metallurgy & Material Science	3	0	0	3	40	60	100
4.	ME304PC	Production Technology	3	0	0	3	40	60	100
5.	ME305PC	Thermodynamics	3	1	0	4	40	60	100
6.	ME306PC	Production Technology Laboratory	0	0	2	1	40	60	100
7.	ME307PC	Material Science & Mechanics of Solids Laboratory	0	0	2	1	40	60	100
8.	ME308PC	Computer Aided Machine Drawing	0	0	2	1	40	60	100
		Total	15	2	6	20	320	480	800
9.	*CI309MC	Constitution of India	3	0	0	0	100	0	100

II YEAR II SEMESTER

S. No.	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1	EE411PC	Basic Electrical and Electronics Engineering	3	0	0	3	40	60	100
2	ME402PC	Kinematics of Machinery	3	0	0	3	40	60	100
3	ME403PC	Fluid Mechanics & Hydraulic Machines	3	0	0	3	40	60	100
4	ME404PC	IC Engines & Gas Turbines	3	0	0	3	40	60	100
5	ME405PC	Instrumentation and Control Systems	3	0	0	3	40	60	100

6	EE412PC	Basic Electrical and Electronics Engineering Laboratory	0	0	2	1	40	60	100
7	ME407PC	Fluid Mechanics & Hydraulic Machines Laboratory	0	0	2	1	40	60	100
8	ME408PC	Instrumentation and Control Systems Laboratory	0	0	2	1	40	60	100
9	ME409PC	Real-time Research Project/Field-Based Project	0	0	4	2	50	-	50
Total			**15**	**0**	**10**	**20**	**370**	**480**	**850**
10.	*GS409MC	Gender Sensitization Laboratory	0	0	2	0	100	0	100

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DEPARTMENT OF MECHANICAL ENGINEERING

MATRICES AND CALCULUS

I B. TECH- I SEMESTER (R -22)								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
MA101BS	**B. Tech**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**1**	**0**	**4**	**40**	**60**	**100**

COURSE OBJECTIVES

To learn

1. Types of matrices and their properties.
2. Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
3. Concept of eigen values and eigen vectors and to reduce the quadratic form to canonical form
4. Geometrical approach to the mean value theorems and their application to the mathematical problems
5. Evaluation of surface areas and volumes of revolutions of curves.
6. Evaluation of improper integrals using Beta and Gamma functions.
7. Partial differentiation, concept of total derivative
8. Finding maxima and minima of function of two and three variables.
9. Evaluation of multiple integrals and their applications

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Write the matrix representation of a set of linear equations and to analyze the solution of the system of equations.
2. Find the Eigen values and Eigen vectors
3. Reduce the quadratic form to canonical form using orthogonal transformations.
4. Solve the applications on the mean value theorems.
5. Evaluate the improper integrals using Beta and Gamma functions
6. Find the extreme values of functions of two variables with/without constraints.
7. Evaluate the multiple integrals and apply the concept to find areas, volumes.

UNIT-I	MATRICES	Classes: 10

Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss- Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Gauss Seidel Iteration Method.

UNIT-II	EIGEN VALUES AND EIGEN VECTORS	Classes:10

Linear Transformation and Orthogonal Transformation: Eigen values, Eigen vectors and their properties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

UNIT-III	CALCULUS	Classes:10

Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem, Taylor's Series.

Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates), Definition of Improper Integral: Beta and Gamma functions and their applications.

UNIT-IV	MULTIVARIABLE CALCULUS (PARTIAL DIFFERENTIATION AND APPLICATIONS)	Classes: 10

Definitions of Limit and continuity. Partial Differentiation; Euler's Theorem, Total derivative, Jacobian, Functional dependence & independence. Applications: Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

UNIT-V	MULTIVARIABLE CALCULUS (INTEGRATION)	Classes: 10

Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form), Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.

Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals).

TEXT BOOKS

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Editon, 2016.

REFERENCE BOOKS

1. Dr. D. Ranadheer Reddy, Mr. K Upender Reddy & Mr. G Chandra Mohan, A First Course in Linear Algebra and Calculus for Engineers, M/s Students Helpline Publishing House Pvt. Ltd, First Edition-2020.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint,2002.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications,Reprint, 2008.
5. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and CompanyLimited, New Delhi.

WEB REFERENCES
1. https://www.efunda.com/math/gamma/index.cfm
2. https://mathworld.wolfram.com/CanonicalForm.html
3. https://mathworld.wolfram.com/Binomial.html
4. https://www.mathworld.wolfram.com/

E -TEXT BOOKS
1. https://www.e-booksdirectory.com/listing.php?category=4
2. https://www.e-booksdirectory.com/details.php?ebook=10830

MOOCS COURSE
1. https://onlinecourses.nptel.ac.in/noc22_ma75/preview
2. https://onlinecourses.swayam2.ac.in/cec20_ma22/preview

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DEPARTMENT OF MECHANICAL ENGINEERING

APPLIED PHYSICS

I B. TECH- I SEMESTER (R 22)

Course Code	Category	Hours / Week			Credits	MaximumMarks		
		L	T	P	C	CIE	SEE	Total
AP102BS	B. Tech	3	1	0	4	40	60	100

COURSE OBJECTIVES

To learn

1. Understand the basic principles of quantum physics and band theory of solids.
2. Understand the underlying mechanism involved in construction and working principles of various semiconductor devices.
3. Study the fundamental concepts related to the dielectric, magnetic and energy materials.
4. Identify the importance of nanoscale, quantum confinement and various fabrication techniques.
5. Study the characteristics of lasers and optical fibres.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to

1. Understand physical world from fundamental point of view by the concepts of Quantum mechanics and visualize the difference between conductor, semiconductor and an insulator by classification of solids.
2. Identify the role of semiconductor devices in science and engineering Applications.
3. Explore the fundamental properties of dielectric, magnetic materials and energy for their applications.
4. Appreciate the features and applications of Nanomaterials.
5. Understand various aspects of Lasers and Optical fiber and their applications in diverse fields.

UNIT-I	QUANTUM PHYSICS AND SOLIDS	Classes:12

Quantum Mechanics: Introduction to quantum physics, blackbody radiation – Stefan-Boltzmann's law, Wein's and Rayleigh-Jean's law, Planck's radiation law - photoelectric effect - Davisson and Germer experiment –Heisenberg uncertainty principle - Born interpretation of the wave function – time independent Schrodinger wave equation - particle in one dimensional potential box.

Solids: Symmetry in solids, free electron theory (Drude & Lorentz, Sommerfeld) - Fermi-Dirac distribution - Bloch's theorem -Kronig-Penney model – E-K diagram- effective mass of electron-origin of energy bands- classification of solids.

UNIT-II	SEMICONDUCTORS AND DEVICES	Classes: 12

Intrinsic and extrinsic semiconductors – Hall effect - direct and indirect band gap semiconductors - construction, principle of operation and characteristics of P-N Junction diode, Zener diode and bipolar junction transistor (BJT)–LED, PIN diode, avalanche photo diode (APD) and solar cells, their structure, materials, working principle and characteristics.

UNIT-III	DIELECTRIC, MAGNETIC AND ENERGY MATERIALS	Classes:12

Dielectric Materials: Basic definitions- types of polarizations (qualitative) - ferroelectric, piezoelectric and pyroelectric materials – applications – liquid crystal displays (LCD) and crystal oscillators.

Magnetic Materials: Hysteresis-soft and hard magnetic materials-magneto strict ion, magneto resistance - applications - bubble memory devices, magnetic field sensors and multiferroics. Energy Materials: Conductivity of liquid and solid electrolytes- superionic conductors - materials and electrolytes for super capacitors - rechargeable ion batteries, solid fuel cells.

UNIT-IV	NANOTECHNOLOGY	Classes:12

Nanoscale, quantum confinement, surface to volume ratio, bottom-up fabrication: sol-gel, precipitation, combustion methods – top-down fabrication: ball milling - physical vapor deposition (PVD) - Chemical vapor deposition (CVD) - characterization techniques - XRD, SEM & TEM - applications of nanomaterials.

UNIT-V	LASER AND FIBER OPTICS	Classes:12

Lasers: Laser beam characteristics-three quantum processes- Einstein coefficients and their relations- lasing action - pumping methods- Ruby laser, He-Ne laser , CO_2 laser, Argon ion Laser, Nd: YAG laser- semiconductor laser-applications of laser.

Fiber Optics: Introduction to optical fiber- advantages of optical Fibers - total internal reflection- construction of optical fiber - acceptance angle - numerical aperture- classification of optical fibers- losses in optical fiber - optical fiber for communication system - applications.

TEXT BOOKS

1. M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy" A Text book of Engineering Physics"- S. Chand Publications, 11th Edition 2019.
2. Engineering Physics by Shatendra Sharma and Jyotsna Sharma, Pearson Publication,2019
3. Semiconductor Physics and Devices- Basic Principle – Donald A, Neamen, Mc Graw Hill, 4th Edition,2021.
4. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2nd Edition, 2022.
5. Essentials of Nanoscience & Nanotechnology by Narasimha Reddy Katta, Typical Creatives Nano Digest, 1st Edition, 2021.

REFERENCE BOOKS

1. Quantum Physics, H.C. Verma, TBS Publication, 2nd Edition 2012.
2. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley & Sons, 11th Edition, 2018.
3. Introduction to Solid State Physics, Charles Kittel, Wiley Eastern, 2019.
4. Elementary Solid State Physics, S.L. Gupta and V. Kumar, Pragathi Prakashan, 2019.
5. A.K. Bhandhopadhya - Nano Materials, New Age International, 1^{st}Edition, 2007.
6. Energy Materials a Short Introduction to Functional Materials for Energy Conversion and Storage Aliaksandr S. Bandarenka, CRC Press Taylor & Francis Group
7. Energy Materials, Taylor & Francis Group, 1st Edition, 2022.

WEB REFERENCES

1. https://ocw.tudelft.nl/courses/solid-state-physics/subjects/3-quantum-theory-of-solids/
2. https://byjus.com/physics/semiconductor-devices/
3. https://www.nano.gov/nanotech-101/what/definition
4. https://www.studocu.com/in/document/delhi-technological-university/engineering-physics/fiber-optics-laser-notes/26618092

E -TEXT BOOKS

1. https://www.pdfdrive.com/physics-for-scientists-engineers-modern-physics-9th-ed-e51722698.html
2. https://www.pdfdrive.com/physics-for-scientists-engineers-modern-physics-9th-ed-e43567270.html

MOOCS COURSE

1. Swayam: https://swayam.gov.in/nd1_noc19_ph13/preview
2. Alison: https://alison.com/courses?&category=physics

DEPARTMENT OF MECHANICAL ENGINEERING

C PROGRAMMING AND DATA STRUCTURES

I B. TECH- I SEMESTER (R 22)

Course Code	Programme	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS104ES	B. Tech	3	0	0	3	40	60	100

COURSEOBJECTIVES

To learn

Introduce the importance of programming, C language constructs, program development, data structures, searching and sorting.

COURSEOUTCOMES

Upon successful completion of the course, the student is able to

1. Understand the various steps in Program development.
2. Explore the basic concepts in C Programming Language.
3. Develop modular and readable C Programs
4. Understand the basic concepts such as Abstract Data Types, Linear and Non-Linear Datastructures.
5. Apply data structures such as stacks, queues in problem solving
6. To understand and analyze various searching and sorting algorithms.

UNIT-I	INTRODUCTION TO COMPUTERS	Classes:12

Introduction to Computers – Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Software Development

Introduction to C Language – Background, Simple C programs, Identifiers, Basic data types, Variables, Constants, Input / Output

Structure of a C Program – Operators, Bit-wise operators, Expressions, Precedence and Associatively, Expression Evaluation, Type conversions, Statements.

UNIT-II	STATEMENTS, DESIGNING STRUCTURED PROGRAMS, ARRAYS	Classes:12

Statements – if and switch statements, Repetition statements – while, for, do-while statements, Loopexamples, other statements related to looping – break, continue, go to, Recursion.

Designing Structured Programs- Functions, basics, user defined functions, inter function communication, standard functions.

Arrays – Concepts, using arrays in C, inter function communication, array applications, two –dimensional arrays, multidimensional arrays.

UNIT-III	POINTERS, POINTER APPLICATIONS	Classes:12

Pointers – Introduction, Pointers for inter function communication, pointers to pointers, compatibility,

Pointer Applications – Passing an array to a function, Memory allocation functions, array of

pointers Strings – Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions, string / data conversion.

UNIT-IV	DERIVED TYPES	Classes:12

Derived types – The Typedef, enumerated types, Structures – Declaration, definition and initialization of structures, accessing structures, operations on structures, complex structures. Unions – Referencing unions, initializers, unions and structures.

Input and Output – Text vs Binary streams, standard library functions for files, converting file types, File programs – copy, merge files.

UNIT-V	SORTING, SORTING AND DATA STRUCTURES	Classes:12

Sorting- selection sort, bubble sort, insertion sort,

Searching-linear and binary search methods.

Data Structures – Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack applications, Queues-operations, array and linked representations.

TEXTBOOKS

1. C Programming & Data Structures, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
2. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, Fifth Edition, Pearson Education.
3. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI/PearsonEducation

REFERENCEBOOKS

1. C & Data structures – P. Padmanabham, 3rd Edition, B.S. Publications.
2. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press
3. Programming in C – Stephen G. Kochan, III Edition, Pearson Education.
4. C for Engineers and Scientists, H. Cheng, McGraw-Hill International Edition
5. Data Structures using C – A. M. Tanenbaum, Y. Langsam, and M.J. Augenstein, Pearson Education / PHI
6. C Programming & Data Structures, E. Balagurusamy, TMH.
7. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press
8. C & Data structures – E V Prasad and N B Venkateswarlu, S. Chand & Co.

WEB REFERENCES

1. https://www.tutorialspoint.com/cprogramming/
2. https://www.tutorialspoint.com/cplusplus/
3. https://www.cprogramming.com/tutorial/c-tutorial.html

E –TEXT BOOKS

1. https://www.amazon.com/Problem-Solving-Program-Design-7th/dp/0132936496
2. https://www.goodreads.com/book/show/36011306-c-programming-data-structures-for-jntu-with-cd

MOOCS COURSE

1. nptel.ac.in/courses/106105085/4
2. https://www.quora.com/Are-IIT-NPTEL-videos-good-to-learn-basic-C-programming

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DEPARTMENT OF MECHANICAL ENGINEERING

ENGINEERING WORKSHOP

I B. TECH- I SEMESTER (R 22)								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
ME107ES	**B. Tech**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		0	**1**	**3**	**2.5**	**40**	**60**	**100**

COURSE OBJECTIVES

To learn
1. To Study of different hand operated power tools, uses and their demonstration.
2. To gain a good basic working knowledge required for the production of various engineering products.
3. To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
4. To develop a right attitude, team working, precision and safety at work place.
5. It explains the construction, function, use and application of different working tools, equipment and machines.
6. To study commonly used carpentry joints.
7. To have practical exposure to various welding and joining processes.
8. Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.

COURSE OUTCOMES
1. Study and practice on machine tools and their operations
2. Practice on manufacturing of components using workshop trades including pluming, fitting, carpentry, and foundry, house wiring and welding.
3. Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling.
4. Apply basic electrical engineering knowledge for house wiring practice.

LIST OF EXPERIMENTS

1. TRADES FOR EXERCISES:

At least two exercises from each trade:
  I. Carpentry – (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)
 II. Fitting – (V-Fit, Dovetail Fit & Semi-circular fit)
III. Tin-Smithy – (Square Tin, Rectangular Tray & Conical Funnel)
 IV. Foundry – (Preparation of Green Sand Mould using Single Piece and Split Pattern)
  V. Welding Practice – (Arc Welding & Gas Welding)
 VI. House-wiring – (Parallel & Series, Two-way Switch and Tube Light)
VII. Black Smithy – (Round to Square, Fan Hook and S-Hook

2. TRADES FOR DEMONSTRATION & EXPOSURE

Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools in construction and Wood Working.

TEXT BOOKS

1. Workshop Practice /B. L. Juneja / Cengage
2. Workshop Manual / K. Venugopal / Anuradha.

REFERENCE BOOKS

1. Work shop Manual - P. Kannaiah/ K.L. Narayana/ Scitech
2. Workshop Manual / Venkat Reddy/ BSP

WEB REFERENCES

1. https://nptel.ac.in/courses/112105126/
2. https://nptel.ac.in/downloads/112105127/
3. https://nptel.ac.in/courses/112107145/
4. https://nptel.ac.in/courses/122104015/

E -TEXT BOOKS

1. http://103.135.169.82:81/fdScript/RootOfEBooks/MED/Introduction Workshop%20Technology
2. https://www.quora.com/Download-free-mechanical-engineering-ebooks-sites

MOOCS COURSE

1. http://www.nits.ac.in/workshops/Workshop_on_MOOCS_26082017.pdf
2. https://www.nitttrc.ac.in/swayam/index.html

DEPARTMENT OF MECHANICAL ENGINEERING

ENGLISH FOR SKILL ENHANCEMENT

I B. TECH- II SEMESTER (R 22)								
Course Code	**Programme**	**Hours / Week**			**Credits**	**Maximum Marks**		
EN204HS	**B.Tech**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		2	**0**	**0**	**2**	**40**	**60**	**100**

COURSE OBJECTIVES

To learn

1. Improve the language proficiency of students in English with an emphasis on Vocabulary,Grammar, Reading and Writing skills.
2. Develop study skills and communication skills in various professional situations.
3. Equip students to study engineering subjects more effectively and critically using the theoreticaland practical components of the syllabus.

COURSE OUTCOMES

1. Understand the importance of vocabulary and sentence structures.
2. Choose appropriate vocabulary and sentence structures for their oral and written communication.
3. Demonstrate their understanding of the rules of functional grammar.
4. Develop comprehension skills from the known and unknown passages.
5. Take an active part in drafting paragraphs, letters, essays, abstracts, précis and reports in various contexts.
6. Acquire basic proficiency in reading and writing modules of English.

UNIT-I	Chapter entitled '*Toasted English*' by R.K.Narayan from *"English: Language, Context andCulture"* published by Orient BlackSwan, Hyderabad.	**Classes: 10**

Vocabulary: The Concept of Word Formation -The Use of Prefixes and Suffixes - Acquaintance with Prefixes and Suffixes from Foreign Languages to form Derivatives - Synonyms and Antonyms

Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions.

Reading: Reading and Its Importance- Techniques for Effective Reading.

Writing: Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of ProperPunctuation- Techniques for Writing precisely – Paragraph Writing – Types, Structures and Features of a Paragraph - Creating Coherence- Organizing Principles of Paragraphs in Documents.

UNIT-II	Chapter entitled **'Appro JRD'** by **Sudha Murthy** from *"English: Language, Context and Culture" published* by Orient BlackSwan, Hyderabad.	**Classes:10**

Vocabulary: Words Often Misspelt - Homophones, Homonyms and Homographs

Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement andSubject-verb Agreement.

Reading: Sub-Skills of Reading – Skimming and Scanning – Exercises for Practice

Writing: Nature and Style of Writing- Defining /Describing People, Objects, Places and Events – Classifying- Providing Examples or Evidence.

UNIT-III	Chapter entitled **'Lessons from Online Learning' by F.Haider Alvi, Deborah Hurst et al** from *"English: Language, Context and Culture"* published by Orient BlackSwan, Hyderabad.	**Classes:10**

Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

Reading: Sub-Skills of Reading – Intensive Reading and Extensive Reading – Exercises for Practice.

Writing: Format of a Formal Letter-Writing Formal Letters eg., Letter of Complaint, Letter of Requisition, Email Etiquette, Job Application with CV/Resume.

UNIT-IV	Chapter entitled **'Art and Literature' by Abdul Kalam** from *"English: Language, Context and Culture"* published by Orient BlackSwan, Hyderabad.	**Classes: 10**

Vocabulary: Standard Abbreviations in English

Grammar: Redundancies and Clichés in Oral and Written Communication.

Reading: Survey, Question, Read, Recite and Review (SQ3R Method) - Exercises for Practice

Writing: Writing Practices- Essay Writing-Writing Introduction and Conclusion -Précis Writing.

UNIT-V	Chapter entitled **'Go, Kiss the World' by Subroto Bagchi** from *"English: Language, Context and Culture"* published by Orient BlackSwan, Hyderabad.	**Classes: 10**

Vocabulary: Technical Vocabulary and their Usage

Grammar: Common Errors in English (*Covering all the other aspects of grammar which were notcovered in the previous units*)

Reading: Reading Comprehension-Exercises for Practice

Writing: Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

Note: *Listening and Speaking Skills which are given under Unit-6 in AICTE Model Curriculum are coveredin the syllabus of ELCS Lab Course.*

 ➢ **Note: 1**. As the syllabus of English given in AICTE *Model Curriculum-2018 for B.Tech First Year is **Open-ended**,* besides following the prescribed textbook, it is required to prepare teaching/learning materials **by the teachers collectively** in the form of handouts based on theneeds of the students in their respective colleges for effective teaching/learning in the class.

 ➢ **Note**: **2**. Based on the recommendations of NEP2020, teachers are requested to be flexible to adopt Blended Learning in dealing with the course contents. They are advised to teach 40 percent of each topic from the syllabus in blended mode.

TEXT BOOKS

1. "English: Language, Context and Culture" by Orient BlackSwan Pvt. Ltd, Hyderabad. 2022. Print.

REFERENCE BOOKS

1. Effective Academic Writing by Liss and Davis (OUP)
2. Richards, Jack C. (2022) Interchange Series. Introduction, 1,2,3. Cambridge University Press
3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
4. Chaudhuri, Santanu Sinha. (2018). Learn English: A Fun Book of Functional Language,Grammar and Vocabulary. (2nd ed.,). Sage Publications India Pvt. Ltd.
5. (2019). Technical Communication. Wiley India Pvt. Ltd.
6. Vishwamohan, Aysha. (2013). English for Technical Communication for Engineering Students.Mc Graw-Hill Education India Pvt. Ltd.
7. Swan, Michael. (2016). Practical English Usage. Oxford University Press. Fourth Edition.

WEB REFERENCES

1. www.edufind.com
2. www.myenglishpages.com
3. http://grammar.ccc.comment.edu
4. http://owl.english.prudue.edu

E -TEXT BOOKS

1. http://bookboon.com/en/communication-ebooks-zip
2. http://learningenglishvocabularygrammar.com/files/idiomsandphraseswith meanin gsandexamlespdf.pdf

MOOCS Course

1. https://mooec.com/courses/grammar-guru-1
2. https://mooec.com/courses/learning-styles

DEPARTMENT OF MECHANICAL ENGINEERING

ELEMENTS OF MECHANICAL ENGINEERING

I B. TECH- I SEMESTER (R 22)							
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
ME109ES	**B. Tech**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		0	**0**	**2**	**1**	**50**	**0**	**50**

COURSE OBJECTIVES

Upon successful completion of the course, the student is able

1. Make the student to experimentally measure the common geometric properties like length, diameter, flatness, curvature, volume and moment of inertia etc.
2. Give a practical knowledge to evaluate the friction between surfaces and also to evaluate the natural frequency of the system.
3. Correlate between theory and experimental results, directly observe the proof of principles and theories through practical knowledge
4. Introduce students to the basic concepts of manufacturing through the demonstration of various processes.
5. Understand the commonly used mechanical components like gear box, working of boilers and IC engine etc.

COURSE OUTCOMES

Upon successful completion of the course, the student is able

1. CO 1: Understand the operation, usage and applications of different measuring instruments and tools.
2. CO 2: Examine the different characteristics of instruments like accuracy, precision etc
3. CO 3: Prepare simple composite components and joining different materials using soldering process.
4. CO 4: Identify tools & learn practically the process of turning, milling, grinding on mild steel pieces.
5. CO 5: Understand the basic components of IC engine, Gear box and boiler

LIST OF EXPERIMENTS

1. Measurement of length, height, diameter by vernier calipers.
2. To measure diameter of a given wire and sphere, thickness of a given sheet and volume of an irregular lamina using micrometer screw gauge.
3. Use of straight edge and sprit level in finding the flatness of surface plate.
4. Determination of time period and natural frequency of simple pendulum.
5. Determination of time period and natural frequency of compound pendulum.
6. To measure the coefficients of static and kinetic friction between a block and a plane using various combination of materials.
7. To determine the radius of curvature of a given spherical surface.
8. The experimental determination of the Moment of Inertia of regular and irregular solids.
9. Metal joining process–soldering of metal alloys to any PCB board

10. A simple composite geometry preparation by hand layup method.

11. Grouping of Dry cells for a specified voltage and current and its measurement using ammeters and voltmeters etc.

12. Demonstration of lathe, milling, drilling, grinding machine operations.

13. Study of transmission system –gear box

14. Assembly /disassembly of Engines

15. Study of Boilers

Note: Perform any 10 out of the 15 Exercises

TEXT BOOKS

1. H.G. Patil, B.Y. Patil, Elements of Mechanical Engineering, ISBN: 9789389633788

2. Sadhu Singh, S. Chand Publishing, 2010, Elements of Mechanical Engineering(GTU)

REFERENCE BOOKS

1. S. TRYMBAKA. MURTHY, ORIENT BLACKSWAN PVT Limited, 2016, Textbook of Elements of Mechanical Engineering

2. Dr. D.S. Kumar, S.K. Kataria & Sons publishers, ISBN: 978-93-5014-623-1, Elements of Mechanical Engineering

WEB REFERENCES

1. https://www.wileyindia.com/elements-of-mechanical-engineering-3.html

2. https://mechanicalenotes.com/elements-of-mechanical-engineering-eme-all-units/

E -TEXT BOOKS

1. https://www.pdfdrive.com/engineering-mechanics-and-engineering-design-e34322231.html

2. https://www.pdfdrive.com/principles-of-engineering-mechanics-volume-2-dynamics-the-analysis-of-motion-mathematical-concepts-and-methods-in-science-and-engineering-e156717989.html

MOOCS Course

1. https://www.udemy.com/course/engineering-mechanics-college-level-statics-part-iii/

2. https://www.fanshawec.ca/programs/pem1-practical-elements-mechanical-engineering/next
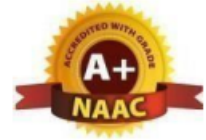
DEPARTMENT OF MECHANICAL ENGINEERING

APPLIED PHYSICS LABORATORY

I B. TECH- I SEMESTER (R 22)								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
AP103BS	**B. Tech**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		0	**0**	**3**	**1.5**	**40**	**60**	**100**

COURSE OBJECTIVES

The objectives of this course for the student to
1. Capable of handling instruments related to the Hall effect and photoelectric effect experiments and their measurements.
2. Understand the characteristics of various devices such as PN junction diode, Zener diode, BJT, LED, solar cell, lasers and optical fiber and measurement of energy gap and resistivity of semiconductor materials.
3. Able to measure the characteristics of dielectric constant of a given material.
4. Study the behavior of B-H curve of ferromagnetic materials.
5. Understanding the method of least squares fitting.

COURSE OUTCOMES

Upon successful completion of the course, the student is able
1. Know the determination of the Planck's constant using Photo electric effect and identify the material whether it is n-type or p-type by Hall experiment.
2. Appreciate quantum physics in semiconductor devices and optoelectronics.
3. Gain the knowledge of applications of dielectric constant.
4. Understand the variation of magnetic field and behavior of hysteresis curve.
5. Carried out data analysis.

LIST OF EXPERIMENTS

1. Determination of work function and Planck's constant using photoelectric effect.
2. Determination of Hall co-efficient and carrier concentration of a given semiconductor.
3. Characteristics of series and parallel LCR circuits.
4. V-I characteristics of a p-n junction diode and Zener diode
5. Input and output characteristics of BJT (CE, CB & CC configurations)
6. a) V-I and L-I characteristics of light emitting diode (LED)

   b) V-I Characteristics of solar cell
7. Determination of Energy gap of a semiconductor.
8. Determination of the resistivity of semiconductor by two probe method.
9. Study B-H curve of a magnetic material.
10. Determination of dielectric constant of a given material
11. a) Determination of the beam divergence of the given LASER beam

    b) Determination of Acceptance Angle and Numerical Aperture of an optical fiber.
12. Understanding the method of least squares – torsional pendulum as an example.

Note: Any 8 experiments are to be performed

REFERENCE BOOK

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S ChandPublishers, 2017.

WEB REFERENCES

1. Fundamental concepts of semi conductors: https://nptel.ac.in/courses/115102025/
2. Semi conductor Optoelectronics:https://nptel.ac.in/courses/115102103/

E -TEXT BOOKS

1. http://www.lehman.edu/faculty/kabat/F2019-166168.pdf
2. https://www.scribd.com/doc/143091652/ENGINEERING-PHYSICS-LAB-MANUAL

MOOCS COURSE

1. https://swayam.gov.in/nd1_noc19_ph13/preview
2. https://alison.com/courses?&category=physics

DEPARTMENT OF MECHANICAL ENGINEERING

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LABORATORY

I B. TECH- I SEMESTER (R 22)

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EN105HS	B. Tech	0	0	2	1	40	60	100

The English Language and Communication Skills (ELCS) Lab focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

COURSE OBJECTIVES

The objectives of this course for the student to
1. To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
2. To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm
3. To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
4. To improve the fluency of students in spoken English and neutralize the impact of dialects.
5. To train students to use language appropriately for public speaking, group discussions and interviews

COURSE OUTCOMES

Upon successful completion of the course, the student is able
1. Understand the nuances of English language through audio- visual experience and group activities
2. Neutralize their accent for intelligibility
3. Speak with clarity and confidence which in turn enhances their employability skills

SYLLABUS:
English Language and Communication Skills Lab (ELCS) shall have two parts:
a. Computer Assisted Language Learning (CALL) Lab
b. Interactive Communication Skills (ICS) Lab

LISTENING SKILLS:

Objectives
1. To enable students develop their listening skills so that they may appreciate the role in theLSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening, so that they can comprehend the speechof people of different backgrounds and regions.
   Students should be given practice in listening to the sounds of the language,

to be able to recognize them and find the distinction between different sounds, to be able to mark stress and recognize and use the right intonation in sentences.

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

SPEAKING SKILLS:

Objectives

1. To involve students in speaking activities in various contexts
2. To enable students express themselves fluently and appropriately in social and professionalcontexts
- Oral practice
- Describing objects/situations/people
- Role play – Individual/Group activities
- Just A Minute (JAM) Sessions

The following course content is prescribed for the English Language and Communication Skills Lab

EXERCISE – I

CALL Lab:
Understand: Listening Skill- Its importance – Purpose- Process- Types- Barriers- Effective Listening. Practice: Introduction to Phonetics – Speech Sounds – Vowels and Consonants – Minimal Pairs- Consonant Clusters- Past Tense Marker and Plural Marker- Testing Exercises

ICS Lab:
Understand: Spoken vs. Written language- Formal and Informal English.
Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

EXERCISE – II

CALL Lab:
Understand: Structure of Syllables – Word Stress– Weak Forms and Strong Forms – Stress pattern in sentences – Intonation.
Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Stress pattern in sentences – Intonation - Testing Exercises

ICS Lab:
Understand: Features of Good Conversation – Strategies for Effective Communication.
Practice: Situational Dialogues – Role Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette

EXERCISE – III

CALL Lab:
Understand: Errors in Pronunciation-Neutralising Mother Tongue Interference (MTI).
Practice: Common Indian Variants in Pronunciation – Differences between British and American Pronunciation -Testing Exercises

ICS Lab:
Understand: Descriptions- Narrations- Giving Directions and Guidelines – Blog Writing
Practice: Giving Instructions – Seeking Clarifications – Asking for and Giving Directions – Thanking and Responding – Agreeing and Disagreeing – Seeking and Giving Advice –

Making Suggestions.

EXERCISE – IV
CALL Lab: Understand: Listening for General Details. Practice: Listening Comprehension Tests - Testing Exercises **ICS Lab:** Understand: Public Speaking – Exposure to Structured Talks - Non-verbal Communication-Presentation Skills. Practice: Making a Short Speech – Extempore- Making a Presentation.

EXERCISE – V
CALL Lab: Understand: Listening for Specific Details. Practice: Listening Comprehension Tests -Testing Exercises **ICS Lab:** Understand: Group Discussion Practice: Group Discussion

MINIMUM REQUIREMENT OF INFRASTRUCTURAL FACILITIES FOR ELCS LAB:

1. Computer Assisted Language Learning (CALL) Lab:
The Computer Assisted Language Learning Lab has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self- study by students.
System Requirement (Hardware component):
Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:
  i) Computers with Suitable Configuration
  ii) High Fidelity Headphones
2. Interactive Communication Skills (ICS) Lab :
  The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio- visual aids with a Public Address System, a T. V. or LCD, a digital stereo –audio & video system and camcorder etc.
 Source of Material (Master Copy):
  • *Exercises in Spoken English. Part 1, 2, 3*. CIEFL and Oxford University Press
Note: Teachers are requested to make use of the master copy and get it tailor-made to suit the contents of the syllabus.

SUGGESTED SOFTWARE

• Cambridge Advanced Learners' English Dictionary with CD.
 • Grammar Made Easy by Darling Kindersley.
  • Punctuation Made Easy by Darling Kindersley.
 • Oxford Advanced Learner's Compass, 10th Edition.
 English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
 • English Pronunciation in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
 • English Vocabulary in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
 • TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).
  • Digital All

• Orell Digital Language Lab (Licensed Version)

REFERENCE BOOKS

1. English Language Communication Skills (2022) – Lab Manual cum Workbook. Cengage Learning India Pvt. Ltd.
2. Shobha, KN & Rayen, J. Lourdes. (2019). Communicative English – A workbook. Cambridge University Press
3. Kumar, Sanjay & Lata, Pushp. (2019). Communication Skills: A Workbook. Oxford University Press
4. Board of Editors. (2016). ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities.Orient Black Swan Pvt. Ltd.
5. Mishra, Veerendra et al. (2020). English Language Skills: A Practical Approach. Cambridge University Press

WEB REFERENCES

1. https://www.asha.org/PRPSpecificTopic.aspx?folderid=8589935321&section=Re ferences
2. https://www.englishlab.co.in/blog/types-of-communication-skills-lab-english-language-lab/

E -TEXT BOOKS

1. https://www.pdfdrive.com/basic-english-grammar-for-english-language-learners-basic-english-grammar-for-english-language-learners-e158730664.html
2. https://www.pdfdrive.com/english-language-communication-skills-e53852464.html

MOOCS COURSE

1. https://www.coursera.org/specializations/improve-english
2. https://www.edx.org/professional-certificate/upvalenciax-upper-intermediate- english

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DEPARTMENT OF MECHANICAL ENGINEERING

C PROGRAMMING AND DATA STRUCTURES LABORATORY

I B. TECH - I SEMESTER (R 22)

Course Code	Programme	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS103ES	B. Tech	0	0	2	1	40	60	100

COURSE OBJECTIVES:

To introduce the importance of programming, C language constructs, program development, data structures, searching and sorting.

COURSE OUTCOMES:

Upon successful completion of the course, student will be able to

1. Develop modular and readable C Programs
2. Solve problems using strings, functions
3. Handle data in files
4. Implement stacks, queues using arrays, linked lists.
5. To understand and analyze various searching and sorting algorithms

LIST OF EXPERIMENTS:

1. Write a C program to find the sum of individual digits of a positive integer.
2. Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Writea C program to generate the first n terms of the sequence.
3. Write a C program to generate all the prime numbers between 1 and n, where n is a valuesupplied by the user.
4. Write a C program to find the roots of a quadratic equation.
5. Write a C program to find the factorial of a given integer.
6. Write a C program to find the GCD (greatest common divisor) of two given integers.
7. Write a C program to solve Towers of Hanoi problem.
8. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and useSwitch Statement)
9. Write a C program to find both the largest and smallest number in a list of integers.
10. Write a C program that uses functions to perform the following:
    i) Addition of Two Matrices
    ii) Multiplication of Two Matrices
11. Write a C program that uses functions to perform the following operations:

      i)   To insert a sub-string in to a given main string from a given position.

      ii) To delete n Characters from a given position in a given string.

12. Write a C program to determine if the given string is a palindrome or not

13. Write a C program that displays the position or index in the string S where the string T begins,or – 1 if S doesn't contain T.

14. Write a C program to count the lines, words and characters in a given text.

15. Write a C program to generate Pascal's triangle.

16. Write a C program to construct a pyramid of numbers.

17. Write a C program that uses functions to perform the following operations:
      i)   Reading a complex number
      ii)   Writing a complex number
      iii) Addition of two complex numbers
      iv) Multiplication of two complex numbers
          (Note: represent complex number using a structure.)

18.
    i.   Write a C program which copies one file to another.
    ii.   Write a C program to reverse the first n characters in a file.(Note: The file name and n are specified on the command line.)

19.
    i.   Write a C program to display the contents of a file.
    ii.   Write a C program to merge two files into a third file (i.e., the contents of the first filefollowed by those of the second are put in the third file)

20. Write a C program that uses functions to perform the following operations on singly linkedlist.:
   i) Creation   ii) Insertion   iii) Deletion   iv) Traversal

21. Write C programs that implement stack (its operations) using
   i) Arrays   ii) Pointers

22. Write C programs that implement Queue (its operations) using
   i) Arrays   ii) Pointers

23. Write a C program that implements the following sorting methods to sort a given list ofintegers in ascending order   i) Bubble sort   ii) Selection sortiii)Insertion sort

24. Write C programs that use both recursive and non recursive functions to perform the followingsearching operations for a Key value in a given list of integers:
   i) Linear search   ii) Binary search

TEXTBOOKS:

1. C Programming & Data Structures, B.A. Forouzan and R. F. Gilberg, Third Edition, CengageLearning.
2. Let us C, Yeswanth Kanitkar
3. C Programming, Balaguruswamy.

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PHI
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill
3. Yashavant Kanetkar, Let Us C, 18th Edition, BPB
4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition
7. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

WEB REFERENCES

1. https://www.tutorialspoint.com/cprogramming/
2. https://www.tutorialspoint.com/cplusplus/
3. https://www.cprogramming.com/tutorial/c-tutorial.html

E -TEXTBOOKS

1. https://www.amazon.com/Problem-Solving-Program-Design-7th/dp/0132936496
2. https://www.goodreads.com/book/show/36011306-c-programming-data-structures-for-jntu-with-cd

MOOCSCOURSE

1. nptel.ac.in/courses/106105085/4
2. https://www.quora.com/Are-IIT-NPTEL-videos-good-to-learn-basic-C-programming

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DEPARTMENT OF MECHANICAL ENGINEERING

ENVIRONMENTAL SCIENCE

I B. TECH- I SEMESTER (R 22)								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
*CH109MC	**B. Tech**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**0**	**100**	**0**	**100**

COURSE OBJECTIVES

To learn

1. Understanding the importance of ecological balance for sustainable development.
2. Understanding the impacts of developmental activities and mitigation measures.
3. Understanding the environmental policies and regulations

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development.

UNIT-I	ECOSYSTEMS	Classes:10

Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

UNIT-II	NATURAL RESOURCES:	Classes:10

Classification Of Resources: Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

UNIT-III	BIODIVERSITY AND BIOTIC RESOURCES	Classes:10

Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In- Situ and Ex-situ conservation. National Biodiversity act.

UNIT-IV	ENVIRONMENTAL POLLUTION AND CONTROL TECHNOLOGIES	Classes:10

Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management,

composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary.

Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Issues and Global Efforts: C**limate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

UNIT-V	ENVIRONMENTAL POLICY, LEGISLATION & EIA	Classes: 10

Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). **Towards Sustainable Future:** Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

TEXT BOOKS

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHILearning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.
6. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.

WEB REFERENCES

1. https://education.nationalgeographic.org/resource/ecosystem
2. https://byjus.com/chemistry/natural-resources-pdf/

E –TEXTBOOKS

1. https://www.pdfdrive.com/biodiversity-inventories-in-high-gear-dna-barcoding-facilitates-a-rapid-biotic-survey-of-a-temperate-d149274581.html
2. https://www.pdfdrive.com/pollution-causes-effects-and-control-e159560577.html

MOOCS COURSE

1. https://nptel.ac.in/courses/120108004
2. https://archive.nptel.ac.in/content/storage2/courses/122102006/mod1/Overview%20of%20ecology.htm

DEPARTMENT OF MECHANICAL ENGINEERING

ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

I B. TECH- II SEMESTER (R 22)								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
MA201BS	**B. Tech**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**1**	**0**	**4**	**40**	**60**	**100**

COURSE OBJECTIVES

To learn

1. Methods of solving the differential equations of first and higher order.
2. Concept, properties of Laplace transforms
3. Solving ordinary differential equations using Laplace transforms techniques.
4. The physical quantities involved in engineering field related to vector valued functions
5. The basic properties of vector valued functions and their applications to line, surface and volume integrals

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Identify whether the given differential equation of first order is exact or not
2. Solve higher differential equation and apply the concept of differential equation to real worldproblems.
3. Use the Laplace transforms techniques for solving ODE's.
4. Evaluate the line, surface and volume integrals and converting them from one to another

UNIT-I	FIRST ORDER ODE	Classes: 10

Exact differential equations, Equations reducible to exact differential equations, linear and Bernoulli's equations, Orthogonal Trajectories (only in Cartesian Coordinates). Applications: Newton's law of cooling, Law of natural growth and decay.

UNIT-II	ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER	Classes: 10

Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type e^{ax}, sin ax, cos ax, polynomials in x, $e^{ax}V(x)$ and $x\ V(x)$, method of variation of parameters, Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation. Applications: Electric Circuits

UNIT-III	LAPLACE TRANSFORMS	Classes: 10

Laplace Transforms: Laplace Transform of standard functions, First shifting theorem, Second shifting theorem, Unit step function, Dirac delta function, Laplace transforms of functions when they are multiplied and divided by 't', Laplace transforms of derivatives and integrals of function, Evaluation of integrals by Laplace transforms, Laplace transform of periodic functions, Inverse Laplace transform by different methods, convolution theorem (without proof). Applications: solving Initial value problems by Laplace Transform method.

UNIT-IV	VECTOR DIFFERENTIATION	Classes: 10

Vector point functions and scalar point functions, Gradient, Divergence and Curl, Directional derivatives, Tangent plane and normal line, Vector Identities, Scalar potential functions, Solenoidal and Irrotational vectors.

UNIT-V	VECTOR INTEGRATION	Classes: 10

Line, Surface and Volume Integrals, Theorems of Green, Gauss and Stokes (without proofs) and their applications.

TEXT BOOKS

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications,5th Edition, 2016.

REFERENCE BOOKS

1. Dr. D. Ranadheer Reddy, Dr. S. Someshwar & Mrs. M. Jhansi Lakshmi, Advanced Calculus for Engineers, M/s Students Helpline Publishing House Pvt. Ltd, First Edition-2020.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint,2002.
4. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and CompanyLimited, New Delhi.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications,Reprint, 2008.

WEB REFERENCES

1. https://www.efunda.com/math/gamma/index.cfm
2. https://www.mathworld.wolfram.com/
3. https://www.efunda.com/math/laplace_transform/index.cfm?search_string=laplace%20transforms

E -TEXT BOOKS

1. https://www.e-booksdirectory.com/listing.php?category=4
2. https://www.e-booksdirectory.com/details.php?ebook=10830

MOOCS COURSE

1. https://archive.nptel.ac.in/content/storage2/courses/122104018/node69.html
2. https://archive.nptel.ac.in/courses/111/106/111106139/
3. https://onlinecourses.nptel.ac.in/noc22_ma75/preview

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DEPARTMENT OF MECHANICAL ENGINEERING

ENGINEERING CHEMISTRY

I B. TECH- II SEMESTER (R 22)								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
CH202BS	B. Tech	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	1	0	4	40	60	100

COURSE OBJECTIVES

To learn

1. To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
2. To include the importance of water in industrial usage, fundamental aspects of battery chemistry, significance of corrosion it's control to protect the structures.
3. To imbibe the basic concepts of petroleum and its products.
4. To acquire required knowledge about engineering materials like cement, smart materials and Lubricants.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Students will acquire the basic knowledge of electrochemical procedures related to corrosion and its control.
2. The students are able to understand the basic properties of water and its usage in domestic and industrial purposes.
3. They can learn the fundamentals and general properties of polymers and other engineering materials.
4. They can predict potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

UNIT-I	WATER AND ITS TREATMENT	Classes: 10

Introduction to hardness of water – Estimation of hardness of water by complexometric method and related numerical problems. Potable water and its specifications - Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and break - point chlorination. Defluoridation - Determination of F^- ion by ion- selective electrode method.
Boiler troubles: Sludges, Scales and Caustic embrittlement. Internal treatment of Boiler feed water - Calgon conditioning - Phosphate conditioning - Colloidal conditioning, External treatment methods - Softening of water by ion- exchange processes. Desalination of water – Reverse osmosis.

UNIT-II	BATTERY CHEMISTRY & CORROSION	Classes: 10

Introduction - Classification of batteries- primary, secondary and reserve batteries with examples. Basic requirements for commercial batteries. Construction, working and applications of: Zn-air and Lithium ion battery, Applications of Li-ion battery to electrical vehicles. Fuel Cells- Differences between battery and a fuel cell, Construction and applications of Methanol Oxygen fuel cell and Solid oxide fuel cell. Solar cells - Introduction and applications of Solar cells.
Corrosion: Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection –

Sacrificial anode and impressed current methods.

UNIT-III	POLYMERIC MATERIALS	Classes: 10

Definition – Classification of polymers with examples – Types of polymerization –
addition (free radical addition) and condensation polymerization with examples – Nylon 6:6,
Terylene Plastics: Definition and characteristics- thermoplastic and thermosetting plastics,
Preparation, Properties and engineering applications of PVC and Bakelite, Teflon, Fiber
reinforced plastics (FRP). Rubbers: Natural rubber and its vulcanization.
Elastomers: Characteristics –preparation – properties and applications of Buna-S, Butyl and
Thiokol rubber.
Conducting polymers: Characteristics and Classification with examples-mechanism of
conduction in trans-polyacetylene and applications of conducting polymers.
Biodegradable polymers: Concept and advantages - Polylactic acid and poly vinyl alcohol and
their applications.

UNIT-IV	ENERGY SOURCES	Classes: 10

Introduction, Calorific value of fuel – HCV, LCV- Dulongs formula. Classification- solid
fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid
fuels – petroleum and its refining, cracking types – moving bed catalytic cracking. Knocking –
octane and cetane rating, synthetic petrol - Fischer-Tropsch's process; Gaseous fuels –
composition and uses of natural gas, LPG and CNG, Biodiesel – Transesterification,
advantages.

UNIT-V	ENGINEERING MATERIALS	Classes: 12

Cement: Portland cement, its composition, setting and hardening. Smart materials and their
engineering applications
Shape memory materials- Poly L- Lactic acid. Thermoresponse materials- Polyacryl amides,
Poly vinyl amides
Lubricants: Classification of lubricants with examples-characteristics of a good lubricants -
mechanism of lubrication (thick film, thin film and extreme pressure)- properties of lubricants:
viscosity, cloud point, pour point, flash point and fire point.

TEXT BOOKS

1. Engineering Chemistry by P.C. Jain and M. Jain, Dhanpatrai Publishing Company, 2010
2. Engineering Chemistry by Rama Devi, Venkata Ramana Reddy and Rath, Cengage learning, 2016
3. A text book of Engineering Chemistry by M. Thirumala Chary, E. Laxminarayana and K.Shashikala, Pearson Publications, 2021.
4. Text book of Engineering Chemistry by Jaya Shree Anireddy, Wiley Publications.

REFERENCE BOOKS

1. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi (2015)
2. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi (2011)
3. Engineering Chemistry by A. Aditya Prasad, S. Hemambika and N. V. V. Panduranga Rao, Spectrum Medico Plus Pharma Publishers., Hyderabad, 1st edition (2020)
4. Engineering Chemistry by Thirumala Chary Laxminarayana, Shashikala, Pearson Publications (2020)

WEB REFERENCES

1. https://www.wileyindia.com/engineering-chemistry-as-per-aicte.html
2. https://www.wileyindia.com/wiley-engineering-chemistry-second-edition.html
3. https://www.wyzant.com/resources/lessons/science/chemistry
4. http://www.chem1.com/acad/webtext/virtualtextbook.html

E –TEXTBOOKS

1. https://www.pdfdrive.com/engineering-chemistry-e33546326.html
2. https://www.pdfdrive.com/engineering-chemistry-fundamentals-and-applications-

2nd-edition-e191456798.html
3. https://www.pdfdrive.com/engineering-chemistry-e48867824.html

MOOCS COURSE
1. https://nptel.ac.in/courses/122101001
2. https://nptel.ac.in/courses/105106205

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DEPARTMENT OF MECHANICAL ENGINEERING

COMPUTER AIDED ENGINEERING GRAPHICS

I B. TECH - II SEMESTER (R 22)									
Course Code	**Programme**	**Hours / Week**			**Credits**	**Maximum Marks**			
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**	
ME208ES	**B. Tech**	1	0	4	3	40	60	100	

COURSE OBJECTIVES

1. To develop the ability of visualization of different objects through technical drawings
2. To acquire computer drafting skill for communication of concepts, ideas in the design of engineering products

COURSE OUTCOMES

At the end of the course, the student will be able to:
1. Apply computer aided drafting tools to create 2D and 3D objects
2. sketch conics and different types of solids
3. Appreciate the need of Sectional views of solids and Development of surfaces of solids
4. Read and interpret engineering drawings
5. Conversion of orthographic projection into isometric view and vice versa manually and by using computer aided drafting

UNIT-I	INTRODUCTION TO ENGINEERING GRAPHICS	Classes: 15

Principles of Engineering Graphics and their Significance, Scales – Plain & Diagonal, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, Introduction to Computer aided drafting – views, commands and conics

UNIT-II	ORTHOGRAPHIC PROJECTIONS	Classes: 15

Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures. Auxiliary Planes. Computer aided orthographic projections – points, lines and planes

UNIT-III	PROJECTIONS OF REGULAR SOLIDS	Classes:15

Projections of Regular Solids – Auxiliary Views - Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views, Computer aided projections of solids – sectional views

UNIT-IV	DEVELOPMENT OF SURFACES OF RIGHT REGULAR SOLIDS	Classes: 15

Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone, Development of surfaces using computer aided drafting

UNIT-V	**ISOMETRIC PROJECTIONS**	**Classes: 10**

Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice-versa –Conventions. Conversion of orthographic projection into isometric view using computer aided drafting.

TEXT BOOKS

1. Engineering Drawing N.D. Bhatt / Charotar
2. Engineering Drawing and graphics Using AutoCAD Third Edition, T. Jeyapoovan, Vikas: S. Chand and company Ltd.

REFERENCE BOOKS

1. Engineering Drawing, Basant Agrawal and C M Agrawal, Third Edition McGraw Hill
2. Engineering Graphics and Design, WILEY, Edition 2020
3. Engineering Drawing, M. B. Shah, B.C. Rane / Pearson.
4. Engineering Drawing, N. S. Parthasarathy and Vela Murali, Oxford
5. Computer Aided Engineering Drawing – K Balaveera Reddy et al – CBS Publishers

WEB REFERENCES

1. http://freevideolectures.com/Course/3420/Engineering-Drawing
2. https://www.slideshare.net/search/slideshow?searchfrom=header&q=engineering+drawing
3. https://www.wiziq.com/tutorials/engineering-drawing
4. http://road.issn.org/issn/2344-4681-journal-of-industrial-design-and-engineering-graphics

E –TEXT BOOKS

1. http://rgpv-ed.blogspot.com/2009/09/development-of-surfaces.html
2. http://www.techdrawingtools.com/12/l1201.htm

MOOCS COURSE

1. https://nptel.ac.in/course.php
2. https://swayam.gov.in/explorer

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DEPARTMENT OF MECHANICAL ENGINEERING

ENGINEERING MECHANICS

I B. TECH- II SEMESTER (R 22)								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
ME209ES	**B. Tech**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**3**	**40**	**60**	**100**

COURSE OBJECTIVES

To learn

1. Explain the resolution of a system of forces, compute their resultant and solve problems using equations of equilibrium
2. Perform analysis of bodies lying on rough surfaces.
3. Locate the centroid of a body and compute the area moment of inertia and mass moment of inertia of standard and composite sections
4. Explain kinetics and kinematics of particles, projectiles, curvilinear motion, centroidal motion and plane motion of rigid bodies.
5. Explain the concepts of work-energy method and its applications to translation, rotation and plane motion and the concept of vibrations

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

CO 1: Determine resultant of forces acting on a body and analyse equilibrium of a body subjected to a system of forces.

CO 2: Solve problem of bodies subjected to friction.

CO 3: Find the location of centroid and calculate moment of inertia of a given section.

CO 4: Understand the kinetics and kinematics of a body undergoing rectilinear, curvilinear, rotatory motion and rigid body motion.

CO 5: Solve problems using work energy equations for translation, fixed axis rotation and plane motion and solve problems of vibration.

UNIT-I	INTRODUCTION TO ENGINEERING MECHANICS	Classes: 12

Force Systems: Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy

UNIT-II	FRICTION	Classes: 12

Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack;
Centroid and Centre of Gravity -Centroid of Lines, Areas and Volumes from first principle,

centroid of composite sections; Centre of Gravity and its implications. – Theorem of Pappus

UNIT-III	AREA MOMENT OF INERTIA	Classes: 10

Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Product of Inertia, Parallel Axis Theorem, Perpendicular Axis Theorem

Mass Moment of Inertia: Moment of Inertia of Masses - Transfer Formula for Mass Moments of Inertia – Mass moment of inertia of composite bodies.

UNIT-IV	REVIEW OF PARTICLE DYNAMICS	Classes: 12

Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained motion; Newton's 2nd law (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy. Impulse-momentum (linear, angular); Impact (Direct and oblique).

UNIT-V	KINETICS OF RIGID BODIES	Classes: 10

Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D' Alembert's principle and its applications in plane motion and connected bodies; Work Energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation

TEXT BOOKS

1. Shames and Rao (2006), Engineering Mechanics, Pearson Education
2. Reddy Vijay Kumar K. and J. Suresh Kumar (2010), Singer's Engineering Mechanics – Statics & Dynamics

REFERENCE BOOKS

1. Beer F.P & Johnston E.R Jr., Vector Mechanics for Engineers – Statics and Dynamics, Mc
2. Graw Hill, 12th Edition.
3. Dumir P.C, Sengupta, Srinivas, Engineering Mechanics- Universities Press, 2020.
4. Hibbeler R.C, Engineering Mechanics, Pearson, 14th Edition.
5. Arshad Noor, Zahid & Goel, Engineering Mechanics, Cambridge University Press, 2018.
6. Khurmi R.S, Khurmi N., Engineering Mechanics, S. Chand, 2020.
7. Basudeb Bhattacharyya, "Engineering Mechanics", Oxford University Press

WEB REFERENCES

1. https://www.udemy.com/course/become-a-mechanics-pro/
2. https://online.norwich.edu/academic-programs/resources/introduction-engineering-mechanics

E –TEXTBOOKS

1. https://www.pdfdrive.com/an-introduction-to-mechanical-engineering-e29993396.html
2. https://www.pdfdrive.com/introduction-to-continuum-mechanics-mechanical-engineering-e6549793.html

MOOCS COURSE

1. https://www.coursera.org/learn/engineering-mechanics-statics
2. https://www.classcentral.com/course/statics1-564

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DEPARTMENT OF MECHANICAL ENGINEERING

ENGINEERING MATERIALS

I B. TECH- II SEMESTER (R 22)

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
ME210PC	B. Tech	2	0	0	2	40	60	100

COURSE OBJECTIVES

To learn

1. Provide basic understanding of engineering materials, their structure, classification and usage.
2. Introduce the testing methods for various material properties and ASTM standards used in testing.
3. Understand the various materials used in mechanical engineering like metals, ceramics, polymers, composite materials and other new materials.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Classify the various materials that will be essential for the mechanical engineering applications.
2. Express the mechanical properties of metals and their testing procedures.
3. Understand the application of materials and their processing
4. Understand the requirement and need for the development of the new materials.

UNIT-I	CLASSIFICATION OF ENGINEERING MATERIALS	Classes: 10

Ashby chart, Mechanical Properties of Metals and their testing equipment/procedures, ASTM standards for testing, Stress–Strain Behavior of various materials, Sources of Material Data

UNIT-II	METALS AND METAL ALLOYS	Classes: 10

Classification of Metal Alloys, Classification, composition, properties and usage of Ferrous alloys, steel, HSS, grey cast iron, white cast iron; Classification, composition, properties and usage of Non-ferrous materials, Aluminum, Titanium, Zinc, Copper, Nickel, Cobalt and their alloys

UNIT-III	COMPOSITES	Classes: 10

Definitions, Reinforcements and matrices, Types of reinforcements, Types of matrices, Classification of composites, Properties of composites in comparison with standard materials Manufacturing methods: Hand and spray lay - up, injection molding, resin injection, filament winding, pultrusion, centrifugal casting and prepregs.

UNIT-IV	CERAMICS	Classes: 10

Classification of ceramic materials, Crystal Structure, Applications and Properties of Ceramics, Ceramic fabrication techniques, Carbon: Diamond and Graphite.
Polymer Structures, Chemistry of Polymer Molecules, Classification scheme of polymer molecules, Thermoplastic and Thermosetting Polymers, Characteristics, Applications, and Processing of Polymers, Elastomers.

UNIT-V	MATERIALS IN NANO TECHNOLOGY	Classes: 10

Semiconductor Nanomaterials (Zinc oxide nano materials, titanium dioxide nanoparticles, Metal nanoparticles, ceramic nano materials metal nano particles (Silver, gold, iron and copper), applications, bio materials and other recent materials

TEXT BOOKS

1. George Murray, Charles V. White, Wolfgang Weise, "Introduction to Engineering Materials", CRC Press, 2007.
2. William. D. Callister, David G. Rethwisch, "Materials Science and Engineering: An Introduction", John Wiley & Sons, 2018

REFERENCE BOOKS

1. Myer Kutz, "Mechanical Engineers' Handbook", John Wiley & Sons, 2015.
2. M.A. Shah, K.A.Shah, Nano technology, the science of Small, WILEY, Second Edition, 2019.
3. E. Paul De Garmo, J.T. Black, R.A. Kohler. Materials and Processes in Manufacturing, John

   Wiley and Sons, Inc., NY, 11 th Edition, 2012.
4. R.J. Crawford, plastics engineering, Pergamon Presss, 2013.
5. Donald R Askland and Pradeep P Phule "Essentials of Materials Science and Engineering", by Pradeep P. Fulay (Author), Donald R. Askeland, 2013.
6. K. K. Chawala, Cermic Matrix composite Materials, Kluwer Academic Publishers, 2002

WEB REFERENCES

1. https://www.mech4study.com/production-engineering/engineering-materials.html/
2. https://mechanicalc.com/reference/engineering-materials

E -TEXT BOOKS

1. https://www.pdfdrive.com/mechanical-engineers-handbook-materials-and-engineering-mechanics-e43174606.html
2. https://www.pdfdrive.com/fundamentals-of-materials-science-and-engineering-e29579234.html
3. https://www.pdfdrive.com/mechanical-engineers-handbook-vol-1-materials-and-engineering-mechanics-e157883538.html

MOOCS COURSE

1. https://www.edx.org/learn/materials-science
2. https://www.coursera.org/courses?query=material%20science
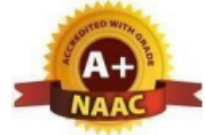
DEPARTMENT OF MECHANICAL ENGINEERING

PYTHON PROGRAMMING LABORATORY

I B. TECH- II SEMESTER (R 22)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS205ES	B. Tech	0	1	2	2	40	60	100

COURSE OBJECTIVES
1. To install and run the Python interpreter
2. To learn control structures.
3. To Understand Lists, Dictionaries in python
4. To Handle Strings and Files in Python

COURSE OUTCOMES
Upon successful completion of the course, the student is able
1. Develop the application specific codes using python.
2. Understand Strings, Lists, Tuples and Dictionaries in Python
3. Verify programs using modular approach, file I/O, Python standard library
4. Implement Digital Systems using Python

Note: **The lab experiments will be like the following experiment examples**

LIST OF EXPERIMENTS

Week -1:

1. i) Use a web browser to go to the Python website http://python.org. This page contains information about Python and links to Python-related pages, and it gives you the ability to search the Python documentation.

   ii) Start the Python interpreter and type help() to start the online help utility.

2. Start a Python interpreter and use it as a Calculator.

3. I) Write a program to calculate compound interest when principal, rate and numbers of periods are given.

   ii) Given coordinates (x1, y1), (x2, y2) find the distance between two points

4. **Read name, address, email and phone number of a person through keyboard and print the details.**

Week - 2:

1. Print the below triangle using

   for loop.5
   4 4
   3 3 3
   2 2 2 2
   1 1 1 1 1

2. Write a program to check whether the given input is digit or lowercase character or uppercase character or a special character (use 'if-else-if' ladder)

3. Python Program to Print the Fibonacci sequence using while loop

4. Python program to print all prime numbers in a given interval (use break)

Week - 3:

1. i) Write a program to convert a list and tuple into arrays.

   ii) Write a program to find common values between two arrays.

2. Write a function called gcd that takes parameters a and b and returns their greatest common divisor.

3. Write a function called palindrome that takes a string argument and returns True if it is a palindromeand False otherwise. Remember that you can use the built-in function len to check the length of a string.

Week - 4:

1. Write a function called is_sorted that takes a list as a parameter and returns true if the list is sortedin ascending order and False otherwise.

2. Write a function called has_duplicates that takes a list and returns True if there is any element thatappears more than once. It should not modify the original list.

   i). Write a function called remove_duplicates that takes a list and returns a new list with only theunique elements from the original. Hint: they don't have to be in the same order.

   ii). The word list I provided, words.txt, doesn't contain single letter words. So you might want to add"I", "a", and the empty string.

   iii). Write a python code to read dictionary values from the user. Construct a function to invert itscontent. i.e., keys should be values and values should be keys.

3. i) Add a comma between the characters. If the given word is 'Apple', it should become 'A,p,p,l,e'

   ii) Remove the given word in all the places in a string?

   iii) Write a function that takes a sentence as an input parameter and replaces the first letter of every word with the corresponding upper case letter and the rest of the letters in the word by corresponding letters in lower case without using a built-in function?

4. Writes a recursive function that generates all binary strings of n-bit length

Week - 5:

1. i) Write a python program that defines a matrix and prints

   ii) Write a python program to perform addition of two square matrices

   iii) Write a python program to perform multiplication of two square matrices

2. How do you make a module? Give an example of construction of a module using different geometricalshapes and operations on them as its functions.

3. Use the structure of exception handling all general purpose exceptions.

Week-6:

1. a. Write a function called draw_rectangle that takes a Canvas and a Rectangle as arguments and draws a representation of the Rectangle on the Canvas.

   b. Add an attribute named color to your Rectangle objects and modify draw_rectangle so that ituses the color attribute as the fill color.

   c. Write a function called draw_point that takes a Canvas and a Point as arguments and draws are presentation of the Point on the Canvas.

   d. Define a new class called Circle with appropriate attributes and instantiate a few Circle objects.Write a function called draw_circle that draws circles on the canvas.

2. Write a Python program to demonstrate the usage of Method Resolution Order (MRO) in multiplelevels of Inheritances.

3. Write a python code to read a phone number and email-id from the user and validate it forcorrectness.

Week- 7

1. Write a Python code to merge two given file contents into a third file.

2. Write a Python code to open a given file and construct a function to check for given words present init and display on found.

3. Write a Python code to Read text from a text file, find the word with most number of occurrences

4. Write a function that reads a file *file1* and displays the number of words, number of vowels, blankspaces, lower case letters and uppercase letters.

Week - 8:

1. Import numpy, Plotpy and Scipy and explore their functionalities.
2. Install NumPy package with pip and explore it.
3. Write a program to implement Digital Logic Gates – AND, OR, NOT, EX-OR
4. Write a program to implement Half Adder, Full Adder, and Parallel Adder
5. Write a GUI program to create a window wizard having two text labels, two text fields and two buttonsas Submit and Reset.

TEXT BOOKS

1. Supercharged Python: Take your code to the next level, Overland
2. Learning Python, Mark Lutz, O'reilly

REFERENCE BOOKS

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
2. Python Programming A Modular Approach with Graphics, Database, Mobile, and Web Applications, Sheetal Taneja, Naveen Kumar, Pearson
3. Programming with Python, A User's Book, Michael Dawson, Cengage Learning, India Edition
4. Think Python, Allen Downey, Green Tea Press
5. Core Python Programming, W. Chun, Pearson
6. Introduction to Python, Kenneth A. Lambert, Cengage

WEB REFERENCES

1. https://www.tutorialspoint.com/python3/
2. https://www.udemy.com/machine-learning-using-r-and-python/
3. https://www.udemy.com/r-programming-language/
4. https://www.simpliv.com/itcertification/data-analytics-using-r-programming
5. https://books.goalkicker.com/PythonBook/

E -TEXT BOOKS

1. https://www.amazon.in/Advanced-Python-Programming-Brian-Overland/dp/0135159946
2. https://www.oreilly.com/library/view/learning-python-5th/9781449355722/

MOOCS COURSE

1. https://nptel.ac.in/courses/106106145
2. https://nptel.ac.in/courses/106106182

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DEPARTMENT OF MECHANICAL ENGINEERING

ENGINEERING CHEMISTRY LABORATORY

I B. TECH- II SEMESTER (R 22)								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
CH204BS	**B. Tech**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		0	**0**	**2**	**1**	**40**	**60**	**100**

COURSE OBJECTIVES

The course consists of experiments related to the principles of chemistry required for engineering student. The student will learn:

1. Estimation of hardness of water to check its suitability for drinking purpose.
2. Students are able to perform estimations of acids and bases using conductometry, potentiometry and pH metry methods.
3. Students will learn to prepare polymers such as Bakelite and nylon-6 in the laboratory.
4. Students will learn skills related to the lubricant properties such as saponification value, surface tension and viscosity of oils.

COURSE OUTCOMES

The experiments will make the student gain skills on:

1. Determination of parameters like hardness of water and rate of corrosion of mild steel in various conditions.
2. Able to perform methods such as conductometry, potentiometry and pH metry in order to find out the concentrations or equivalence points of acids and bases.
3. Students are able to prepare polymers like bakelite and nylon-6.
4. Estimations saponification value, surface tension and viscosity of lubricant oils.

LIST OF EXPERIMENTS

I. **Volumetric Analysis:** Estimation of Hardness of water by EDTA Complexometry method.

II. **Conductometry:** Estimation of the concentration of an acid by Conductometry.

III. **Potentiometry:** Estimation of the amount of Fe^{+2} by Potentiomentry.

IV. **pH Metry:** Determination of an acid concentration using pH meter.

V. **Preparations:**
1. Preparation of Bakelite.
2. Preparation Nylon – 6.

VI. Lubricants:
    1. Estimation of acid value of given lubricant oil.
    2. Estimation of Viscosity of lubricant oil using Ostwald's Viscometer.

VII. Corrosion: Determination of rate of corrosion of mild steel in the presence and absence of inhibitor.

VIII. Virtual lab experiments
1. Construction of Fuel cell and its working.
2. Smart materials for Biomedical applications
3. Batteries for electrical vehicles.

REFERENCE BOOKS

1. Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, S Chand Publications,New Delhi (2022)
2. Vogel's text book of practical organic chemistry 5th edition
3. Inorganic Quantitative analysis by A.I. Vogel, ELBS Publications.
4. College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007)

WEB REFERENCES

1. https://www.academia.edu/39911915/Engineering_Chemistry_Laboratory_Manual_and_Observation_Subject_Code_18CHEL16_26
2. https://www.vlab.co.in/broad-area-chemical-engineering

E -TEXT BOOKS

1. https://www.pdfdrive.com/engineering-chemistry-lab-manual-e51801253.html
2. https://www.pdfdrive.com/engineering-chemistry-lab-manual-autonomous-2015-16-e37927940.html

MOOCS COURSE

1. https://www.coursera.org/browse/physical-science-and-engineering/chemistry
2. https://libguides.mines.edu/chem/online-course-resources
3. https://ecampus.oregonstate.edu/online-degrees/undergraduate/online-chemistry-lab-course/

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DEPARTMENT OF MECHANICAL ENGINEERING

FUELS AND LUBRICANTS LABORATORY

I B. TECH- II SEMESTER (R 22)

Course Code	Category	Hours / Week			Credits	Maximum Marks		
ME211PC	**B. Tech**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		0	**0**	**2**	**1**	**40**	**60**	**100**

COURSE OBJECTIVES

   To Understand the fuel and lubricants properties.

COURSE OUTCOMES

  After learning the contents of this paper the student must be able to

1. Find the kinematic viscosity of lubricants and its variation with temperature
2. Determine the flash point, fire point, cloud point and pour point of liquid fuels
3. Determine the calorific value of solid, liquid and gaseous fuels
4. Determination of the dropping point of lubricating grease
5. Determination of distillation characteristics of petroleum products

LIST OF EXPERIMENTS

1. Determination of Flash and Fire points of Liquid fuels/Lubricants using: Abels Apparatus
2. Determination of Flash and Fire points of Liquid fuels/Lubricants using: Pensky Martens Apparatus
3. Carbon residue test: Liquid fuels.
4. Determination of Viscosity of Liquid lubricants and Fuels using: Saybolt Viscometer
5. Determination of Viscosity of Liquid lubricants and Fuels using: Redwood Viscometer
6. Determination of Viscosity of Liquid lubricants and Fuels using: Engler Viscometer
7. Determination of Calorific value: of Gaseous fuels using: Junkers Gas Calorimeter.
8. Determination of Calorific value: Solid/Liquid/ fuels using: Bomb Calorimeter.
9. Drop point and Penetration Apparatus for Grease.
10. ASTM Distillation Test Apparatus.
11. Cloud and Pour Point Apparatus

TEXT BOOKS

1.   Fuels and Lubricants Handbook: Technology, Properties, Performance, and Testing (Astm Manual Series, Mnl 37) by George E. Totten, Rajesh J. Shah

REFERENCE BOOKS

1.   https://www.slideshare.net/reddykishen/fuels-lubricants-laboratory-manual

WEB REFERENCES

1. https://www.nrel.gov/transportation/refuel.html
2. https://www.chemeng.ntua.gr/the_fuels_and_lubricants_technology_lab/_en

E –TEXTBOOKS

1. https://powertechlabs.com/fuels-and-lubricant-testing/
2. https://www.element.com/materials-testing-services/fuels-and-lubricants

MOOCS COURSE

1. https://www.shivaanalyticals.com/fuels-and-oils
2. https://clarktesting.com/service/fuel-and-lubrication-testing/

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DEPARTMENT OF MECHANICAL ENGINEERING

PROBABILITY STATISTICS & COMPLEX VARIABLES

II B. TECH- I SEMESTER (R22)								
Course Code	**Programme**	**Hours/Week**			**Credits**	**Maximum Marks**		
PS301BS	**B.Tech.**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**1**	**0**	**4**	**40**	**60**	**100**

COURSE OBJECTIVES

To learn

1. The ideas of probability and random variables and various discrete and continuous probability distributions and their properties.
2. The basic ideas of statistics including measures of central tendency, correlation and regression.
3. The statistical methods of studying data samples.
4. Differentiation and integration of complex valued functions.
5. Evaluation of integrals using Cauchy's integral formula and Cauchy's residue theorem.
6. Expansion of complex functions using Taylor's and Laurent's series.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Formulate and solve problems involving random variables and apply statistical methods for analyzing experimental data.
2. Apply concept of estimation and testing of hypothesis to case studies.
3. Analyze the complex function with reference to their analyticity, integration using Cauchy's integral and residue theorems.
4. Taylor's and Laurent's series expansions of complex function.

UNIT-I	BASIC PROBABILITY	Classes: 12

Probability spaces, conditional probability, independent events, and Baye's theorem.

Random variables: Discrete and continuous random variables, Expectation of Random Variables, Variance of random variables

UNIT-II	PROBABILITY DISTRIBUTIONS	Classes: 12

Binomial, Poisson, evaluation of statistical parameters for these distributions, Poisson approximation to the binomial distribution, Continuous random variables and their properties, distribution functions and density functions, Normal and exponential, evaluation of statistical parameters for these distributions

UNIT-III	ESTIMATION & TESTS OF HYPOTHESES	Classes: 10

Introduction, Statistical Inference, Classical Methods of Estimation.: Estimating the Mean, Standard Error of a Point Estimate, Prediction Intervals, Estimating a Proportion for single sample, Difference between Two Means, difference between two proportions for two Samples.
Statistical Hypotheses: General Concepts, Testing a Statistical Hypothesis, Tests Concerning a Single Mean, Tests on Two Means, Test on a Single Proportion, Two Samples: Tests on Two Proportions.

UNIT-IV	COMPLEX DIFFERENTIATION	Classes: 10

Limit, Continuity and Differentiation of Complex functions, Analyticity, Cauchy-Riemann equations (without proof), finding harmonic conjugate, elementary analytic functions (exponential, trigonometric, logarithm) and their properties, Conformal mappings, Mobius transformations.

UNIT-V	COMPLEX INTEGRATION	Classes: 10

Line integral, Cauchy's theorem, Cauchy's Integral formula, Zeros of analytic functions, Singularities, Taylor's series, Laurent's series, Residues, Cauchy Residue theorem (All theorems without Proof).

TEXT BOOKS

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.
2. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, keying Ye, Probability and statistics for engineers and scientists, 9th Edition, Pearson Publications.

REFERENCE BOOKS

1. T.T. Soong, Fundamentals of Probability And Statistics For Engineers, John Wiley & Sons Ltd, 2004.
2. Sheldon M Ross, Probability and statistics for Engineers and scientists, Academic Press.
3. Millerand Freund's, Probability and StatisticsforEngineers,8th Edition, Pearson Educations.
4. S. Ross, A First Course in Probability, 6thEd.,PearsonEducationIndia,2002

WEB REFERENCES

1. https://www.efunda.com/math/gamma/index.cfm
2. https://ocw.mit.edu/resources/#Mathematics
3. https://www.sosmath.com/
4. https://www.mathworld.wolfram.com/

E -TEXT BOOKS

1. https://www.e-booksdirectory.com/listing.php?category=4
2. https://www.e-booksdirectory.com/details.php?ebook=10830

MOOCS COURSE

1. https://swayam.gov.in/
2. https://swayam.gov.in/NPTEL

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DEPARTMENT OF MECHANICAL ENGINEERING
MECHANICS OF SOLIDS

II B. TECH- I SEMESTER (R 22)								
Course Code	**Programme**	**Hours/Week**			**Credits**	**Maximum Marks**		
ME302PC	**B. Tech**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**3**	**40**	**60**	**100**

COURSE OBJECTIVES

To learn
1. To understand basic concepts of stress, strain and their relations based on linear elasticity.
2. To discuss Material behaviors due to different types of loading
3. To understand and know how to calculate stresses and deformation of a bar due to an axial loading under uniform and non-uniform conditions.
4. To develop shear-moment diagrams of a beam and find the maximum moment/shear and their locations
5. To calculate normal and shear stresses

COURSE OUTCOMES

Upon successful completion of the course, the student is able to
1. Analyze the behavior of the solid bodies subjected to various types of loading;
2. Apply knowledge of materials and structural elements to the analysis of simple structures;
3. Undertake problem identification, formulation and solution using a range of analytical methods;
4. Analyse and interpret laboratory data relating to behaviour of structures and the materials they are made of, and undertake associated laboratory work individually and in teams.
5. Expectation and capacity to undertake lifelong learning

UNIT-I	SIMPLE STRESSES AND STRAINS	Classes: 10

Elasticity and plasticity – Types of stresses & strains–Hooke's law– stress – strain diagram for mild steel–Working stress–Factor of safety–Lateral strain, Poisson's ratio & volumetric strain–Elastic moduli & the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

UNIT-II	SHEAR FORCE AND BENDING MOMENT	Classes: 10

Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l., uniformly varying loads and combination of these loads–Point of contra flexure–Relation between S.F., B.M and rate of loading at a section of abeam.

UNIT-III	FLEXURAL STRESSES	Classes: 12

Theory of simple bending – Assumptions – Derivation of bending equation: $M/I = f/y = E/R$ Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.

Shear Stresses: Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T angle sections

UNIT-IV	PRINCIPAL STRESSES AND STRAINS	Classes: 10

Introduction – Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear – Mohr's circle of stresses – Principal stresses and strains – Analytical and graphical solutions.

Theories of Failure: Introduction – Various theories of failure - Maximum Principal Stress Theory, Maximum Principal Strain Theory, Strain Energy and Shear Strain Energy Theory (Von Mises Theory).

UNIT-V	TORSION IN CIRCULAR SHAFTS	Classes: 12

Theory of pure torsion – Derivation of Torsion equations: $T/J = q/r = N\theta/L$ – Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion and end thrust – Design of shafts according to theories of failure.

Columns and Struts: Euler's Theory, Limitations of Euler's theory, Equivalent Length, Rankine's Formula, Secant Formula..

TEXT BOOKS

1. Barry J. Goodno and James M. Gere, "Mechanics of Materials" Ninth Edition, Cengage Learning,2018.

2. S. S. Rattan, "Strength of Materials", Second Edition Tata McGraw Hill Education Pvt. Ltd, New Delhi,2011

REFERENCE BOOKS

1. Mechanics of Solids - Dr. D.V. Sreekanth, SunRise Publications-2021.

2. U. C. Jindal, "Strength of Materials", Pearson Education India,2012

3. Egor P. Popov, Toader A. Balan, "Engineering Mechanics of Solids", PHI Learning, 2010

4. G. H. Ryder, "Strength of Materials", Macmillan Long Man Publications, 1961

5. W. A. Nash and M. C. Potter, "Strength of Materials", Fifth Edition, Schaum's Outline Series, 2011

WEB REFERENCES

1. www.springer.com/physics/classical+continuum+physics/journal/11964
2. "Engineering Mechanics of Solids" by Popov
3. www.worldscientific.com/worldscibooks/10.1142/p187
4. www.civil.iitb.ac.in/~sghosh/CE201/

E -TEXT BOOKS

1. Mechanics of Solids,R K BANSAL ,Laxmi Publications.
2. Strength of materials ,R S Khurmi, S. Chand publications

MOOCS COURSES

1. https://web.mit.edu/emech/dontindex-build/
2. https://www.springer.com/physics/classical+continuum+physics

DEPARTMENT OF MECHANICAL ENGINEERING

METALLURGY & MATERIAL SCIENCE

II B. TECH- I SEMESTER (R 22)								
Course Code	**Programme**	**Hours/Week**	**Credits**	**Maximum Marks**
ME303PC	**B. Tech**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**3**	**40**	**60**	**100**

COURSE OBJECTIVES

To Learn

1. The concepts of metallurgy and materials science in manufacturing processes.
2. Interpret phase diagrams of different alloy systems.
3. Describe the concept of heat treatment and other strengthening mechanisms

COURSE OUTCOMES

Upon successful completion of the course, the student is able to
1. Memorize the types of Crystal structures and their defects.
2. Learn the necessity of alloying and identify types of alloy phases.
3. Demonstrate importance of critical understanding of heat treatment in achieving required properties.
4. Apply the knowledge of heat treatment to enhance surface properties.
5. Analyze the properties and micro structure of ferrous and non-ferrous alloys.
6. Develop new materials and enhance properties for the advanced applications.

UNIT-I	**CRYSTAL STRUCTURE**	**Classes: 10**

Unit cells, Metallic and Ceramic crystal structures. Imperfection in solids: Point, line, surface and volume defects; dislocations, strengthening mechanisms, slip systems, critical resolved shear stress.

UNIT-II	**PHASE DIAGRAMS**	**Classes: 12**

Hume – Rothery rules, Alloys, substitutional and interstitial solid solutions- Phase diagrams: Interpretation of binary phase diagrams and microstructure development; eutectic, peritectic, Eutectiod, peritectoid and monotectic reactions. Iron Iron-carbide phase diagram and microstrctural aspects of ledeburite, austenite, pearlite, ferrite and cementite

UNIT-III	HEAT TREATMENT OF STEELS	Classes: 12

Isothermal transformation diagrams for Fe-C alloys and microstructures development. Martensite, Bainite. Annealing. Normalising, Hardening, Tempering and Spheroidising.

UNIT-IV	COOLING CURVES AND MICROSTRUCTURES	Classes: 10

Continuous cooling curves and interpretation of final microstructures and properties-Thermo mechanical treatments like austempering, martempering, surface hardening methods like case hardening, carburizing, nitriding, cyaniding, carbo-nitriding, flame and induction hardening, vacuum and plasma hardening.

UNIT-V	ALLOYS	Classes: 12

Alloy steels, properties and applications of stainless steels and tool steels, maraging steels- Types of cast irons (grey, white, malleable and spheroidal graphite cast irons), copper and its alloys (Brass and bronze)- Aluminium and its alloys (Al-Cu Alloys). Ceramics and Composites: Types, properties and applications.

TEXT BOOKS

1. V. Raghavan, "Material Science and Engineering', Prentice Hall of India Private Limited, Fifth Edition.
2. William. D. Callister, David G. Rethwisch, "Materials Science and Engineering: An Introduction", John Wiley & Sons, 2018.
3. SIDNEY H AVNER, Introduction to Physical Metallurgy, McGraw Hill,2017

REFERENCE BOOKS

1. Metallurgy and Material Science - Dr. D.V. Sreekanth, Spectrum Publications-2021
2. Kenneth G. Budinski and Michael K. Budinski, "Engineering Materials", Prentice Hall of India Private Limited, 9th Edition, Indian Reprint, 2009.
3. U. C. Jindal, "Engineering Materials and Metallurgy", Pearson, 2011

WEB REFERENCES

1. http://www.ceramics.nist.gov/webbook/webbook.htm
2. http://materials.npl.co.uk/

E -TEXT BOOKS

1. Material Science & Metallurgy. P. Khanna, Dhanpat Rai Publications

MOOCS COURSES

1. https://www.metallurgy.utah.edu/prospective/undergraduates/careers.php
2. http://nptel.ac.in/courses/112107144

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DEPARTMENT OF MECHANICAL ENGINEERING

PRODUCTION TECHNOLOGY

II B. TECH- I SEMESTER (R 22)								
Course Code	**Programme**	**Hours/Week**			**Credits**	**Maximum Marks**		
ME304PC	**B. Tech**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**3**	**40**	**60**	**100**

COURSE OBJECTIVES

To learn

1. To expose the students to understand the concept of basic casting processes & furnaces.
2. To provide a technical understanding of various joining processes used in the manufacturing industry.
3. To impart the students to the concepts of solid-state welding processes.
4. To teach the concepts of rolling and various press working operations.
5. To provide a technical understanding of different metal forming processes like extrusion, forging and high energy rate forming processes.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Elaborate the fundamentals of various moulding, casting techniques and furnaces.
2. Identify the importance of permanent joining and principle behind different welding processes.
3. Explain the concepts of solid-state welding processes
4. Understand the concepts of rolling and sheet metal operations in metal working.
5. Elaborates the uniqueness of extrusion, forging and high energy rate forming processes in metal working

UNIT-I	CASTING	Classes: 10

Steps involved in making a casting – Advantage of casting and its applications; Patterns - Pattern making, Types, Materials used for patterns, pattern allowances; Properties of mouldingmethods. Methods of Melting - Crucible melting and cupola operation – Defects in castings; Principlesof Gating – Requirements – Types of gates, Design of gating systems – Riser – Function, types of Riserand Riser design. Casting processes – Types – Sand moulding, Centrifugal casting, die- casting, Investment casting, shell moulding

UNIT-II	WELDING	Classes: 10

Classification – Types of welds and welded joints and their characteristics, Welding Positions - Gas welding - Types, oxy-fuel gas cutting – standard time and cost calculations. Arc welding, Shielded metal arc welding, submerged arc welding, Resistance welding, Thermit welding.

UNIT-III	INERT GAS WELDING	Classes: 12

Inert Gas Welding _ TIG Welding, MIG welding, Friction welding, Friction Stir Welding, induction welding, explosive welding, Laser Welding; Soldering and Brazing; Heat affected zone in welding. Welding defects – causes and remedies; destructive and non- destructive testing of welds.

UNIT-IV	HOT AND COLD WORKING	Classes: 10

Hot working, cold working, strain hardening, recovery, recrystallisation and grain growth. Sheet metal Operations: Stamping, Blanking and piercing, Coining, Strip layout, Hot and cold spinning – Bending and deep drawing. Rolling fundamentals – theory of rolling, types of Rolling mills and products. Forces in rolling and power requirements. Drawing and its types – wire drawing and Tube drawing –Types of presses and press tools. Forces and power requirement in the above operations.

UNIT-V	EXTRUSION OF METALS	Classes: 12

Basic extrusion process and its characteristics. Hot extrusion and cold extrusion - Forward extrusion and backward extrusion – Impact extrusion – Extruding equipment – Tube extrusion, Hydrostatic extrusion. Forces in extrusion

Forging Processes: Forging operations and principles – Tools – Forging methods – Smith forging, Drop Forging – Roll forging – Forging hammers: Rotary forging – forging defects – cold forging, swaging, Forces in forging operations.

High Energy Rate Forming Processes: Principles of Explosive Forming, Electro-hydraulic Forming, Electro-magnetic forming and rubber pad Forming.

TEXT BOOKS

1. Manufacturing Technology / P.N. Rao/ Vol.1 / Mc Graw Hill Education/ 5th Edition, 2018.

2. Manufacturing Engineering & Technology / Serope Kalpakjian / Steven R. Schmid / Pearson, 7th Edition,2014

REFERENCE BOOKS

1. Metal Casting / T.V Ramana Rao / NewAge

2. Production Technology Vol.: 1, WILEY, sreeramulu M, 2018

3. A Text book of Production Technology (Manufacturing Processes) / Dr.P.C. Sharma / S. Chand Publications /1st Edition, 2006.

4. Manufacturing processes H. S. Shan, Second Edition, Cambridge University Press, 2017.

5. Production Technology: Manufacturing Processes, Technology and Automation / R. K. Jain /Vol.1/Khanna Publishers /19th Edition, 2009.

6. Elements of Workshop Technology/ S.K. Hajra Choudhury, A.K. Hajra Choudhury, Nirjhar Roy/Vol.1/ Media Publishers & Promoters Pvt. Ltd./1st Edition,2008.

WEB REFERENCES

1.https://www.elsevier.com/books/production-technology/bolton/978-0-434-901739
2.https://www.elomatic.com/en/services/consulting-and-engineering/productionengineering-and-development/production-engineering-and-development-references.html
3.https://www.sanfoundry.com/best-reference-books-manufacturing-processes/

E -TEXT BOOKS

1. Production Technology by P.C Sharma, S.Chand Publications.

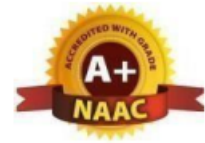2.Production Technology by R.K.Jain, Khanna Publications

MOOCS COURSES

1.https://www.mooc-list.com/tags/production-engineering
2.https://businesscasestudies.co.uk/business-theory/operations/production- technology.html

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DEPARTMENT OF MECHANICAL ENGINEERING
THERMODYNAMICS

II B. TECH- I SEMESTER (R 22)								
Course Code	**Programme**	**Hours/Week**			**Credits**	**Maximum Marks**		
ME305PC	**B. Tech**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**1**	**0**	**4**	**40**	**60**	**100**

COURSE OBJECTIVES

To understand the treatment of classical Thermodynamics and to apply the First and Second laws of Thermodynamics to engineering applications

COURSE OUTCOMES

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

1. Understand the basics of Thermodynamics
2. Apply first and second laws of thermodynamics to different systems
3. Determine the feasibility of a process w.r.to entropy changes
4. Apply concepts of thermodynamic property relations to ideal gas and real gases
5. Evaluate performance of power cycles and refrigeration cycles

UNIT-I	INTRODUCTION: BASIC CONCEPTS	Classes: 11

System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Exact & Inexact Differentials, Cycle – Reversibility – Quasi – static Process, Irreversible Process, Causes of Irreversibility – Energy in State and in Transition, Types, Displacement & Other forms of Work, Heat, Point and Path functions, Zeroth Law of Thermodynamics – Concept of Temperature – Principles of Thermometry – Reference Points – Const. Volume gas Thermometer – Scales of Temperature, Ideal Gas Scale

UNIT-II	LAWS OF THERMODYNAMICS	Classes: 12

PMM I - Joule's Experiments – First law of Thermodynamics – Corollaries – First law applied to a Process – applied to a flow system – Steady Flow Energy Equation.

Limitations of the First Law – Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance, Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries, PMM of Second kind, Carnot's principle, Carnot cycle and its specialties, Thermodynamic scale of Temperature, Clausius Inequality, Entropy, Principle of Entropy Increase – Energy Equation, Availability and Irreversibility – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations – Elementary Treatment of the Third Law of Thermodynamics.

UNIT-III	PURE SUBSTANCES	Classes: 12

Pure Substances, p-V-T- surfaces, T-S and h-s diagrams, Mollier Charts, Phase Transformations – Triple point at critical state properties during change of phase, Dryness Fraction – Clausius – Clapeyron Equation Property tables. Mollier charts – Various Thermodynamic processes and energy Transfer – Steam Calorimetry.

Perfect Gas Laws – Equation of State, specific and Universal Gas constants – various Non-flow processes, properties, end states, Heat and Work Transfer, changes in Internal Energy – Throttling and Free Expansion Processes – Flow processes

UNIT-IV	GAS LAWS AND PSYCHROMETRY	Classes: 10

Deviations from perfect Gas Model – Vader Waals Equation of State – Compressibility charts – variable specific Heats – Gas Tables

Mixtures of perfect Gases – Mole Fraction, Mass friction Gravimetric and volumetric Analysis – Dalton's Law of partial pressure, Avogadro's Laws of additive volumes – Mole fraction, Volume fraction and partial pressure, Equivalent Gas const. And Molecular Internal Energy, Enthalpy, sp. Heats and Entropy of Mixture of perfect Gases and Vapour, Atmospheric air - Psychrometric Properties – Dry bulb

Temperature, Wet Bulb Temperature, Dew point Temperature, Thermodynamic Wet Bulb Temperature, Specific Humidity, Relative Humidity, saturated Air, Vapour pressure, Degree of saturation – Adiabatic Saturation, Carrier's Equation – Psychrometric chart.

UNIT-V	POWER CYCLES	Classes: 12

Power Cycles :Otto, Diesel, Dual Combustion cycles, Sterling Cycle, Atkinson Cycle, Ericsson Cycle, Lenoir Cycle – Description and representation on P–V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis – comparison of Cycles, Brayton and Rankine cycles – Performance Evaluation.

Refrigeration Cycles: Bell-Coleman cycle, Vapour compression cycle-performance Evaluation.

TEXT BOOKS

1. Engineering Thermodynamics / PK Nag / Mc Graw Hill
2. Thermodynamics – An Engineering Approach by Yunus A. Cengel & Michael A. Boles, TMH
3. Fundamentals of Classical Thermodynamics by G. Van Wylan & R.E. Sonntag, John Wiley Pub

REFERENCE BOOKS

1. Thermodynamics / Dr. D.V. Sreekanth, Spectrum Publications-2021.
2. U. C. Jindal, "Strength of Materials", Pearson Education India,2012
3. Egor P. Popov, Toader A. Balan, "Engineering Mechanics of Solids", PHI Learning, 2010
4. G. H. Ryder, "Strength of Materials", Macmillan Long Man Publications, 1961
5. W. A. Nash and M. C. Potter, "Strength of Materials", Fifth Edition, Schaum's Outline Series, 2011

WEB REFERENCES

1. https://nptel.ac.in/courses/112103016/
2. https://www.mcgoodwin.net/pages/thermodynamics.pdf
3. http://www.darshan.ac.in/DIET/ME/SubjectDetail/3131905
4. https://www3.nd.edu/~powers/ame.20231/notes.pdf

E -TEXT BOOKS

1. H.N.Gupta, R.C.Gupta, Arun Mittal, New Agr Publication-Second Edition,ISBN : 978-81-224-2844-5
2. Fluid Mechanics and Thermodynamics of Turbomachinery, Publisher:Elsevier Butterworth Heinemann,Print SBN:9780750678704,0750678704
3. Thermodynamics Foundations and Applications, By: EliasP.Gyftopoulos, Publisher: Dover Publications, Print ISBN: 9780486439327,0486439321

MOOCS COURSES

1. https://nptel.ac.in/courses/112104113
2. https://www.mooc-list.com/course/thermodynamique-applications-coursera

DEPARTMENT OF MECHANICAL ENGINEERING
PRODUCTION TECHNOLOGY LABORATORY

II B. TECH- I SEMESTER (R -22)

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
ME306PC	B. Tech	0	0	2	1	40	60	100

COURSE OBJECTIVES

To learn
1. Know about the basic Physical, Chemical Properties of materials
2. Learn the basic operation of various manufacturing processes
3. Design and fabricate a simple product

COURSE OUTCOMES

Upon successful completion of the course, the student is able to
1. Analyze the given problem and conducts investigation on the experimental setup.
2. Operate different types of welding machines
3. Perform operations on mechanical press.
4. get familiarity with processing of Plastics.
5. Effectively communicate and explain the experimental analysis.

LIST OF EXPERIMENTS

Minimum of 12 Exercises need to be performed
I. Metal Casting Lab:
1. Pattern Design and making - for one casting drawing.
2. Sand properties testing - Exercise -for strengths, and permeability – 1
3. Moulding Melting and Casting - 1 Exercise

II. Welding Lab:
1. ARC Welding Lap & Butt Joint - 2 Exercises
2. Spot Welding - 1 Exercise
3. TIG Welding - 1 Exercise
4. Plasma welding and Brazing - 2 Exercises (Water Plasma Device)

III. Mechanical Press Working:
1. Blanking & Piercing operation and study of simple, compound and progressive press tool.
2. Hydraulic Press: Deep drawing and extrusion operation.
3. Bending and other operations

IV. Processing of Plastics
1. Injection Moulding
2. Blow Moulding

TEXT BOOKS

1. Dictionary of Mechanical Engineering – G.H.F. Nayler, Jaico Publishing House

REFERENCE BOOKS

1. Production Technology Vol.: 1, WILEY, sreeramulu M, 2018
2. A Text book of Production Technology (Manufacturing Processes) / Dr.P.C. Sharma / S. Chand Publications /1st Edition, 2006.
3. Manufacturing processes H. S. Shan, Second Edition, Cambridge University Press, 2017.
4. Production Technology: Manufacturing Processes, Technology and Automation / R. K. Jain /Vol.1/Khanna Publishers /19th Edition, 2009.
5. Elements of Workshop Technology/ S.K. Hajra Choudhury, A.K. Hajra Choudhury, Nirjhar Roy/Vol.1/ Media Publishers & Promoters Pvt. Ltd./1st Edition,2008.

WEB REFERENCES

1.https://www.elsevier.com/books/production-technology/bolton/978-0-434-901739
2.https://www.elomatic.com/en/services/consulting-and-engineering/productionengineering-and-development/production-engineering-and-development-references.html
3.https://www.sanfoundry.com/best-reference-books-manufacturing-processes/

E -TEXT BOOKS

1. Production Technology by P.C Sharma, S.Chand Publications.
2.Production Technology by R.K.Jain, Khanna Publications

MOOCS COURSES

1.https://www.mooc-list.com/tags/production-engineering
2.https://businesscasestudies.co.uk/business-theory/operations/production- technology.html

DEPARTMENT OF MECHANICAL ENGINEERING

MATERIAL SCIENCE & MECHANICS OF SOLIDS LABORATORY

II B. TECH- I SEMESTER (R -22)

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
ME307PC	B. Tech	0	0	2	1	40	60	100

MATERIAL SCIENCE LAB

COURSE OBJECTIVES

The Objective is to make the students to learn the concepts of Metallurgy and Material Science in manufacturing processes, which convert raw materials into useful products. Students will be able to understand basic structure and crystal arrangements of materials and classify and distinguish different microstructures of steels, cast irons and non-ferrous alloys.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Design different crystal structures and their models.
2. Infer the microstructures developed for different ferrous and non-ferrous metals.
3. Correlate the microstructures, properties, performance and processing of alloys.

LIST OF EXPERIMENTS

1. Preparation and study of crystal models for simple cubic, body centred cubic, face centred cubic and hexagonal close packed structures.
2. Preparation and study of the Microstructure of pure metals like Iron, Cu and Al.
3. Preparation and study of the Microstructure of Mild steels, low carbon steels, high Carbon steels.
4. Study of the Microstructures of Various Cast Irons.
5. Study of the Microstructures of Non-Ferrous alloys. (Al, Cu, Mg)
6. Hardenability of steels by Jominy End Quench Test.

MECHANICS OF SOLIDS LAB

COURSE OBJECTIVES

The objective is to learn the fundamental concepts of stress, strain, and deformation of solids with applications to bars, beams, and columns. Detailed study of engineering properties of materials is also of interest. Fundamentals of applying equilibrium, compatibility, and force- deformation relationships to structural elements are emphasized. The students are introduced to advanced concepts of flexibility and stiffness method of structural analysis. The course builds on the fundamental concepts of engineering mechanics course.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to
1. Analyze the behavior of the solid bodies subjected to various types of loading.
2. Apply knowledge of materials and structural elements to the analysis of simple structures.
3. Undertake problem identification, formulation and solution using a range of analytical methods
4. Analyze and interpret laboratory data relating to behavior of structures and the materials they are made of, and undertake associated laboratory work individually and in teams.
5. Expectation and capacity to undertake lifelong learning.

LIST OF EXPERIMENTS

1. Direct tension test
2. Bending test on Simple supported beam
3. Bending test on Cantilever beam
4. Torsion test
5. Brinell hardness test/ Rockwell hardness test
6. Test on springs
7. Izod Impact test/ Charpy Impact test

TEXT BOOKS

1. William. D. Callister, David G. Rethwisch, "Materials Science and Engineering: An Introduction", John Wiley & Sons, 2018.
2. S. S. Rattan, "Strength of Materials", Second Edition Tata McGraw Hill Education Pvt. Ltd, New Delhi,2011

WEB REFERENCES

1. http://www.ceramics.nist.gov/webbook/webbook.html
2. "Engineering Mechanics of Solids" by Popov

E -TEXT BOOKS

1. Material Science & Metallurgy. P. Khanna, Dhanpat Rai Publications
2. Mechanics of Solids, R K BANSAL, Laxmi Publications

MOOCS COURSES

1.http://nptel.ac.in/courses/112107144/

2. https://web.mit.edu/emech/dontindex-build/

DEPARTMENT OF MECHANICAL ENGINEERING
COMPUTER AIDED MACHINE DRAWING

II B. TECH- I SEMESTER (R -22)

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
ME308PC	B. Tech	0	0	2	1	40	60	100

COURSE OBJECTIVES

To familiarize with the standard conventions for different materials and machine parts in working drawings. To make part drawings including sectional views for various machine elements. To prepare assembly drawings given the details of part drawings.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Preparation of engineering and working drawings with dimensions and bill of material during design and development. Developing assembly drawings using part drawings of machine components.
2. Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
3. Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.
4. Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.
5. Title boxes, their size, location and details - common abbreviations and their liberal usage
6. Types of Drawings – working drawings for machine parts.

LIST OF DRAWINGS

Drawing of Machine Elements and simple parts

Selection of Views, additional views for the following machine elements and parts with every drawingproportion.

1. Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
2. Keys, cottered joints and knuckle joint.
3. Rivetted joints
4. Shaft coupling, spigot and socket pipe joint.
5. Journal, pivot and collar and foot step bearings.

Drawing of Machine Elements: Using Computer aided drafting in addition to manual drawing

Assembly Drawings:

Drawings of assembled views for the part drawings of the following using conventions and easy drawingproportions.

1. Steam engine parts – stuffing box, cross head, Eccentric.
2. Machine tool parts: Tail stock, Tool Post, Machine Vices.
3. Other machine parts - Screw jack, Connecting rod, Plumber block, Fuel Injector
4. Valves - Steam stop valve, spring loaded safety valve, feed check valve and air cock.

Assembly Drawings: Using Computer aided drafting in addition to manual drawing

TEXT BOOKS

1. Machine Drawing / N.D. Bhatt / Charotar

2. Machine Drawing with Auto CAD / Goutham Pohit, Goutam Ghosh / Pearson

REFERENCE BOOKS

1. Machine Drawing by / Bhattacharyya / Oxford

2. Machine Drawing / Ajeet Singh / Mc Graw Hill

WEB REFERENCES

1. https://www.google.co.in/books/edition/Computer_Aided_Machine_Drawing_Laborator /9PmXzQEACAAJ?hl=en

E -TEXT BOOKS

1. https://www.google.co.in/books/edition/Machine_Drawing/9co5rU-v7F4C?hl=en&gbpv=1&dq=computer+aided+machine+drawing+textbook+pdf&printsec=frontcover

MOOCS COURSES

1. https://nptel.ac.in/courses/112105294

DEPARTMENT OF MECHANICAL ENGINEERING
CONSTITUTION OF INDIA

II B. TECH- I SEMESTER (R 22)								
Course Code	**Programme**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
CI309MC	**B. Tech**	**3**	**0**	**0**	**0**	**100**	**0**	**100**

COURSE OBJECTIVES

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.

2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.

3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

COURSE OUTCOMES

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

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution
4. Discuss the passage of the Hindu Code Bill of 1956.

UNIT-I	**HISTORY OF MAKING OF THE INDIAN CONSTITUTION**	**Classes: 9**
History of Making of the Indian Constitution- History of Drafting Committee.		

UNIT-II	**PHILOSOPHY OF THE INDIAN CONSTITUTION**	**Classes: 10**
Philosophy of the Indian Constitution- Preamble Salient Features.		

UNIT-III	**CONTOURS OF CONSTITUTIONAL RIGHTS & DUTIES - FUNDAMENTAL RIGHTS**	**Classes: 12**

Contours of Constitutional Rights & Duties - Fundamental Rights

Right to Equality

- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties.

UNIT-IV	ORGANS OF GOVERNANCE	Classes: 10

Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

UNIT-V	LOCAL ADMINISTRATION	Classes: 12

Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayat raj: Introduction, PRI: Zila Panchayat. Elected officials and their roles, CEO ZilaPanchayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

UNIT-VI	ELECTION COMMISSION	Classes: 11

Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

TEXT BOOKS

1. The Constitution of India, 1950 (Bare Act), Government Publication.

2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.

3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.

4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

REFERENCE BOOKS

1. An Introduction to the Constitution of India by Dr. Durga DasBasu
2. An Introduction to the Constitution of India by M. V.Pylee

WEB REFERENCES

1. http://www.wdl.org/en/item/2672/
2. https://nptel.ac.in/courses/109103135/24

E -TEXT BOOKS
1. https://iasexamportal.com/ebook/the-constitution-of-india 2. https://www.india.gov.in/my-government/documents/e-books

MOOCS COURSES
1. http://nludelhi.ac.in/images/moocs/moocs-courses.pdf 2. https://www.classcentral.com/tag/constitutional-law

St. Martin's Engineering College

UGC Autonomous
NBA & NAAC A+ Accredited
Dhulapally, Secunderabad-500 100
www.smec.ac.in

DEPARTMENT OF MECHANICAL ENGINEERING

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

II B. TECH- II SEMESTER (R -22)							
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**	

Course Code	**Category**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
EE411PC	**B. Tech**	**3**	**0**	**0**	**3**	**40**	**60**	**100**

COURSE OBJECTIVES

To learn

1. To introduce the concepts of electrical circuits and its components
2. To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
3. To study and understand the different types of DC/AC machines and Transformers.
4. To import the knowledge of various electrical installations.
5. To introduce the concept of power, power factor and its improvement.
6. To introduce the concepts of diodes & transistors, and
7. To impart the knowledge of various configurations, characteristics and applications.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. To analyze and solve electrical circuits using network laws and theorems.
2. To understand and analyze basic Electric and Magnetic circuits
3. To study the working principles of Electrical Machines
4. To introduce components of Low Voltage Electrical Installations
5. To identify and characterize diodes and various types of transistors

UNIT-I	**D.C. CIRCUITS**	**Classes: 10**

D.C. Circuits: Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation.
A.C. Circuits**:** Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits, Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-II	**ELECTRICAL INSTALLATIONS**	**Classes:11**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB,
Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries.
Elementary calculations for energy consumption, power factor improvement and battery backup.

UNIT-III	ELECTRICAL MACHINES	Classes:10

Working principle of Single-phase transformer, equivalent circuit, losses in transformers, efficiency, Three-phase transformer connections. Construction and working principle of C generators, EMF equation, working principle of DC motors, Torque equations and Speed control of DC motors, Construction and working principle of Three-phase Induction motor, Torques equations and Speed control of Three-phase induction motor. Construction and working principle of synchronous generators.

UNIT-IV	P-N JUNCTION AND ZENER DIODE	Classes: 12

Principle of Operation Diode equation, Volt-Ampere characteristics, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuit, Zener diode characteristics and applications.

Rectifiers and Filters: P-N junction as a rectifier - Half Wave Rectifier, Ripple Factor - Full Wave Rectifier, Bridge Rectifier, Harmonic components in Rectifier Circuits, Filters – Inductor Filters, Capacitor Filters, L- section Filters, π- section Filters.

UNIT-V	BIPOLAR JUNCTION TRANSISTOR (BJT)	Classes: 10

Construction, Principle of Operation, Amplifying Action, Common Emitter, Common Base and Common Collector configurations, Comparison of CE, CB and CC configurations.

Field Effect Transistor (FET): Construction, Principle of Operation, Comparison of BJT and FET, Biasing FET.

TEXT BOOKS

1. Basic Electrical and electronics Engineering –M S Sukija TK Nagasarkar Oxford University.
2. Basic Electrical and electronics Engineering-D P Kothari. I J Nagarath, McGraw Hill Education.

REFERENCE BOOKS

1. Electronic Devices and Circuits – R. L. Boylestad and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.
2. Millman's Electronic Devices and Circuits – J. Millman and C. C. Halkias, Satyabrata Jit, TMH, 1998.
3. Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, McGraw Hill Company, 6th edition.
4. Linear circuit analysis (time domain phasor and Laplace transform approaches) - 2nd edition by
5. Raymond A. De Carlo and Pen-Min-Lin, Oxford University Press-2004.
6. Network Theory by N. C. Jagan& C. Lakshminarayana, B.S. Publications.
7. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.
8. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
9. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
10. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

WEB REFERENCES
1. https://www.electrical4u.com/
2. http://www.basicsofelectricalengineering.com/
3. https://www.khanacademy.org/science/physics/circuits-topic/circuits-resistance/a/eevoltage-and-current
4. https://circuitglobe.com/

E -TEXT BOOKS
1. https://easyengineering.net/basic-electrical-engineering-by-wadhwa/
2. https://easyengineering.net/objective-electrical-technology-by-mehta/

MOOCS COURSE
3. https://nptel.ac.in/courses/108108076/1
4. https://nptel.ac.in/courses/108102146/
5. https://nptel.ac.in/courses/108108076/35

DEPARTMENT OF MECHANICAL ENGINEERING

KINEMATICS OF MACHINERY

II B. TECH- II SEMESTER (R -22)								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
ME402PC	**B. Tech**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**3**	**40**	**60**	**100**

COURSE OBJECTIVES

To learn

1. To introduce the concept of machines, mechanisms and related terminologies and the relative motion, velocity, and accelerations of the various elements in a mechanism.
2. To make the students become familiar with the most commonly used mechanisms such as four bar/slider crank/double slider crank mechanisms and their inversions.
3. To provide an overview of straight-line motion mechanisms, steering mechanisms and Hooke's joint.
4. To familiarize higher pairs like cams and principles of cams design.
5. To understand the kinematic analysis of gears & gear trains.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Understand the various elements in mechanism and the inversions of commonly used mechanisms such as four bar, slider crank and double slider crank mechanisms.
2. Draw the velocity and acceleration polygons for a given configuration of a mechanism.
3. Understand the conditions for straight line motion mechanisms, steering mechanism and the usage of Hooke's joint.
4. Draw the displacement diagrams and cam profile diagram for followers executing different types of motions and various configurations of followers.
5. Calculate the number of teeth and velocity ratio required for a given combination of gears.

UNIT-I	MECHANISMS	Classes: 12

Mechanisms: Elements or Links – Classification – Rigid Link, flexible and fluid link – Types of kinematics pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs – closed and open pairs – constrained motion – completely, partially or successfully and incompletely constrained.

Mechanism and Machines – Mobility of Mechanisms: Grubler's criterion, classification of machines – kinematics chain – inversions of mechanism – inversions of quadric cycle chain,

single and double slider crank chains, Mechanical Advantage.

UNIT-II	KINEMATICS	Classes:10

Kinematics: Velocity and acceleration – Motion of link in machine – Determination of Velocity and acceleration – Graphical method – Application of relative velocity method.
Plane motion of body: Instantaneous center of rotation- centrodes and axodes – Three centers in line theorem – Graphical determination of instantaneous center, determination of angular velocity of points and links by instantaneous center method. Kliens construction - Coriolis acceleration - determination of Coriolis component of acceleration
Analysis of Mechanisms: Analysis of slider crank chain for displacement- velocity and acceleration of slider – Acceleration diagram for a given mechanism.

UNIT-III	STRAIGHT-LINE MOTION MECHANISMS	Classes:12

Straight-line motion mechanisms: Exact and approximate copied and generated types – Peaucellier-Hart - Scott Russel – Grasshopper – Watt -Tchebicheff's and Robert Mechanism - Pantographs Steering gears: Conditions for correct steering – Davis Steering gear, Ackerman's steering gear. Hooke's Joint: Single and double Hooke's joint –velocity ratio – application – problems.

UNIT-IV	CAMS	Classes: 10

Cams: Definitions of cam and followers – their uses – Types of followers and cams – Terminology – Types of follower motion - Uniform velocity, Simple harmonic motion and uniform acceleration and retardation. Maximum velocity and maximum acceleration during outward and return strokes in the above 3 cases.

Analysis of motion of followers: Tangent cam with Roller follower – circular arc cam with straight, concave and convex flanks.

UNIT-V	HIGHER PAIR	Classes: 12

Higher pair: Friction wheels and toothed gears – types – law of gearing, condition for constant velocity ratio for transmission of motion – velocity of sliding

Forms of teeth, cycloidal and involutes profiles – phenomena of interferences – Methods of interference. Condition for minimum number of teeth to avoid interference – expressions for arc of contact and path of contact of Pinion & Gear and Pinion & Rack Arrangements– Introduction to Helical – Bevel and worm gearing

Gear Trains: Introduction – Types – Simple – compound and reverted gear trains – Epicyclic gear train. Methods of finding train value or velocity ratio of Epicyclic gear trains. Selection of gear box - Differential gear for an automobile.

TEXT BOOKS

1. Rattan, S.S, "Theory of Machines", 4th Edition, Tata McGraw-Hill, 2014.
2. Uicker, J.J., Pennock G.R and Shigley, J.E., "Theory of Machines and Mechanisms", 4 th Edition, Oxford University Press, 2014..

REFERENCE BOOKS

1. Engineering Mechanics / Dr. D.V. Sreekanth, Spectrum Publications-2020
2. Sadhu Sigh, "Theory of Machines", Third Edition, Pearson Education, 2012.
3. Thomas Bevan, "Theory of Machines", 3rd Edition, CBS Publishers and Distributors, 2005.
4. Robert L. Norton, "Kinematics and Dynamics of Machinery", Tata McGraw-Hill, 2009.

5. Rao. J.S. and Dukkipati. R.V. "Mechanisms and Machine Theory", Wiley-Eastern Ltd., New Delhi, 1992.

WEB REFERENCES

1. https://www.slideshare.net/senthilkumar1311/kinematics-of-machinery
2. https://lecturenotes.in/notes/18655-note-for-kinematics-of-machinery-km-by-dipesh-shah
3. https://www.academia.edu/10262801/Kinematics_of_Machines_-Notes_Tutorials_Mechanisms_Kinematics_of_Machines
4. http://engineering.myindialist.com/2013/introduction-of-kinematics-ofmachine/#.XWOkM3GUfIU

E -TEXT BOOKS

1. https://engineeringstudymaterial.net/ebook/theory-of-machines-rs-khurmi-jk-gupta/

MOOCS COURSE

1. https://nptel.ac.in/courses/112/104/112104121/
2. https://nptel.ac.in/courses/112/105/112105268/

DEPARTMENT OF MECHANICAL ENGINEERING

FLUID MECHANICS & HYDRAULIC MACHINES

II B. TECH- II SEMESTER (R -22)

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
ME403PC	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

To learn

1. To understand the basic principles of fluid mechanics
2. To identify various types of flows
3. To understand boundary layer concepts and flow through pipes
4. To evaluate the performance of hydraulic turbines
5. To understand the functioning and characteristic curves of pumps

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Able to explain the effect of fluid properties on a flow system.
2. Able to identify type of fluid flow patterns and describe continuity equation.
3. To analyze a variety of practical fluid flow and measuring devices and utilize Fluid Mechanics principles in design.
4. To select and analyze an appropriate turbine with reference to given situation in power plants.
5. To estimate performance parameters of a given Centrifugal and Reciprocating pump.
6. Able to demonstrate boundary layer concepts.

UNIT-I	FLUID STATICS	Classes: 10

Dimensions and units: physical properties of fluids- specific gravity, viscosity, and surface tension - vapour pressure and their influence on fluid motion- atmospheric, gauge and vacuum pressures – measurement of pressure- Piezometer, U-tube and differential manometers

UNIT-II	FLUID KINEMATICS	Classes:11

Fluid kinematics: Stream line, path line and streak lines and stream tube, classification of flows-steady & unsteady, uniform & non-uniform, laminar & turbulent, rotational & irrotational flows-equation of continuity for one dimensional flow and three-dimensional flows.

Fluid dynamics: Surface and body forces –Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its application on force on pipe bend.

UNIT-III	BOUNDARY LAYER CONCEPTS	Classes:10

Boundary Layer Concepts: Definition, thicknesses, characteristics along thin plate, laminar and turbulent boundary layers (No derivation) boundary layer in transition, separation of boundary layer, submerged objects – drag and lift.

Closed conduit flow: Reynold's experiment- Darcy Weisbach equation- Minor losses in pipes-pipes in series and pipes in parallel- total energy line-hydraulic gradient line. Measurement of flow: Pitot tube, venturi meter, and orifice meter, Flow nozzle

UNIT-IV	BASICS OF TURBO MACHINERY	Classes: 12

Basics of turbo machinery: Hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.

Hydraulic Turbines: Classification of turbines, Heads and efficiencies, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design –draft tube theory- functions and efficiency.

Performance of hydraulic turbines: Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer.

UNIT-V	PUMPS	Classes: 10

Centrifugal pumps: Classification, working, work done – barometric head- losses and efficiencies specific speed- performance characteristic curves, NPSH.

Reciprocating pumps: Working, Discharge, slip, indicator diagrams.

TEXT BOOKS
1. Hydraulics, Fluid mechanics and Hydraulic Machinery - MODI and SETH, 21st Edition, standard Book House.
2. Fluid Mechanics and Hydraulic Machines by Er. R. K. Rajput, S. Chand,2019.

REFERENCE BOOKS
1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, S.K. Kataria & Sons,2018
2. Fluid Mechanics and Machinery by D. Rama Durgaiah, New Age International publishers
3. Hydraulic Machines by T.R.Banga & S.C. Sharma, 7th Edition, Khanna Publishers

WEB REFERENCES
1. https://www.sanfoundry.com/best-reference-books-fluid-mechanics-machinery/
2. https://brijrbedu.org/FluidMechanics
3. https://www.indiamart.com/proddetail/a-textbook-of-fluid-mechanics-hydraulic-machines-9-edition-7035085912.html
4. https://qaget.info/?q=fluid+mechanics+and+hydraulic+machines+ds+kumar&spid=18pit cein4253b54pd6l82jt&sub_id=media_ping

E -TEXT BOOKS
1. Text Book of Fluid Mechanics and Hydraulic Machines - Dr. R. K. Bansal, LaxmiA
2. Textbook of Fluid Mechanics & Hydraulic Machines By R K Rajput, S Chand Publications
MOOCS COURSE
1. https://ocw.mit.edu/courses/mechanical-engineering/2-06-fluid-dynamics-spring-2013/
2. https://ocw.tudelft.nl/programs/master/hydraulic-engineering/

DEPARTMENT OF MECHANICAL ENGINEERING

IC ENGINES & GAS TURBINES

II B. TECH- II SEMESTER (R -22)							
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**	
ME404PC	**B. Tech**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		3	**0**	**0**	**3**	**40**	**60**	**100**

COURSE OBJECTIVES

To learn

1. Explain the Components of IC Engines and systems.
2. Analyze the stages of combustion to improve the performance of IC engines with respect to fuel economy and control of emissions in global, environmental and social context.
3. Understand and evaluate the performance analysis of the major components and systems of IC engines and their applications.
4. Explore to the components and working principles of rotary, reciprocating, dynamic and axial compressors.
5. Understand the significance of gas turbines in real context in power generation.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Elaborate the working principles of IC Engine systems and its classification.
2. Explore the combustion stages of SI and CI engines, and factors influence for better combustion.
3. Evaluate the testing and performance parameters of IC engines.
4. Explain the function and working principles of rotary, reciprocating, dynamic axial compressors.
5. Understand the working principle of gas turbine and its classification with thermodynamic analysis.

UNIT-I	I.C. ENGINES	Classes: 12

Classification - Working principles of Four & Two stroke engine, SI & CI engines, Valve and Port Timing Diagrams, Air – Standard, air-fuel and actual cycles - Engine systems – Carburetor and Fuel Injection Systems for SI engines, Fuel injection systems for CI engines, Ignition, Cooling and Lubrication system, Fuel properties and Combustion Stoichiometry.

UNIT-II	COMBUSTION	Classes:13

Normal Combustion and abnormal combustion in SI engines – Importance of flame speed and effect of engine variables – Abnormal combustion, pre-ignition and knocking in SI Engines – Fuel requirements and fuel rating, anti-knock additives – combustion chamber – requirements, types of SI engines.

Four stages of combustion in CI engines – Delay period and its importance – Effect of engine variables

Diesel Knock– Need for air movement, suction, compression and combustion induced turbulence in Diesel engine – open and divided combustion chambers and fuel injection– Diesel fuel requirements and fuel rating

UNIT-III	TESTING AND PERFORMANCE	Classes:10

Parameters of performance - measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, Brake power – Determination of frictional losses and indicated power – Performance test – Heat balance sheet and chart

Classification of compressors – Fans, blowers and compressors – positive displacement and dynamic types – reciprocating and rotary types.

Reciprocating Compressors: Principle of operation, work required, Isothermal efficiency volumetric efficiency and effect of clearance volume, staged compression, under cooling, saving of work, minimum work condition for staged compression

UNIT-IV	ROTARY COMPRESSOR	Classes: 12

Rotary Compressor (Positive displacement type): Roots Blower, vane sealed compressor, mechanical details and principle of working – efficiency considerations.

Dynamic Compressors: Centrifugal compressors: Mechanical details and principle of operation – velocity and pressure variation. Energy transfer-impeller blade shape-losses, slip factor, power input factor, pressure coefficient and adiabatic coefficient – velocity diagrams – power.

Axial Flow Compressors: Mechanical details and principle of operation – velocity triangles and energy transfer per stage degree of reaction, work done factor - isentropic efficiency- pressure rise calculations–polytropic efficiency.

UNIT-V	GAS TURBINES	Classes: 11

Simple Gas Turbine Plant – Ideal Cycle – Closed Cycle and Open Cycle for Gast Turbines, Constant Pressure Cycle, Constant Volume Cycle, Efficiency – Work Ratio and Optimum Pressure Ration for Simple Gas Turbine Cycle. Parameters of Performance, Actual Cycle.

TEXT BOOKS

1. I.C. Engines, V. Ganesan, 4th Edition, Mc Graw Hill.
2. Thermal Engineering, Mahesh M Rathore, Tata Mc Graw Hill, 2010.

REFERENCE BOOKS

1. Applied Thermodynamics for Engineering Technologists, Eastop & McConkey, Pearson
2. Fundamentals of Classical Thermodynamics, Vanwylen G.J., Sonntag R.E., Wiley Eastern
3. Internal Combustion Engines Fundamentals, John B. Heywood, McGraw Hill Ed.

WEB REFERENCES

1. http://webserver.dmt.upm.es/~isidoro/tc3/Thermal%20engineering.pdf
2. https://vakantievillaveersehoek.nl/1253/thermal-engineering-pdf/
3. https://www.sanfoundry.com/best-reference-books-applied-thermal-engineering/

E -TEXT BOOKS

1. A Textbook of Thermal Engineering 15th Edition J K Gupta & R S Khurmi
2. Introduction to Thermal Systems Engineering – Thermodynamics, Fluid Mechanics and
3. Heat Transfer, Michael Moran, Howard Shapiro, Bruce Munson and David DeWitt, Publisher : John Wiley and Sons

MOOCS COURSE

1. https://nptel.ac.in/courses/112107216/
2. https://easyengineering.net/me6404-thermal-engineering

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DEPARTMENT OF MECHANICAL ENGINEERING

INSTRUMENTATION AND CONTROL SYSTEMS

II B. TECH- II SEMESTER (R -22)								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
ME405PC	**B. Tech**	**3**	**0**	**0**	**3**	**40**	**60**	**100**

COURSE OBJECTIVES

To learn

1. To impart the basic knowledge of the functional blocks of measurement systems.
2. To provide technical understanding of various Temperature and pressure measuring instruments.
3. To expose the students to know the working of various physical variable Level, Flow, Speed and Acceleration measuring instruments.
4. To understand the working of various physical and Electrical variables Stress, Humidity, Force, Torque and Power measuring instruments.
5. To understand the concept of control system and calculate transfer functions of mechanical and translational systems with different techniques.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Know the basic knowledge of the functional blocks of measurement systems.
2. Describe the working of various physical variable Temperature and pressure measuring instruments.
3. Explain the working of various physical variable Level, flow, Speed and Acceleration measuring instruments.
4. Understand the working of various physical and Electrical variables Stress, Humidity, Force, Torque and Power measuring instruments.
5. Understand the concept of control system and calculate transfer functions of mechanical and translational systems with different techniques

UNIT-I	INTRODUCTION	Classes: 10

Definition – Basic principles of measurement – Measurement systems, generalized configuration and functional description of measuring instruments – examples. Static and Dynamic performance characteristics– sources of errors, Classification and elimination of errors. Measurement of Displacement: Theory and construction of various transducers to measure displacement – Using Piezo electric, Inductive, capacitance, resistance, ionization and Photo electric transducers; Calibration procedures.

UNIT-II	MEASUREMENT OF TEMPERATURE	Classes:10

Various Principles of measurement-Classification: Expansion Type: Bimetallic Strip- Liquid

in glass Thermometer; Electrical Resistance Type: Thermistor, Thermocouple, RTD; Radiation Pyrometry: Optical Pyrometer; Changes in Chemical Phase: Fusible Indicators and Liquid crystals. Measurement of Pressure: Different principles used- Classification: Manometers, Dead weight pressure gauge Tester (Piston gauge), Bourdon pressure gauges, Bulk modulus pressure gauges, Bellows, Diaphragm gauges. Low pressure measurement – Thermal conductivity gauges, ionization pressure gauges, McLeod pressure gauge.

UNIT-III	MEASUREMENT	Classes:11

Measurement of Level: Direct methods – Indirect methods – Capacitive, Radioactive, Ultrasonic, Magnetic, Cryogenic Fuel level indicators –Bubbler level indicators.

Flow measurement: Rotameter, magnetic, Ultrasonic, Turbine flowmeter, Hot – wire anemometer, Laser Doppler Anemometer (LDA).

Measurement of Speed: Mechanical Tachometers, Electrical tachometers, Non-contact type Stroboscope; Measurement of Acceleration and Vibration: Different simple instruments – Principles of Seismic instruments – Vibrometer and accelerometer using this principle- Piezo electric accelerometer.

UNIT-IV	STRESS-STRAIN MEASUREMENTS	Classes: 12

Stress-Strain measurements: Various types of stress and strain measurements –Selection and installation of metallic strain gauges; electrical strain gauge – gauge factor – method of usage of resistance strain gauge for bending, compressive and tensile strains – Temperature compensation techniques, Use of strain gauges for measuring torque, Strain gauge Rosettes.

Measurement of Humidity: Moisture content of gases, Sling Psychrometer, Absorption Psychrometer, Dew point meter. Measurement of Force, Torque and Power- Elastic force meters, load cells, Torsion meters, Dynamometers.

UNIT-V	ELEMENTS OF CONTROL SYSTEMS	Classes: 10

Elements of Control Systems: Introduction, Importance – Classification – Open and closed systems- Servomechanisms – Examples with block diagrams – Temperature, speed and position control systems- Transfer functions- First and Second order mechanical systems.

TEXT BOOKS

1. Principles of Industrial Instrumentation & Control Systems/Chennakesava R alaavala, - Cengage Learning/1st Edition, 2009.
2. Basic Principles – Measurements (Instrumentation) & Control Systems /S. Bhaskar/ Anuradha Publications

REFERENCE BOOKS

1. Measurement Systems: Applications & design, E. O. Doebelin, TMH, Tata Mcgraw Hill/6th Edition, 2017.
2. Instrumentation, Measurement & Analysis, B.C. Nakra & K.K. Choudhary, TMH, 4th Edition, 2016.
3. Experimental Methods for Engineers / Holman
4. Mechanical and Industrial Measurements / R. K. Jain/ Khanna Publishers.
5. Mechanical Measurements / Sirohi and Radhakrishna / New Age International, 3rd Edition, 2013.

WEB REFERENCES

1. https://meche.mit.edu/featured-classes/measurement-and-instrumentation

E -TEXT BOOKS

1. https://www.elsevier.com/books/instrumentation-and-control-systems/bolton/978-0-12-823471-6

2. https://www.google.co.in/books/edition/Instrumentation_and_Control_Systems/tOcTE AAAQBAJ?hl=en
MOOCS COURSE
3. https://nptel.ac.in/courses/103103037   4. https://nptel.ac.in/courses/107106081

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DEPARTMENT OF MECHANICAL ENGINEERING

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY

II B. TECH- II SEMESTER (R -22)								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
EE412PC	**B. Tech**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		0	**0**	**2**	**1**	**40**	**60**	**100**

COURSE OBJECTIVES

To learn
1. To introduce the concepts of electrical circuits and its components
2. To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
3. To study and understand the different types of DC/AC machines and Transformers.
4. To import the knowledge of various electrical installations.
5. To introduce the concept of power, power factor and its improvement.
6. To introduce the concepts of diodes & transistors, and
7. To impart knowledge of various configurations, characteristics and applications.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to
1. To analyze and solve electrical circuits using network laws and theorems.
2. To understand and analyze basic Electric and Magnetic circuits
3. To study the working principles of Electrical Machines
4. To introduce components of Low Voltage Electrical Installations
5. To identify and characterize diodes and various types of transistors.

LIST OF EXPERIMENTS

PART A: ELECTRICAL

1. Verification of KVL and KCL
2. (i) Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of aSingle-Phase Transformer
   (ii) Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star) in a Three Phase Transformer
3. Measurement of Active and Reactive Power in a balanced Three-phase circuit
4. Performance Characteristics of a Separately Excited DC Shunt Motor
5. Performance Characteristics of a Three-phase Induction Motor
6. No-Load Characteristics of a Three-phase Alternator

PART B: ELECTRONICS

1. Study and operation of
   (i) Multi-meters (ii) Function Generator (iii) Regulated Power Supplies (iv) CRO.
2. PN Junction diode characteristics
3. Zener diode characteristics and Zener as voltage Regulator
4. Input & Output characteristics of Transistor in CB / CE configuration
5. Full Wave Rectifier with & without filters
6. Input and Output characteristics of FET in CS configuration

TEXT BOOKS

1. Basic Electrical and electronics Engineering –M S Sukija TK Nagasarkar Oxford University
2. Basic Electrical and electronics Engineering-D P Kothari. I J Nagarath, McGraw Hill Education

REFERENCE BOOKS

1. Electronic Devices and Circuits – R. L. Boylestead and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.
2. Millman's Electronic Devices and Circuits – J. Millman and C. C. Halkias, Satyabrata Jit, TMH, 2/e, 1998.
3. Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, McGraw Hill Company, 6th edition.
4. Linear circuit analysis (time domain phasor and Laplace transform approaches) - 2nd edition by Raymond A. De Carlo and Pen-Min-Lin, Oxford University Press-2004.
5. Network Theory by N. C. Jagan& C. Lakshminarayana, B.S. Publications.
6. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.
7. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
8. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
9. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989

WEB REFERENCES

1. https://www.electrical4u.com/
2. http://www.basicsofelectricalengineering.com/
3. https://www.khanacademy.org/science/physics/circuits-topic/circuits-resistance/a/eevoltage-and-current
4. https://circuitglobe.com

E -TEXT BOOKS

1. https://easyengineering.net/basic-electrical-engineering-by-wadhwa/
2. https://easyengineering.net/objective-electrical-technology-by-mehta/

MOOCS COURSE

1. https://nptel.ac.in/courses/108108076/1
2. https://nptel.ac.in/courses/108102146/
3. https://nptel.ac.in/courses/108108076/35

DEPARTMENT OF MECHANICAL ENGINEERING

FLUID MECHANICS & HYDRAULIC MACHINES LABORATORY

II B. TECH- II SEMESTER (R -22)								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
ME407PC	**B. Tech**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		0	**0**	**2**	**1**	**40**	**60**	**100**

COURSE OBJECTIVES

To learn
1. To understand the basic principles of fluid mechanics.
2. To identify various types of flows.
3. To understand boundary layer concepts and flow through pipes.
4. To evaluate the performance of hydraulic turbines.
5. To understand the functioning and characteristic curves of pumps.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to
1. Able to explain the effect of fluid properties on a flow system.
2. Able to identify type of fluid flow patterns and describe continuity equation.
3. To analyze a variety of practical fluid flow and measuring devices and utilize fluid mechanics principles in design.
4. To select and analyze an appropriate turbine with reference to given situation in power plants.
5. To estimate performance parameters of a given Centrifugal and Reciprocating pump.
6. Able to demonstrate boundary layer concepts

LIST OF EXPERIMENTS

1. Impact of jets on Vanes.
2. Performance Test on Pelton Wheel.
3. Performance Test on Francis Turbine.
4. Performance Test on Kaplan Turbine.
5. Performance Test on Single Stage Centrifugal Pump.
6. Performance Test on Multi Stage Centrifugal Pump.
7. Performance Test on Reciprocating Pump.
8. Calibration of Venturimeter.
9. Calibration of Orifice meter.
10. Determination of friction factor for a given pipe line.
11. Determination of loss of head due to sudden contraction in a pipeline.
12. Verification of Bernoulli's Theorems.

TEXT BOOKS

1. Basic Electrical and electronics Engineering –M S Sukija TK Nagasarkar Oxford University
2. Basic Electrical and electronics Engineering-D P Kothari. I J Nagarath, McGraw Hill Education

REFERENCE BOOKS

1. Hydraulic Machines by Banga & Sharma, Khanna Publishers.
2. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, Kotaria& Sons.
3. Fluid Mechanics and Machinery by D. Rama Durgaiah, New Age International.

WEB REFERENCES

1. https://qaget.info/?q=fluid+mechanics+and+hydraulic+machines+ds+kumar&spid=18pitcein4b54pd6l82jt&sub_id=media_ping
2. https://qaget.info/?q=fluid+mechanics+and+hydraulic+machines+ds+kumar&spid=18pitcein4b54pd6l82jt&sub_id=media_ping

E -TEXT BOOKS

1. Text Book of Fluid Mechanics and Hydraulic Machines - Dr. R. K. Bansal, Laxmi
2. Textbook of Fluid Mechanics & Hydraulic Machines By R K Rajput, S Chand Publications.

MOOCS COURSE

1. https://ocw.mit.edu/courses/mechanical-engineering/2-06-fluid-dynamics-spring- 2013/
2. https://ocw.tudelft.nl/programs/master/hydraulic-engineering/

DEPARTMENT OF MECHANICAL ENGINEERING

INSTRUMENTATION AND CONTROL SYSTEMS LABORATORY

II B. TECH- II SEMESTER (R -22)

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
ME408PC	**B. Tech**	**0**	**0**	**2**	**1**	**40**	**60**	**100**

COURSE OBJECTIVES

To learn
1. To impart the basic elements of measurement systems.
2. To provide a technical understanding of various measuring instruments.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to
1. Characterize and calibrate measuring devices.
2. Identify and analyze errors in measurement.
3. Analyze measured data using regression analysis.
4. Calibration of Pressure Gauges, temperature, LVDT, capacitive transducer, rotameter.

LIST OF EXPERIMENTS

1. Calibration of Pressure Gauges.
2. Calibration of transducer for temperature measurement.
3. Study and calibration of LVDT transducer for displacement measurement.
4. Calibration of strain gauge for temperature measurement.
5. Calibration of thermocouple for temperature measurement.
6. Calibration of capacitive transducer for angular displacement.
7. Study and calibration of photo and magnetic speed pickups for the measurement of speed.
8. Calibration of resistance temperature detector for temperature measurement.
9. Study and calibration of a rotameter for flow measurement.
10. Study and use of a Seismic pickup for the measurement of vibration amplitude of an engine bed atvarious loads.
11. Study and calibration of McLeod gauge for low pressure.
12. Measurement and control of Pressure of a process using SCADA system.
13. Measurement and control of level in a tank using capacitive transducer with SCADA.
14. Measurement and control of temperature of a process using resistance temperature detector withSCADA.

TEXT BOOKS
1. Principles of Industrial Instrumentation & Control Systems/Chennakesava R alaavala, - Cengage Learning/1st Edition, 2009.   2. Basic Principles – Measurements (Instrumentation) & Control Systems /S. Bhaskar/ Anuradha Publications

REFERENCE BOOKS
1. Measurement Systems: Applications & design, E. O. Doebelin, TMH, Tata Mcgraw Hill/6th Edition, 2017.   2. Instrumentation, Measurement & Analysis, B.C. Nakra & K.K. Choudhary, TMH, 4th Edition, 2016.   3. Experimental Methods for Engineers / Holman   4. Mechanical and Industrial Measurements / R. K. Jain/ Khanna Publishers.   5. Mechanical Measurements / Sirohi and Radhakrishna / New Age International, 3rd Edition, 2013.

WEB REFERENCES
1. https://meche.mit.edu/featured-classes/measurement-and-instrumentation

E -TEXT BOOKS
1. https://www.elsevier.com/books/instrumentation-and-control-systems/bolton/978-0-12-823471-6   2. https://www.google.co.in/books/edition/Instrumentation_and_Control_Systems/tOcTE AAAQBAJ?hl=en

MOOCS COURSE
1. https://nptel.ac.in/courses/103103037   2. https://nptel.ac.in/courses/107106081

DEPARTMENT OF MECHANICAL ENGINEERING

GENDER SENSITIZATION LAB

II B. TECH- II SEMESTER (R -22)								
Course Code	**Category**	**Hours / Week**		**Credits**	**Maximum Marks**			
GS409MC	**B. Tech**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		0	**0**	**2**	**0**	**100**	**0**	**100**

COURSE OBJECTIVES

1. To develop students' sensibility with regard to issues of gender in contemporary India.
2. To provide a critical perspective on the socialization of men and women.
3. To introduce students to information about some key biological aspects of genders.
4. To expose the students to debates on the politics and economics of work.
5. To help students reflect critically on gender violence.
6. To expose students to more egalitarian interactions between men and women.

COURSE OUTCOMES

1. Students will have developed a better understanding of important issues related to gender in contemporary India.
2. Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
3. Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
4. Students will acquire insight into the gendered division of labor and its relation to politics and economics.
5. Men and women students and professionals will be better equipped to work and live together as equals.
6. Students will develop a sense of appreciation of women in all walks of life.
7. Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

UNIT-I	UNDERSTANDING GENDER

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men -Preparing for Womanhood. Growing up Male. First lessons in Caste.

UNIT-II	GENDER ROLES AND RELATIONS

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles- Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences- Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary

UNIT-III	GENDER AND LABOUR

Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work.
Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

UNIT-IV	GENDER - BASED VIOLENCE

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No!-Sexual Harassment, not Eve-teasing-Coping with Everyday Harassment- Further Reading: "Chupulu".
Domestic Violence: Speaking OutIs Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life…."

UNIT-V	GENDER AND CULTURE

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals
Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks- The Brave Heart.

ASSESSMENT AND GRADING

- Discussion & Classroom Participation: 20%
- Project/Assignment: 30%
- End Term Exam: 50%

TEXTBOOK

1. "Towards a World of Equals: A Bilingual Textbook on Gender" written by A.Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu published by Telugu Akademi, Telangana Government in 2015.

NOTE

1. Since it is Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.
2. Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments. Apart from the above prescribed book, Teachers can make use of any authentic materials related to the topics given in the syllabus on "Gender".