Curriculum for B. Tech

Mechanical Engineering

(From The Academic Year 2020)

Approved in Senate 43 & 44

Indian Institute of Information Technology, Design and Manufacturing, Kancheepuram
Chennai-600 127

Curriculum & Syllabus

Semester 1							
S.No	Course Code	Course Name	Category	L	T	P	C
1	MA1000	Calculus	BSC	3	1	0	4
2	PH1000	Engineering Electromagnetics	BSC	3	0	0	3
3	EC1000	Electrical Circuits for Engineers	BEC	3	1	0	4
4	CS1000	Problem Solving and Programming	BEC	3	0	0	3
5	ME1000	Materials for Engineers	BEC	3	0	0	3
6	DS1000	Foundation for Engineering and Product Design	DSC	1	2	0	3
7	PH1001	Engineering Electromagnetics Practice	BSC	0	0	3	1.5
8	CS1001	Problem Solving and Programming Practice	BEC	0	0	3	1.5
9	HS1000	Effective Language and Communication Skills	HSC	1	0	2	2
10	HS1001	NSO/NCC/SSG/NSS	HSC	0	0	2	P/F
							25.0

Semester 2							
S.No	Courses Code	Course Name	Category	L	T	P	C
1	MA1001	Differential Equations	BSC	3	1	0	4
2		Science Elective Course 1	SEC	3	1	0	4
3	ME1001	Engineering Graphics	BEC	2	0	4	4
4	CS1002	Elementary Data Structures and Logical Thinking	ITC	3	0	0	3
5	DS1001	Sociology of Design	DSC	1	2	0	3
6	ID1000	Design and Manufacturing Lab	ITC	0	0	2	1
7	ME1004	Engineering Mechanics	PCC	3	0	0	3
8	CS1003	Elementary Data Structures and Logical Thinking Practice	ITC	0	0	4	2
9	ME1005	Mechanics and Materials Practice	PCC	0	0	2	1
10	HS1001	NSO/NCC/SSG/NSS	HSC	0	0	2	P/F
11	HS1002	Earth, Environment and Design	HSC	1	0	0	P/F
							25.0

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Semester 3							
S.No	Course Code	Course Name	Category	L	T	P	C
1		Science Elective Course 2	SEC	3	1	0	4
2	DS2000	Systems Thinking for Design	DSC	1	2	0	3
3	ME2000	Engineering Thermodynamics	PCC	3	1	0	4
4	ME2001	Fluid Mechanics and Fluid Machinery	PCC	3	1	0	4
5	ME2002	Mechanics of Materials	PCC	3	1	0	4
6	ME2003	Manufacturing Processes - 1	PCC	3	1	0	4
7	ME2004	Manufacturing Processes Practice - 1	PCC	0	0	4	2
8	HS2000	Indian Constitution, Essence of Indian Traditional Knowledge	HSC	1	0	0	P/F
							25.0

Semester 4							
S.No	Course Code	Course Name	Category	L	T	P	C
1		Science Elective Course 3	SEC	3	1	0	4
2	DS2001	Smart Product Design	DSC	1	2	0	3
3	ME2005	Heat Transfer	PCC	3	1	0	4
4	ME2006	Kinematics and Dynamics of Machinery	PCC	3	1	0	4
5	ME2007	Manufacturing Processes - 2	PCC	3	1	0	4
6	ME2008	Fluid Mechanics and Heat Transfer Practice	PCC	0	0	3	1.5
7	ME2009	Mechanical Design Practice	PCC	0	0	4	2
8	ME2010	Manufacturing Processes Practice - 2	PCC	0	0	3	1.5
9	HS2001	Human Values and Stress Management	HSC	1	0	0	P / F
							24.0

Semester 5							
S.No	Courses Code	Course Name	Category	L	T	P	C
1	CS2005	Introduction of Data Science for Engineers	ITC	3	0	2	4
2	DS3000	Entrepreneurship and Management Functions	DSC	1	2	0	3
3	ME3000	Design of Machine Elements	PCC	3	1	0	4
4	ME3001	Measurement and Automation	PCC	3	1	0	4
5	ME3002	Thermal Engineering Practice	PCC	0	0	3	1.5
6	ME3003	Production Drawing and Inspection Practice	PCC	0	0	3	1.5
7		Professional Elective Course 1	PEC	3	1	0	4
8	HS3000	Professional Ethics and Organizational Behaviour	HSC	1	0	0	P/F
							22.0

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Semester 6							
S.No	Courses Codes	Course Name	Category	L	T	P	C
1	DS3001	Prototyping and Testing	DSC	1	2	0	3
2		Professional Elective Course 2	PEC	3	1	0	4
3		Professional Elective Course 3	PEC	3	1	0	4
4		Elective Course 1	ELC	3	1	0	4
5		Elective Course 2	ELC	3	1	0	4
6	HS3001	Professional Communication	HSC	1	0	2	2
7	HS3002	Intellectual Property Rights	HSC	1	0	0	P/F
							21.0
Semester 7							
S.No	Courses Codes	Course Name	Category	L	T	P	C
1		Elective Course 3	ELC	3	1	0	4
2		Elective Course 4	ELC	3	1	0	4
3		Elective Course 5	ELC	3	1	0	4
4	ME4000	Internship	PCD				P/F
							12.0
Semester 8							
S.No	Courses Codes	Course Name	Category	L	T	P	C
1		Elective Course 6	ELC	3	1	0	4
2	ME4001	Project	PCD	0	0	16	8
							12.0

Curriculum & Syllabus

Semester wise Credit Distribution

Category	Semester wise Structure									
	S1	S2	S3	S4	S5	S6	S7	S8	Total	%
Basic Science Course (BSC)	8.5	4	0	0	0	0	0	0	12.5	7.5
Science Elective Course (SEC)	0	4	4	4	0	0	0	0	12	7.2
Basic Engineering Course (BEC)	11.5	4	0	0	0	0	0	0	15.5	9.3
Design Course (DSC)	3	3	3	3	3	3	0	0	18	10.8
IT Skill Course (ITC)	0	6	0	0	4	0	0	0	10	6.0
Professional Core Course (PCC)	0	4	18	17	11	0	0	0	50	30.1
Professional Elective Course (PEC)	0	0	0	0	4	8	0	0	12	7.2
Elective Course (ELC)	0	0	0	0	0	8	12	4	24	14.5
Humanities and Social Science Course (HSC)	2	0	0	0	0	2	0	0	4	2.4
Professional Career Development (PCD)	0	0	0	0	0	0	0	8	8	4.8
Total	25.0	25.0	25.0	24.0	22.0	21.0	12.0	12.0	166.0	100.0

Curriculum & Syllabus

Course Name	Calculus	Course Code	MA1000			
Offered by Department	SH -Mathematics	Structure (LTPC)	3	1	0	4
To be offered for	B.Tech	Course type	Core			
Pre-requisite	NIL	Approved In	Senate-43			
Learning Objectives	The course will introduce the student to basic concepts in Calculus such as convergence, differentiation & integration and its applications.					
Contents of the course	• Limit and Continuity of functions defined on intervals, Intermediate Value Theorem, Differentiability, Rolle's Theorem, Mean Value Theorem, Taylor's Formula (5) • Sequences and series (7) • Definite integral as the limit of sum – Mean value theorem – Fundamental theorem of integral calculus and its applications (9) • Functions of several variables – Limit and Continuity, Geometric representation of partial and total increments Partial derivatives – Derivatives of composite functions (8) • Directional derivatives – Gradient, Lagrange multipliers – Optimization problems (7) • Multiple integrals – Evaluation of line and surface integrals (6)					
Essential Reading	•Thomas. G.B, and Finney R.L, Calculus, Pearson Education, 2007.					
Supplementary Reading	1. Piskunov. N, Differential and Integral Calculus, Vol. I & II, Mir. Publishers, 1981. 2. Kreyszig. E, Advanced Engineering Mathematics, Wiley Eastern 2007. 3. J Hass, M D Weir, F R Giordano, Thomas Calculus, 11th Edition, Pearson.					

Curriculum & Syllabus

Course Name	Engineering Electromagnetics	Course Code	MA1000			
Offered by Department	SH -Physics	Structure (LTPC)	3	0	0	3
To be offered for	B. Tech	Course Type	Core			
Pre-requisite	NIL	Approved In	Senate-43			
Learning Objectives	The objective of this course is to give an idea how the electromagnetic wave behaves. This also provides an understanding of theories of electrostatics, magnetism and electrodynamics with their applications. It will enhance the problem solving capacity of the student.					
Contents of the course	• Vectors - an introduction; Unit vectors in spherical and cylindrical polar co-ordinates; Concept ofvector fields; Gradient of a scalar field; flux, divergence of a vector, Gauss's theorem, Continuity equation; Curl –rotational and irrational vector fields, Stoke's theorem. (12) • Electrostatics: • Electrostatic potential and field due to discrete and continuous charge distributions, boundary condition, Energy for a charge distribution, Conductors and capacitors, Laplace's equation Image problem, Dielectric polarization, electric displacement vector, dielectric susceptibility, energy in dielectric systems. (10) • Magneto statics: • Lorentz Force Law Bio-Savart's law and Ampere's law in magneto statics, Divergence and curl of B, Magnetic induction due to configurations of current-carrying conductors, Magnetization and bound currents, Energy density in a magnetic field Magnetic permeability and susceptibility. (10) • Electrodynamics: • Electromotive force, Time-varying fields, Faradays' law of electromagnetic induction, • Self and mutual inductance, displacement current, Maxwell's equations in free space. Boundary condition, propagation in linear medium. Plane electromagnetic waves—reflection and refraction,electromagnetic energy density, Pointing Vector.(10)					
Essential Reading	1. W. H. Hayt and J. A. Buck, Engineering Electromagnetics, Tata McGraw Hill Education Pvt.Ltd, 2006.					
Supplementary Reading	1. W. H. Hayt, J. A. Buck and M. Jaleel Akhtar, Engineering Electromagnetics, McGraw Hill (India) Education Pvt. Ltd, Special Indian Edition 2020. 2. Purcell. E.M, Electricity and Magnetism Berkley Physics Course, V2, Tata McGraw Hill, 2008. 3. Feynman. R.P, Leighton. R.B, Sands. M, The Feynman Lectures on Physics, Narosa Publishing House, Vol. II, 2008. Hill, 2008. 4. G. B. Arfken, H. J. Weber and F. E. Harris, Mathematical Methods for Physicists, Academic Press, 2013					

Curriculum & Syllabus

Course Name	Electrical Circuits for Engineers	Course Code	EC1000			
Offered by Department	Electronics and Communication Engineering	Structure (LTPC)	3	1	0	4
To be offered for	B TECH	Course Type	Core			
Pre-requisite	NIL	Approved In	Senate-43			
Learning Objectives	This course aims to equip the students with a basic understanding of electrical circuits andmachines for specific types of applications. This course also equips students with an ability to understand basics of analog and digital electronics.					
Learning Outcomes	The students shall develop an intuitive understanding of the circuit analysis, basic conceptsof electrical machines, and electronic devices and circuits and be able to apply them inproduct design and development					
Contents of the course *(With approximate break-up of hours)*	Elements in electrical circuits: R, L, C, voltage and current sources, Ohm's law, Kirchoff'sLaws **(4)** Network analysis: Nodal and mesh analysis with only independent sources **(4)** Network theorems: Superposition, Thevenin's & Norton's, Maximum power transfertheorems **(4)** DC circuits: Response of RC, RL and RLC circuits **(6)** AC circuits: AC signal measures, Phasor analysis of single-phase AC circuits, Three phase AC circuits **(6)** Machines: Transformers, DC generator, DC motor, AC induction machines **(8)** Diodes: V-I characteristics, applications -rectifiers, clippers, clampers **(2)** Op-amps: gain, feedback, applications - inverting/non-inverting amplifiers, sum anddifference amplifier, comparators **(4)** Logic gates and combinational circuits – Basic gates, Karnaugh maps, Full adder, half adder **(4)**					
Essential Reading	Edward Hughes, Ian McKenzie Smith, John Hiley, Keith Brown, 'Hughe's Electrical andElectronic Technology', 10th edition, Pearson, 2010					
Supplementary Reading	1. Charles Alexander and Matthew Sadiku 'Fundamentals of Electric Circuits' 7th Edition, McGraw Hill, 2021 2. C. H. Roth, Jr., Larry R Kinney, 'Fundamentals of Logic Design', 7th Edition, Cengage Learning, 2013. 3. Jacob Millman, Christos C Halkais, Satyabrata Jit, 'Millman's Electronic Devices and Circuits', 4th Edition, Mc Graw Hill India, 2015 4. Stephen D Umans, 'Fitzgerald & Kingsley's Electric Machinery', McGraw-Hill, 7thed. 2020.					

Curriculum & Syllabus

Course Name	Problem Solving and Programming	Course Code	CS1000			
Offered by Department	Computer Science Engineering	Structure (LTPC)	3	0	0	3
To be offered for	B.Tech	Course type	Core			
Prerequisite	NIL	Approved In	Senate -43			
Learning Objectives	Focus is on problem solving using computers with C programming as the language. Data representation, base conversions, arithmetic in fixed and floating point representations, and problems related to this shall be covered. The sequence, selection and repetition statements in C programming language shall be discussed with case studies. The practice component of this course shall supplement theory by providing hands-on experience.					
Learning Outcomes	The teaching and assessment shall ensure that given a computational problem, students can use computers as a tool to model and solve the problem. Writing pseudo codes and C programming using basic programming constructs are expected out of the students. Students are expected to be conversant in number conversions and representations.					
Course Contents (with approximate breakup of hours for lecture/ tutorial/practice)	• Computing Machine - Need and Applications - Evolution of Computing Machines (Calculators through Computers) Number Representation - Fixed and Floating Point - Base Conversions: Binary, Decimal, Octal, Hexa decimal number systems and conversions. (8 hours) • Basic programming constructs in C – Data types in C – Input and output statements – Formatted input/output - Control strings - return types - Case studies involving sequence statements (4 hours) • Operators - Arithmetic, logical, relational, shift, unary operators - Precedence and Associativity (3 hours) • Selection Statements: IF-ELSE, SWITCH-CASE - Programs involving sequence and selection - GOTO statements - break statement - Nested IF - Switch inside if and vice-versa (5 hours) • Repetition Statements: FOR, WHILE - Programs involving sequence, selection and repetition - continue statement - Nested loops (5 hours) • Introduction to Arrays and Strings - Array manipulation - string manipulation - string operations - multi-dimensional arrays (6 hours) • Functions in C – Function declaration, definition – scope -storage Class-Built and user defined functions –Recursive functions (7 hours) • Introduction to Pointers, Dynamic Memory Allocation, Structures and File processing (7 hours)					
Essential Reading	Deitel P J and Deitel H M, C : How To Program, Prentice Hall, 7th Edn, 2012.					
Supplementary Reading	Kernighan, Ritchie D, The C Programming Language, Prentice Hall, 2 Edn, 1988					

Curriculum & Syllabus

Course Name	Materials for Engineers	Course Code	ME1000			
Offered by Department	Mechanical Engineering	Structure (LTPC)	3	0	0	3
To be offered for	B. Tech	Course Type	Core			
Pre-requisite	NIL	Approved In	Senate- 43			
Learning Objectives	• To provide overview of microstructure and properties of various engineering materials • To explore relations between performance of engineering products and microstructure, properties of materials that are used to construct them.					
Learning Outcomes	After the completion of the course, students will be able: • To explain the microstructure and properties of materials like steels, polymers, ceramics, and composites. • To understand the correlation of microstructure-properties-performance of materials so as to select suitable materials for engineering products.					
Contents of the course	• Classification and evolution of engineering materials, crystal structure, defects, crystallographic planes, directions, slip, deformation mechanical behavior, strengthening mechanisms, microstructure and properties of metal alloys (12) • Properties and processing of polymers, ceramics and composite materials, microstructure-property relationships (9) • Electrical, electronic and magnetic properties of materials, microstructure-property relationships (6) • Introduction to Nano, Bio, Smart and Functional materials. (3) • Introduction to selection of materials, Product based case studies on microstructure-property-performance of materials in the design of automobile; aircraft structures; e-vehicles; energy storage; electronic, optical and magnetic devices; and biomedical devices. (12)					
Essential Reading	1. William D. Callister Jr., David G. Rethwisch, "Materials Science and Engineering: An Introduction", 10th Edition, Wiley, 2018. 2. Michael Ashby, Hugh Shercliff, David Cebon, "Materials – Engineering, Science, Processing and Design", 4th Edition, Butterworth-Heinemann, 2018.					
Supplementary Reading	1. V Raghavan, "Materials Science and Engineering: A First Course, 5th Ed, 2007, PHI India. 2. Donald R. Askeland K Balani, "The Science and Engineering of Materials," 7th Edition, Cengage Learning, 2016. 3. Michael Ashby, "Materials Selection in Mechanical Design", 5th Edition, Butterwoth-Heinemann, 2016.					

Curriculum & Syllabus

Course Name	Foundation for engineering and product design	Course Code	DS1000			
Offered by Department	SIDI	Structure (LTPC)	1	2	0	3
To be offered for	B.Tech	Course Type	Core			
Prerequisite	NIL	Approved In	Senate -43			
Learning Objectives	The objective of this foundation program is to help students coming from +2 background to: • Unlearn limiting assumptions, risk avoidance, fear of failure • Awaken their senses & rediscover their creative selves • Experience the impact of design and technology in everyday objects					
Learning Outcomes	At the end the course, the student should • demonstrate qualities of immersion in a task; • unlearn key limiting assumptions; • become comfortable with sketch-thinking and develop skills in design sketching; • be excited by the potential of technology and design in improving lives;					
Contents of the course (With approximate break up of hours)	**Module-1: Induction: (5 hrs.)** • History of the place; the industrial ecosystem; institution • Exercises to improve interaction; local visits; **Module-2: Learn to observe nature and self (12 hrs)** • Know your context - physical and social; • Unlearning activities; Start journaling • Observe wholes-parts (trees-leaves); variety of leaves; colors • Document in a variety of ways - collage; sketch, paint, photograph, video **Module-3: Learn to observe everyday objects (15 hrs)** • Unbundle everyday objects, observe, reorganize • Whole-part relations; System physics; • Observe interplay of art, design, culture, technology in everyday objects **Module-4: Visualize and Realize 3D objects (15 hrs)** • Introduction to design sketching-1 (paper/pencil) • Concepts of perspective drawing and product sketching. • Introduction to color theory - mixing of colors to get different shades • Explore variations on the form of chosen objects • Realize designs with tools/materials (Origami; Clay; Foam cutting; Laser cutting; Glues) • Introduction to digital sketching & 3D printing Evaluation: Continuous assessment (80%); Final Form Designs Presentation (20%)					
Essential & Supplementary Reading	1. Kevin Henry, Drawing for Product Designers, Laurence King Publishing, 2012, ISBN: 9781856697439 2. Koos Eissen and Roselien Steur, Sketching – The Basics, BIS Publishers, 2011, ISBN: 9789063695347 3. Thomas C Wang, Pencil Sketching, John Wiley, 2002, ISBN: 9780471218050 4. Wucius Wong, Principles of Color Design: Designing with Electronic Color, John Wiley, 2nd Edition, 1996, ISBN: 9780471287087					

Curriculum & Syllabus

Course Name	Engineering Electromagnetics Practice	Course Code	PH1001			
Offered by Department	SH-Physics	Structure (LTPC)	0	0	3	1.5
To be offered for	B.Tech	Course Type	Core			
Pre-requisite	NIL	Approved In	Senate-43			
Learning Objectives	The objective of this course is to give a hand on experience how the electromagnetic wave behaves in different situations. The students will be able to relate the knowledge they have got in the theory class with their experience. This course will enhance their skill of handling instruments and the presentation of the results obtained from the experiments.					
Contents of the course	Electrical and magnetic properties of materials based on the concept of electrical polarization, magnetization of materials will be studied in various experiments. Experiments based on the concept of phenomena such as interference, diffraction etc. related to electromagnetic waves will be done here and these methods will be applied to measure some unknown physical quantities such as wavelength of a light, diameter of a very thin wire, very small aperture for light etc.					
Essential Reading	1. IIITD&M Laboratory manual for Electromagnetic Wave Practice					
Supplementary Reading	1. W. H. Hayt and J. A. Buck, Engineering Electromagnetics, Tata McFraw Hill Education Pvt. Ltd,2006.					

Curriculum & Syllabus

Course Name	Problem Solving and Programming Practice	Course Code	CS1001			
Offered by Department	Computer Science Engineering	Structure (LTPC)	0	0	3	1.5
To be offered for	B.Tech	Course Type	Core			
Prerequisite	NIL	Approved In	Senate-43			
Learning Objectives	Focus is on problem solving using computers with C programming as the language. The sequence, selection and repetition statements in C programming language shall be discussed with case studies.					
Learning Outcomes	The teaching and assessment shall ensure that given a computational problem, students can use computers as a tool to model and solve the problem. Writing pseudo codes and C programming using basic programming constructs are expected out of the students. Students are expected to be conversant in number conversions and representations.					
Course Contents (with approximate breakup of hours for lecture/ tutorial/practice)	• Introduction to text editors - basic text processing - case studies involving office software - doc and ppt creation • Introduction to Linux commands - file/directory creation - copy, move, pdf creation, zip commands • Case studies using sequence statements - input/output statements - arithmetic with precedence and associativity. • Case studies involving selection and repetition statements - functions – recursion					
Essential Reading	Deitel P J and Deitel H M, C : How To Program, Prentice Hall, 7th Edn, 2012.					
Supplementary Reading	Kernighan, Ritchie D, The C Programming Language, Prentice Hall, 2 Edn., 1988					

Curriculum & Syllabus

<table>
<tr><td>Course Name</td><td>Effective Language and Communication Skills</td><td>Course Code</td><td colspan="4">HM1000</td></tr>
<tr><td>Offered by Department</td><td>SH-English</td><td>Structure(LTPC)</td><td>1</td><td>0</td><td>2</td><td>2</td></tr>
<tr><td>To be offered for</td><td>B.Tech</td><td>Course Type</td><td colspan="4">Core</td></tr>
<tr><td>Prerequisite</td><td>NIL</td><td>Approved In</td><td colspan="4">Senate-43</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">• Hone LSRW and practice critical thinking
• Enable students to speak and write grammatically acceptable sentences
• Train students in technical communication
• Cultivate interest to learn language and to build the confidence to communicate in English
• Develop an interest in updating their language skills through continuous learning
• Connecting personal growth with improvement in their proficiency in English</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">• Able to communicate effectively with grammatically acceptable constructions and appropriate wordsin formal and informal situations
• Can extract information effectively and able to think critically
• Able to present technical content confidently</td></tr>
<tr><td>Course Contents (with approximate breakup of hours for lecture/ tutorial/ be done practice)</td><td colspan="6">• Introduction: Language, effective communication, ethics and aesthetics of communication (L1)
• Phonetics – sounds, pronunciation of words, stress, intonation, listening, Varieties of English (L3, P4)
• Sentence structure, concord, punctuation, stylistic errors, common errors (L3, P4)
• Reading and comprehension (L2, P5)
➢ Different types of reading, analyzing the organization of the text
➢ Critical thinking- thesis statement, argument, hypothesis, order, reason, evidence, consistency,tautology, conclusion
• Exercises for vocabulary enrichment (for daily practice)
• Speaking (L2, P5)
➢ Barriers to effective communication, technical presentation and presentation skills, self-introduction,
➢ Requests, enquiry, suggestion in formal and informal situations, reporting an event, grouppresentation – debate
• Writing (L3, P8)
➢ Writing formal letters, email, résumé,
➢ Data interpretation, reports, product description/requirements/ technical instructions, recordingobservations
➢ The language of content strategy - voice and tone strategy - the language of localization – textanalysis tools
➢ Plagiarism – the importance of documentation, different methods of note-taking
➢ Essays/story/ book & movie reviews/writing for social media/blogging/ journaling
• Life lessons through stories and activities (P2)</td></tr>
<tr><td>Essential & Supplementary Reading</td><td colspan="6">1. Tebeaux, Elizabeth, and Sam Dragga. The Essentials of Technical Communication. OUP, 2018.
2. Rizvi, M Ashraf. Effective Technical Communication. McGraw-Hill, 2017
3. Hancock, Mark. English Pronunciation in Use: Intermediate Self-study and Classroom Use.CUP,2012.
4. Cottrell, Stella. Critical Thinking Skills: Developing Effective Argument and Analysis. Palgrave,2005.
5. Gower, Roger. Grammar in Practice. CUP, 2005.
6. Paterson, Ken. Oxford Living Grammar. OUP, 2014.
7. Sabin, William A. The Gregg Reference Manual: A Manual of Style, Grammar, Usage, andFormatting. McGraw-Hill, 2011.
8. Fitikides, T. J. Common Mistakes in English. London: Orient Longman, 1984.</td></tr>
</table>

	Leech, Geoffrey and Jan Svartvik. A Communicative Grammar of English. Routledge, 2013. 9. Astley, Peter and Lewis Lansford. *Oxford English for Careers: Engineering*. OUP, 2013. 10. Savage, Alice and Patricia Mayer. *Effective Academic Writing*. OUP, 2013 11. Harari, Yuval Noah. *Sapiens: A Brief History of Humankind*. Vintage, 2014. 12. https://www.ted.com/ 13. https://www.bbc.co.uk/learningenglish/features/pronunciation/tims-pronunciation-workshop-ep-13 14. https://learnenglish.britishcouncil.org/skills/listening 15. https://www.nationalgeographic.com/podcasts/overheard 16. https://www.youtube.com/user/NatureVideoChannel 17. https://www.youtube.com/watch?v=Aj-EnsvU5Q0&list=PLcetZ6gSk969oGvAI0e4_PgVnlGbm64bp 18. https://www.merriam-webster.com/word-of-the-day 19. https://www.newyorker.com/tag/book-reviews

Curriculum & Syllabus

Course Name	Differential Equations	Course Code	MA1001			
Offered by Department	SH-Mathematics	Structure (LTPC)	3	1	0	3
To be offered for	B.Tech	Course Type	Core			
Pre-requisite	NIL	Approved In	Senate-44			
Learning Objectives	To provide an exposure to the theory of ODEs & PDEs and the solution techniques.					
Contents of the course	Linear ordinary differential equations with constant coefficients, method of variation of parameters – Linear systems of ordinary differential equations (10) Power series solution of ordinary differential equations and Singular points Bessel and Legendre differential equations; properties of Bessel functions and Legendre Polynomials (12) Fourier series (6) Laplace transforms elementary properties of Laplace transforms, inversion by partial fractions, convolution theorem and its applications to ordinary differential equations (6) Introduction to partial differential equations, wave equation, heat equation, diffusion equation(8)					
Essential Readings	1. Simmons. G.F, Differential Equations, Tata McGraw Hill, 2003. 2. Kreyszig. E, Advanced Engineering Mathematics, Wiley, 2007.					
Supplementary Reading	1. William. E. Boyce and R. C. Diprima, Elementary Differential Equations and Boundary Value Problems, John Wiley, 8 Edn, 2004. 2. Sneddon. I, Elements of Partial Differential Equations, Tata McGraw Hill, 1972. 3. Ross. L.S, Differential Equations, Wiley, 2007. 4. Trench, W, Elementary Differential Equations, http://digitalcommons.trinity.edu/mono					

Curriculum & Syllabus

<table>
<tr><td>Course Name</td><td>Engineering Graphics</td><td>Course Code</td><td colspan="4">ME1001</td></tr>
<tr><td>Offered by Department</td><td>Mechanical Engineering</td><td>Structure(LTPC)</td><td>2</td><td>0</td><td>4</td><td>4</td></tr>
<tr><td>To be offered for</td><td>B.Tech</td><td>Course Type</td><td colspan="4">Core</td></tr>
<tr><td>Prerequisite</td><td>NIL</td><td>Approved In</td><td colspan="4">Senate-44</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">• To introduce the basic concepts and techniques of technical drawing.
• 2D and 3D representation of various shapes/objects and its engineering applications.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">Students will acquire visualization skills and will be able to prepare technical drawings and 3D models using computer aided tools.</td></tr>
<tr><td>Course Contents (with approximate breakup of hours for lecture/tutorial/practice)</td><td colspan="6">• Role of technical drawing in product development process, Basics of technicaldrawing, Standards, Dimensioning principles. (L2+P4 hrs.)
• Computer aided drafting. (L2+P8 hrs.)
• Engineering curves and its applications. (L4+P8 hrs.)
• Principles of orthographic projection. Orthographic projection of points, lines, planes and regular solids, Exercises related to engineering applications. (L7+P8hrs.)
• Principles of isometric projections. Orthographic to isometric and isometric to orthographic transformation of objects. (L3+P8 hrs.)
• Section and intersection of regular solids and their lateral developments.
• (L6+P12 hrs.)
• Introduction to 3D modelling of shapes and objects; electrical CAD. (L2+P4hrs.)</td></tr>
<tr><td>Essential Reading</td><td colspan="6">1. K. Venugopal and V Prabhu Raja, Engineering Drawing + AutoCAD, New Age International (P) Limited. 5th Edition Reprint: July, 2016
2. Narayana. K.L, and Kannaiah. P, Engineering Drawing, Scitech Pub. Pvt. Ltd,
3. 3rd Edition.</td></tr>
<tr><td>Supplementary Reading</td><td colspan="6">1. PI Varghese, Engineering Graphics, McGraw Hill Education, 2013.
2. Bhatt. N.D, Engineering Drawing – Plane and Solid Geometry, Charotar Publishing House Pvt. Ltd., 53 Edition 2014.</td></tr>
</table>

Curriculum & Syllabus

Course Name	Elementary Data Structures and Logical Thinking	Course Code	CS1002			
Offered by Department	Computer Science Engineering	Structure(LTPC)	3	0	0	3
To be offered for	B.Tech	Course Type	Core			
Prerequisite	NIL	Approved In	Senate-44			
Learning Objectives	The focus is to discuss how data is organized and retrieved in computers. Elementary data structures with supporting operations shall be discussed. Studentswill be exposed to art of logical thinking through algorithmic puzzles.					
Learning Outcomes	At the end of the course, given a computational problem, students are expected tocome up with an algorithm and a suitable data structure, and implement the same using a programming language.					
Course Contents (with approximate breakup of hours for lecture/ tutorial/practice)	• History of Computing and Computers – the need for data organization – introduction to abstract data types and data structures (3L) • Introduction to logical thinking (algorithmic thinking) through simple examples.Introduction to Elementary data structures - Discussion on Stacks and Queues with supporting operations – implementation using arrays and lists – implementation of stack using queues and vice-versa – variants of stacks and queues – algorithmic puzzles (10L) • Arrays and applications - algorithmic puzzles involving arrays- sorting andsearching. (8L) • Discussion on linked lists with various supporting operations- algorithmic puzzles involving lists. Types of Lists – double, circular – the need for double and circular linked lists – puzzles involving lists (10L) • Introduction to trees, binary trees, search trees (7L) • Applications of elementary data structures in computer science and engineering. (7L)					
Essential Reading	1. M. A. Weiss, Data Structures and Algorithm Analysis in C, 2nd ed., Pearson,2002. 2. Anany Levitin and Maria Levitin, Algorithmic Puzzles, Oxford UniversityPress, 2011.					
Supplementary Reading	1. Narasimha Karumanchi, Data Structure and Algorithmic Thinking with Python,Careermonk Publications, 2017					

Curriculum & Syllabus

Course Name	Sociology of Design	Course Code	DS1001			
Offered by Department	SIDI	Structure (LTPC)	1	2	0	3
To be offered for	B.Tech	Course Type	Core			
Prerequisite	Foundation Program	Approved In	Senate-43			
Learning objectives	The objective of the course is to introduce engineering students tothe importance of understanding the social context of technology and product design: • Observing the problem context and surfacing unstated user/customer needs / new product concepts, • Understanding people, team dynamics and working in multicultural / cross-functional / distributed teams.					
Course Outcomes	At the end of the course, the students should be in a position to: • Understand the need and the process of doing an ethnographic study • Surface unstated needs and articulate the high level product requirements • Connect with people, form teams and collaborate towards a common goal					
Contents of the course (With approx. mate break up of hours)	Module 1: Technology, Design and Society - [9 hrs] • Observe the way people interact with objects • Understanding the relationship between people and a variety of objects • Actor Network Theory; History of Technology and Design; 2-3 Case studies • Discover your passion and domain of interest & network to identify partners Module 2: Understanding user/customer contexts [21 hrs] • Ethnography - immersion in a problem context • Learning to observe - see and listen; • Developing rich pictures; Gigamapping • Introduction to signs and semiotic analysis Module 3: Understanding groups (multicultural/cross-functional teams) [12 hrs] • Learning team formation and dynamics through a movie; • Introduction to sociological imagination - Functionalism, Conflict Theory, Symbolic Interactionism; Interaction Ritual Chains • Values, culture, methods of engineers and designers and how they shape thequality of our lives; • Group dynamics within organizations and across organizations andimplications for innovation and change Evaluation: Continuous assessment (40%); Final ethnography report (20%); End Semester (40%)					
Essential & Supplementary Readings	1. Trevor Pinch (Editors) (2012), The Social Construction of Technological Systems: New directions in the sociology and history of technology, MIT Press, Anniversary Edition 2. Wendy Gunn, Ton Otto and Rachel Smith (2013), Design Anthropology: Theory and practice, Bloomsbury 3. Adrian Forty (2014), Objects of desire: Design and society since 1750s, Thames & Hudson 4. Bernhard E Burdek(2015), History, theory and practice of product design,second revised edition 5. Keri Smith (2008), How to be an Explorer of the World: Portable Life Museum, Penguin Group					

Curriculum & Syllabus

Course Name	Design and Manufacturing Lab.	Course Code	ID1000			
Offered by Department	SIDI	Structure (LTPC)	0	0	2	1
To be To be offered for	B.Tech	Course Type	Core			
Pre-requisite	NIL	Approved In	Senate-44			
Learning Objectives	The objective of this course is to give an exposure on the basic practices followed in the domain of mechanical, electrical, electronics and communication engineering. The exercises will train the students to acquire skills which are very essential for the engineers through hands-on sessions.					
Contents of the course	Experiments will be framed to train the students in following common engineering practices: Basic manufacturing processes: Fitting, Drilling & tapping, Material joining processes, Carpentry, Sheet-metal work, Adhesive bonding and plastic welding, Arc Welding, 3D Printing. (10 hours) Familiarization of electronic components by Nomenclature, meters, power supplies, function generators and Oscilloscope – Bread board assembling of simple circuits: IR transmitter and receiver – LED emergency lamp – Communication study: amplitude modulation and demodulation. (6 hours) Domestic wiring practice: Fluorescent lamp connection, Staircase wiring – Estimation and costing of domestic and industrial wiring – power consumption by Incandescent, CFL and LED lamps. (2 Hours) Dismantle and assembly of PC. Installing OS and disk management. (4 hours)					
Essential Reading	1. Uppal S. L., "Electrical Wiring & Estimating", 5Edn, Khanna Publishers, 2003. 2. Chapman. W. A. J., Workshop Technology, Part 1 & 2, Taylor & Francis.					
Supplementary Reading	1. Clyde F. Coombs, "Printed circuits hand book", 6Edn, McGraw Hill, 2007. 2. John H. Watt, Terrell Croft, "American Electricians' Handbook: A ReferenceBook for the Practical Electrical Man", Tata McGraw Hill, 2002.					

Curriculum & Syllabus

Course Name	Engineering Mechanics	Course Code	ME1004			
Offered By Department	Mechanical Engineering	Structure(LTPC)	3	0	0	3
To be offered for	B.Tech.	Course Type	Core			
Prerequisite	Basic Mathematics and Physics	Approved In	Senate-44			
Learning Objectives	To analyze the components and systems of engineering structures under static and dynamic conditions in terms of forces and moments.					
Learning Outcomes	At the end of the course, a student will be able to: • determine various forces acting on a component and structure, and calculate the resultant forces and moments • apply governing equations of equilibrium, work-energy and impulse-momentum principles to solve engineering problems • analyses the characteristics of single degree of freedom vibration systems					
Course Contents (with approximate breakup of hours for lecture/ tutorial/practice)	• Equivalent force systems; free-body diagrams; degrees of freedom; equilibrium of particles and rigid bodies; analysis of determinate structures. (9 hrs.) • Properties of surfaces and volumes. Friction and applications. Principle of virtual work. (9 hrs.) • Particle Dynamics: equations of motion; work-energy and impulse-momentum principles; System of particles. (9 hrs) • Rigid body dynamics: plane kinematics and kinetics of rigid bodies; Coriolis acceleration; work-energy and impulse-momentum principles. (9 hrs) Introduction to vibrations;					
Essential Reading	1. F. Beer. R. Johnston, P.J. Cornwell, S. Sanghi, Vector mechanics for engineers: statics and dynamics, McGraw Hill Education; Eleventh edition, 2017.					
Supplementary Reading	1. J. L Meriam, L.G. Kraige, J.N. Bolton, Engineering Mechanics, Vol. I – Statics, Vol 2: Dynamics, SI version, Wiley, 2018. 2. Irving H Shames, Engineering mechanics: statics and dynamics, Pearson Education India, Fourth Edition, 2005. 3. R.C. Hibbeler, Engineering Mechanics: Statics & Dynamics, Pearson, Fourteenth Edition, 2016.					

Curriculum & Syllabus

Course Name	Elementary Data Structures and Logical Thinking Practice	Course Code	CS1006			
Offered by Department	Computer Science Engineering	Structure(LTPC)	0	0	4	2
To be offered for	B.Tech	Course Type	Core			
Prerequisite	NIL	Approved In	Senate--44			
Learning Objectives	• The focus is to discuss how data is organized and retrieved in computers. • Elementary data structures with supporting operations shall be discussed. Students will be exposed to art of logical thinking through algorithmic puzzles.					
Learning Outcomes	At the end of the course, given a computational problem, students are expected to come up with an algorithm and a suitable data structure, and implement the sameusing a programming language.					
Course Contents (with approximate breakup of hours for lecture/ tutorial/practice)	• Case studies that motivates logical thinking (algorithmic thinking) – implementation using C programming • Case studies involving arrays and implementation - Arrays with various supporting operations- algorithmic puzzles involving arrays – sorting and searching • Examples on linked lists with various supporting operations- algorithmic puzzles involving singly, doubly and circular linked lists. – puzzles involvinglists • Case studies on Stacks and Queues with supporting operations – implementation using arrays and lists – implementation of stack using queues and vice-versa – variants of stacks and queues – algorithmic puzzles • Applications of elementary data structures in computer science and engineeringand implementation					
Essential Reading	1. M. A. Weiss, Data Structures and Algorithm Analysis in C, 2nd ed., Pearson,2002. 2. Anany Levitin and Maria Levitin, Algorithmic Puzzles, Oxford UniversityPress, 2011					
Supplementary Reading	1. Narasimha Karumanchi, Data Structure and Algorithmic Thinking with Python, Careermonk Publications, 2017					

Curriculum & Syllabus

Course Name	Mechanics and Materials Practice	Course Code	ME1005			
Offered By Department	Mechanical Engineering	Structure (LTPC)	0	0	2	1
To be offered for	B.Tech.	Course Type	Core			
Prerequisite	Basic Mathematics and Physics	Approved In	Senate-44			
Learning Objectives	• To assess a few important geometric and material properties of given objects relevant for engineering applications					
Learning Outcomes	At the end of the course, a student will be able: • To measure friction coefficients, radius of gyration, rigidity modulus, strength and elastic modulus of materials. • To determine the hardness and examine the microstructure of materials • To analyze the stiffness and damping characteristics of single degree of freedom systems					
Course Contents (with approximate breakup of hours for lecture/ tutorial/practice)	Experiments to measure rigidity modulus and radius of gyration Experiments to measure strength and elastic modulus of materials Experiments to study the hardness of materials and their microstructure Experiments on small oscillations and friction					
Essential Reading	IIITD&M Laboratory manual for Mechanics and Materials Practice					
Supplementary Reading	1. F. Beer. R. Johnston, P.J. Cornwell, S. Sanghi, Vector mechanics for engineers: statics and dynamics, McGraw Hill Education, Eleventh edition, 2017. 2. F.P. Beer, E.R. Johnston, J.T. DeWolf, D. Mazurek, Mechanics of Materials, McGraw-Hill Education, Seventh edition, 2014. 3. Callister's Materials Science and Engineering, Adapted by R. Balasubramaniam, Wiley, Second edition, 2010.					

Curriculum & Syllabus

Course Name	Earth, Environment and Design	Course Code	HS1002			
Offered By Department	SIDI	Structure(LTPC)	1	0	0	P/F
To be Offered for	B.Tech	Course Type	Core			
Prerequisite	NIL	Approved In	Senate-44			
Learning Objectives	The course aims to provide an understanding of systems and processes in aquatic and terrestrial environments, and to explore changes in the atmosphere, lithosphere, hydrosphere, biosphere, and the evolution of organisms, since the origin of life on earth.					
Course Contents (with approximate breakup of hours for lecture/ tutorial/practice)	• Introduction to environment and ecology – Ecosystems Impacts of natural and human activities on ecosystems • Environmental policies, acts and standards, Environmental Impact Assessment Prediction and assessment of the impacts on air, water, land, and biological environments Assessment of impacts of the cultural, socioeconomic and eco sensitive environments					
Essential Reading	1. Rubin. E. S, Introduction to Engineering and the Environment, McGraw Hill, 2000. 2. Masters. G. M., Introduction to Environmental Engineering & Science, Prentice Hall, 1997.					
Supplementary Reading	1. Henry. J. G, and Heike, G. W, Environmental Science & Engineering, Prentice Hall International, 1996. 2. Dhameja. S. K, Environmental Engineering and Management, S. K. Kataria and Sons, 1999. 3. Shyam Divan and Armin Rosancranz, Environmental Law and Policy in India, Cases, Materials and Statutes, Oxford University Press, 2001.					

Curriculum & Syllabus

Course Name	Systems Thinking for Design	Course Code	DS2000			
Offered by Department	SIDI	Structure (LTPC)	1	2	0	3
To be offered for	B.Tech	Course Type	Core			
Pre-requisite	Sociology of Design	Approved In	Senate-43			
Learning Objectives	Design for effectiveness – Level 1					
Learning Outcomes	This course will help students understand •The importance of modeling systems to realize effective designs •Abstraction of key elements from problem situations •Use of specific techniques to model problems in a holistic manner					
Contents of thecourse	•Real-world problems & the need for inter-disciplinary approaches [2] •Basic concepts of systems thinking (parts, relations, patterns) [6] •Technique #1: Rich Pictures •Technique #2: Mapping Stakeholder, Needs, Alterables, Constraints [6] •Technique #3: Structural Modeling (Hierarchical decomposition) [6] Technique #4: Influence Diagrams (Self-regulating systems) [6]					
Essential Reading	1. Hitchins, Derek K. (2007) Systems Engineering: A 21st Century SystemsMethodology, John Wiley, ISBN: 978-0-470-05856-5. 2. Wilson, Brian (1991) Systems: Concepts, Methodologies and Applications. 2nd Edition, Wiley. ISBN: 0471927163. Hutchinson, William; Systems Thinking and Associated Methodologies, Praxis Education. ISBN: 0 646 34145 6.					
Supplementary Reading	1. Gerald Wienberg (2001), An introduction to general systems thinking, Dorset House Publishing. 2. Sage, A.P. (1977); Methodology for Large Scale Systems, McGraw Hill, New York.					

Curriculum & Syllabus

<table>
<tr><td>Course Name</td><td>Engineering Thermodynamics</td><td>Course Code</td><td colspan="4">ME2000</td></tr>
<tr><td>Offered by Department</td><td>Mechanical Engineering</td><td>Structure(LTPC)</td><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>To be offered for</td><td>B.Tech.</td><td>Course Type</td><td colspan="4">Core</td></tr>
<tr><td>Prerequisite</td><td>Basic Mathematics and Physics</td><td>Approved In</td><td colspan="4">Senate-44</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">To develop the basic understanding of thermal concepts and applications to analyze heat, work, energy interaction and thermodynamic cycles.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">Students will be able to:
Use thermodynamic terminology correctly
Assess thermodynamic applications using thermodynamic laws
Solve problems using the properties and relationships of engineering fluids
Analyze the performance of ideal and actual thermodynamic cycles such as vapor-power, refrigeration and air-standard cycles.</td></tr>
<tr><td>Course Contents (with approximate breakup of hours for lecture/ tutorial/practice)</td><td colspan="6">Basic Concepts and First Law of Thermodynamics: (L3+T1)
Continuum and macroscopic approach; systems (closed and open); thermodynamic properties and equilibrium; paths, processes and cycles; zeroth law of thermodynamics; internal energy, enthalpy; specific heats. Applications: Thermometer, first law applied to elementary processes.
Second Law of Thermodynamics and Entropy: (L6+T2)
Concepts of heat engines and reversed heat engines, Kelvin-Planck and Clausius statements; reversible and irreversible processes; Carnot cycle and Carnot principles/theorems; Clausius inequality and concept of entropy; t-s diagrams; availability and irreversibility; third law of thermodynamics. Applications: Heat pumps/refrigerators and its performance evaluation.
Properties of Pure Substances: (L6+T2)
Thermodynamic properties diagrams of pure substances, steam property tables and charts, steam quality or dryness fraction. Applications: Calculation of thermodynamic properties of liquid water/steam.
Thermodynamic Cycles: (L20+T7)
Carnot vapor cycle, ideal Rankine cycle, modified Rankine cycles. Application: Steam power plant. Otto cycle, air-standard Diesel cycle, air-standard dual cycle, air-standard Brayton cycle Applications: IC Engines and Gas turbines. Simple vapor-compression refrigeration cycle, modified vapor-compression refrigeration cycle. Vapour absorption refrigeration Applications: Refrigerators.
Thermodynamic Relations and Ideal Gas Mixtures: (L7+T2)
T-ds relations, Helmholtz and Gibbs functions, Gibbs relations, Maxwell relations, Clapeyron and Clapeyron-Clausius equations. Air-water vapor mixtures; atmospheric air properties, psychrometric chart. Applications: Air-conditioning Systems</td></tr>
<tr><td>Essential Reading</td><td colspan="6">1. Nag, P. K. Engineering thermodynamics. Tata McGraw-Hill Education, 2013.</td></tr>
<tr><td>Supplementary Reading</td><td colspan="6">1. Cengel, Yunus A., and Michael A. Boles. Thermodynamics: An Engineering Approach 6th Editon (SI Units). The McGraw-Hill Companies, Inc., New York, 2007.
2. Kroos, Kenneth A., Merle C. Potter and Shaligram Tiwari. Thermodynamics for engineers. Cengage Learning India Private Limited, 2015.
3. Moran, Michael J., Howard N. Shapiro, Daisie D. Boettner, and Margaret B. Bailey. Fundamentals of engineering thermodynamics. John Wiley & Sons, 2010.</td></tr>
</table>

Curriculum & Syllabus

Course Name	Fluid Mechanics and Fluid Machinery	Course Code	ME2001			
Offered By Department	Mechanical Engineering	Structure(LTPC)	3	1	0	4
To be To be offered for	B.Tech.	Course Type	Core			
Prerequisite	NIL	Approved In	Senate-44			
Learning Objectives	• To introduce different concepts and governing equations for fluid mechanics. • To demonstrate application of the learned concepts. • To discuss the concepts of various fluid machines (both prime mover and non-prime mover) with design concepts					
Learning Outcomes	At the end of this course the students will be able to • Understand the concepts of fluid mechanics and can relate them with practical scenarios and can apply them suitably. • Solve fundamental problems of fluid mechanics which help them to understand the fluid mechanics consideration of mechanical design • Analyze the performance of various turbo machineries which a foundation for the design of turbomachines					
Contents of the course *(With approximate break up of hours)*	**Introduction to fundamental concepts and Fluid Statics** *(L9+T3)* Introduction to fluid, stress, fluid properties - Density, viscosity, surface tension, different types of flows, Forces on fluid elements, concept of pressure, concept of pressure measurement, stability of submerged and floating object, tutorials **Fluid Kinematics** ***(****L3+T1****)*** The principles governing fluids in motion, the momentum equation, Physical similarity and dimensional analysis **Fluid Dynamics** ***(****L18+T7****)*** Laminar flow between solid boundaries, Flow and losses in pipes and fittings, Boundary layers, wakes and other shear layers, The flow of an inviscid fluid, Flow with a free surface, Application of flow through a pipe, Application of Unsteady flow, Compressible flow of gases, Turbulent flow **Fluid Machinery – Concepts and Design(***L12+T3***)** Hydraulic turbine – Impulse, Reaction turbine, Pump – Centrifugal pump, reciprocating pump Wind turbine - Drag and lift turbine - Performance parameters					
Essential Readings	1. Introduction to fluid mechanics and fluid machines, S Som, G Biswash, S Chakraborty, 3e. Tata McGraw-Hill Education, 2017. 2. Fluid Mechanics, F M White, 6e, McGraw-Hill Education, 2017.					
Supplementary Readings	1. Fox and McDonald's Introduction to Fluid Mechanics, J. Pritchard, 8e, John Wiley and sons, 2010 2. Fluid Mechanics: Fundamentals and Applications, Yunus A. Cengel, John A Cimbala. Tata McGraw-Hill Education, 2010.					

Curriculum & Syllabus

Course Name	Mechanics of Materials	Course Code	ME2002			
Offered by Department	Mechanical Engineering	Structure(LTPC)	3	1	0	4
To be offered for	B.Tech.	Course Type	Core			
Prerequisite	Engineering Mechanics	Approved In	Senate-44			
Learning Objectives	To understand the principles of solid mechanics as applied to the simplified case of elastic solids.					
Learning Outcomes	At the end of the course, a student will be able to •analyses the material behavior under different static loading conditions •solve problems related to deformation of elastic bodies •design the geometry of elements like beams, shafts, columns, under equilibrium loads					
Course Contents (with approximate breakup of hours for lecture/ tutorial/practice)	Equilibrium of a deformable body, stress, deformation, strain, Hooke's law for simple tension, compression and shear; axial loads; Torsion of circular shafts. (9L+3T) Beam Bending: Shear force and bending moment diagrams, Euler-Bernoulli beam, bending stresses, shearing stress, deflection of beams. (12L+4T) Buckling of Columns: eccentric loading under various end constraints. (3L+1T) Biaxial and Triaxial states of stress and strain, Transformations, Principal stresses and strains, Mohr's circle. (9L+3T) Theories of failure; Design of thin cylinders, shafts and beams; Energy methods. (9L+3T)					
Essential Reading	1. F. P. Beer, E. R. Johnston, J. T. Dewolf, D. F. Mazurek and S. Sanghi, Mechanics of Materials, Mc Graw Hill, 8th edition, 2020. 2. J. M. Gere and B. J. Goodno, Mechanics of Materials, 8th edition, Cengage, 2013.					
Supplementary Reading	1. R. C. Hibbeler, Mechanics of Materials, Pearson education, 9th edition, 2013. 2. A. C. Ugural, Mechanics of Materials, Wiley India Pvt Ltd, 2013. 3. E. P. Popov, Mechanics of Materials, Pearson education, 2nd edition, 2015.					

Curriculum & Syllabus

Course Name	Manufacturing Processes - 1	Course Code	ME2003			
Offered by Department	Mechanical Engineering	Structure(LTPC)	3	1	0	4
To be offered for	B. Tech.	Course Type	Core			
Prerequisite	Materials for Engineers	Approved In	Senate-44			
Learning Objectives	To study the fundamentals of manufacturing processes and equipment.					
Learning Outcomes	● At the end, the students will be able to select the range of manufacturing processes suitable to realize the intended physical components/products. ● At the end the students will be able to identify the causes of the defects if any found in the components/products manufactured and rectify using suitable combinations of parameters.					
Course Contents (with approximate breakup of hours for lecture/ tutorial/practice)	**Molding and Casting Practices:** (16 *L* + 5 *T)* Introduction to casting and foundry industry; basic principle; sequence in foundry operations; patterns; molding practice; ingredients of molding sand and cores. Melting furnaces. Special casting techniques: investment casting, shell molding, die casting, centrifugal casting, plaster mould casting, magnetic casting, squeeze casting, full mould process, strip casting, CO_2 molding. Gating system design. Casting defects and foundry automation. **Forming and Forging:** (14 *L* + 5 *T*) Basics of plastic forming & forging, forging process – classification – equipment – calculation of forging loads – forging defects – residual stresses, rolling and extrusion – classification -rolling mills - rolling of bars & shapes – rolling forces – defects in rolling - theories of hot & cold rolling – torque power estimation. Extrusion: classification-equipment – deformation lubrication and defects – analysis – hydrostatic extrusion – tube extrusion. Drawing & sheet metal forming- rod & wire drawing, deep drawing, tube drawing, shearing and blanking. **Welding processes:** (12 *L* + 4 *T)* Classification of welding processes, V-I relationship, types of weld joints. Fusion welding processes, solid state welding processes, thermo-chemical welding processes, brazing and soldering. Weld Metallurgy; concept of HAZ, defects in welds, their causes and remedies.					
Essential Reading	1. S. Kalpakjian, S. R. Schmidt, Manufacturing Engineering and Technology, 7th edition, Pearson India, 2009. ISBN: 978-0133128741 2. M. P. Groover, Principles of Modern Manufacturing, 5th edition, Wiley, 2014. 978-8126547371.					
Supplementary Reading	1. B. Wulff, H. F. Taylor and M. C. Fleming, Foundry Engineering, Wiley Eastern, 2009. 2. American Welding Society, Welding Handbook, AWS, 2009. 3. G. E Dieter, Mechanical Metallurgy, Tata McGraw Hill, 2007.					

Curriculum & Syllabus

Course Name	Manufacturing Processes Practice - 1	Course Code	ME2004			
Offered by Department	Mechanical Engineering	Structure(LTPC)	0	0	4	2
To be offered for	B.Tech	Course Type	Core			
Prerequisite	Basics of Manufacturing Processes	Approved In	Senate-44			
Learning Objectives	To perform experiments on fundamental manufacturing processes to understand the process, equipment, tooling and set-up involved in these processes.					
Learning Outcomes	• At the end, students will be able to apply: • A suitable casting process to shape the component and identify the defects involved and rectify them. • Select suitable welding processes based on the application. • The concepts of different forming processes and thus to get desired part shape. • Can identify the effect of process parameters on the outputs and can select suitable process parameter values.					
Course Contents	• Determination of molding properties of sodium silicate bonded sand • Study of the shrinkage behavior during phase change processes • Study of sheet metal forming processes • Study on the spring back in forming processes • Study of injection molding process • Study of manual metal arc welding process • Study of gas metal arc welding (GMAW) process • Study of gas tungsten arc welding processes • Study of friction stir welding processes • Study on process control and optimization in welding and casting					
Essential Reading	1. S. Kalpakjian, S. R. Schmidt, Manufacturing Engineering and Technology, 7th edition, Pearson India, 2009. ISBN: 978-0133128741 2. E. P. DeGarmo, J. T. Black, and R. A. Kohser, DeGarmo's materials and processes in manufacturing, 11th edition, John Wiley & Sons, 2013. ISBN: 978-8126540464					
Supplementary Reading	1. M. P. Groover, Principles of Modern Manufacturing, 5th edition, Wiley, 2014. ISBN: 978-8126547371					

Curriculum & Syllabus

<table>
<tr><td>Course Name</td><td>Smart Product Design</td><td>Course Code</td><td colspan="4">DS2001</td></tr>
<tr><td>Offered By Department</td><td>SIDI</td><td>Structure(LTPC)</td><td>1</td><td>2</td><td>0</td><td>3</td></tr>
<tr><td>To be Offered for</td><td>B. Tech</td><td>Course Type</td><td colspan="4">Core</td></tr>
<tr><td>Prerequisite</td><td>Systems Thinking for Design</td><td>Approved In</td><td colspan="4">Senate -43</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">The objective of this course to help the students understand and apply the concepts of designing smart/intelligent products, i.e., information intensive and context sensitive</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">At the end of the course, the students will:
• Identify and define the right type of intelligent behavior for a chosen product concept
• Design high-level functional and component (structural) architecture for intelligent behavior using appropriate metaphor and analogy
• Evaluate and select the right AI technique for the proposed functional and component architecture and vice versa</td></tr>
<tr><td>Course Contents (with approximate breakup of hours for lecture/ tutorial/practice)</td><td colspan="6">Module 1: Introduction to intelligence behavior (9 hours)
• Definition of intelligence
• Dimensions of intelligence
• Levels of intelligence

Module 2: Architecture for intelligent behavior (15 hours)
• Functional arch for Intelligent Behavior (Intelligence and information
• intensity relation (equilibrium, amplification))
• Biological metaphors for cyber-physical systems (Bio-inspired adaptive
• systems (Positive and negative feedback)
• Theory of living systems (Self evolve, self-improve, self-aware (e.g., self-configuration, -organization, -optimization) properties)

Module 3: Selection of appropriate AI Techniques (18 hours)
Rule-based systems - Fuzzy inferencing - Artificial neural networks -
• Evolutionary computation -
• determine which type of intelligent system methodology would be suitable
• for a given type of application problem
• Demonstrate a working prototype, in the form of a major project work, the
• ability to design and develop an intelligent system for a selected application.
• Poster Session
• Evaluation: Continuous assessment (40%); Final concept presentation (20%); End Sem (40%)</td></tr>
<tr><td>Essential Reading& Supplementary Reading</td><td colspan="6">References:
1. Donald A Norman (2007), The design of future things, Basic Books, New York
2. Dario Floreano and Claudio Mattiussi (2008), Bio-Inspired Artificial Intelligence: Theories, Methods and Technologies, MIT Press
3. Michael Negnevitsky (2005), Artificial Intelligence: A Guide to Intelligent Systems, Second Edition, Addison Wesley</td></tr>
</table>

Curriculum & Syllabus

Course Name	Heat Transfer	Course Code	ME2006			
Offered by the Department	Mechanical Engineering	Structure	3	1	0	4
To be offered for	B.Tech	Course Type	Core			
Prerequisite	Engineering Thermodynamics, and Fluid Mechanics.	Approved In	Senate-44			
Learning Objectives	The course will make the students learn various fundamental concepts in Heat transfer and helps students to develop the problem-solving skills essential to good engineering practice of heat transfer in real-world applications.					
Learning Outcomes	At end of the course the students will be able to understand the heat transfer concepts and apply them to solve the real-world heat transfer problems.					
Contents of the course *(With approximate break up of hours)*	• **Introduction:** (L2+T1) • Modes of heat transfer, Fourier law, Material properties of importance in heat transfer, Thermal conductivity and Specific heat capacity of various materials. • **Conduction:**(L12+T4) • General Differential equation of Heat Conduction, One Dimensional Steady State Heat Conduction in Cartesian and Polar Coordinates, plane and Composite Systems, Critical insulation thickness, Conduction with Internal Heat Generation, Fins or Extended Surfaces, Unsteady Heat Conduction, Lumped-system Analysis, Slab, Semi-infinite Solids. • **Convection and Mass Transfer:**(L15+T5) • Energy Equation**,** Forced and Free Convection, Hydrodynamic and Thermal Boundary Layer. Concept of heat transfer coefficient, Heat transfer in Turbulent and Laminar flows, Free and Forced Convection - external flow over Plates, Cylinders and Spheres. Internal flow through tubes and ducts. Empirical correlations. Mass Transfer - Diffusion, Fick's Law of Diffusion, Steady state Molecular Diffusion, Heat and Mass Transfer Analogy, Mass Transfer Correlations. • **Applications:** (L8+T2) • Heat Exchanger Types, Overall Heat Transfer Coefficient, Fouling Factors, LMTD method, NTU method. Regimes of Pool boiling and Flow boiling. Correlations in boiling and condensation. • **Radiation:**(L5+T2) • Basic definitions of radiation. Black Body Radiation, Planck's law, Wien's law, Stefan-Boltzmann law, Kirchhoff's law, and Grey body radiation. Radiative heat transfers between surfaces, View factor. Electrical Analogy, Radiation Shields.					
Essential Reading	1. Holman, J.P., "Heat and Mass Transfer", Tata McGraw Hill, 10th Edition, 2010. 2. 2. Yunus A. Cengel, "Heat Transfer A Practical Approach", Tata McGraw Hill, 5th Edition, 2015					
Supplementary Reading	1. Bejan, Heat Transfer, John Wiley, 1993 2. F.P.Incropera, and D.P. Dewitt, Fundamentals of Heat and Mass Transfer, John Wiley, 1998. 3. Massoud Kaviany, Principles of Heat Transfer, John Wiley, 2002 4. A. Bejan, Convection Heat Transfer, John Wiley, 4th Edition, 2013					

Curriculum & Syllabus

Course Name	Kinematics and Dynamics of Machinery	Course Code	ME2006			
Offered By Department	Mechanical Engineering	Structure (LTPC)	3	1	0	4
To be offered for	B.Tech	Course Type	Core			
Prerequisite	Engineering Mechanics	Approved In	Senate-44			
Learning Objectives	To understand the kinematics and kinetics of various planar mechanisms in different machineries					
Learning Outcomes	At the end of the course, a student will be able to: • investigate the motion of a planar mechanisms using graphical and analytic methods • synthesize cams, followers, gears and gear-trains • analyze the imbalance in rotating and reciprocating masses					
Course Contents (with approximate breakup of hours for lecture/ tutorial/practice)	• Introduction to mechanisms- joints, pairs and couplings; Constraints, mobility and degree of freedom, Grashof's law, Kinematic inversions. (7 L + 2 T) • Kinematics (Position, Velocity and Acceleration) of rigid bodies – analytical and graphical methods. (12 L + 4 T) • Kinematic synthesis of mechanisms, gears, gear trains and cams. (12 L + 4 T) Dynamics of planar mechanisms – slider crank forces, engine balancing. (6 L + 2 T) • Review of vibrations; Harmonically excited vibration; Vibration isolation, resonance, critical speeds of shafts (5 L + 2 T)					
Essential Reading	1. J.J. Uicker, G.R. Pennock and J.E. Shigley, Theory of Machines and Mechanisms, Oxford University Press, 4th Edition, 2014.					
Supplementary Reading	1. A. Ghosh and A. K. Mallik, Theory of Mechanism and Machines, Affiliated East – West Press Private Ltd., 2009. 2. S. S. Rattan, Theory of Machines, Tata McGraw-Hill, 4^{th} Edition, 2017. 3. Norton, R.L., Design of Machinery, Third Edition, Tata McGraw Hill, New Delhi, 2005.					

Curriculum & Syllabus

Course Name	Manufacturing Processes - 2	Course Code	ME2007			
Offered by Department	Mechanical Engineering	Structure(LTPC)	3	1	0	4
To be offered for	B.Tech.	Course Name	Core			
Prerequisite	Materials for Engineers, Manufacturing Processes - I	Approved In	Senate-44			
Learning Objectives	To study the fundamentals of machining processes and machine tools.					
Learning Outcomes	●At the end students will be able to select and apply a suitable machining process and cutting tool upon the work piece material and geometry. ●At the end students will be able to identify the machining defects and solution to overcome the same. ●At the end students will be able to utilize the powder metallurgy concepts.					
Course Contents (with approximate breakup of hours for lecture/ tutorial/practice)	**Machining and Cutting Tool:** (6 L + 2 T) Material removal. Elements, fundamental, mechanism of deformation in metal cutting. Geometry & design of single and multi-point tool **Mechanics of Chip Formation:** (6 L + 2 T) Orthogonal & oblique cutting, mechanism of chip formation, chip types, mechanics of machining. Forces and stresses on tool and its distribution, cutting force measuring technique. **Heat flow in metal cutting and tool life:** (6 L + 2 T) Heat flow in primary, secondary and tertiary zones, tool temperature measurement, temperature distribution in tool. Machinability, tool life, Taylor's equation, tool failure, economics in metal machining. **Cutting Tool material and Cutting life:** (8 L + 3 T) Tool materials, Alloying elements in tool steel. Carbon steel, high speed steels, co- cast alloys, carbide tools, ceramic tools, diamond. Function & requirement of cutting fluid. Type of cutting fluid. Method of application of cutting fluids. **Abrasive Machining Processes and Broaching:** (8 L + 3 T) Abrasive processes, grinding wheel - specifications and selection, types of grinding process, concepts of surface integrity, broaching machines, broach construction **Processing of Powder metals:** (8 L + 2 T) Production and compaction of metal powders, sintering, design and process capabilities. Forming, shaping and machining of ceramics. Processing semiconductors, elastomers, metal matrix composites and ceramic-matrix composite.					
Essential Reading	1. S. Kalpakjian, S. R. Schmidt, Manufacturing Engineering and technology, 7th edition, Pearson India, 2009. ISBN: 978-0133128741 2. M. P. Groover, Principles of Modern Manufacturing, 5th edition, Wiley, 2014. 978-8126547371.					
Supplementary Reading	1. E. P. DeGarmo, J. T. Black, and R. A. Kohser, DeGarmo's materials and processes in manufacturing, 11th edition, John Wiley & Sons, 2013. 2. 2.D. A. Stephenson, and J. S. Agapiou, Metal cutting theory and practice, CRC Press, 2005.					

Curriculum & Syllabus

<table>
<tr><td>Course Name</td><td>Fluid Mechanics and Heat Transfer Practice</td><td>Course Code</td><td colspan="4">ME2007</td></tr>
<tr><td>Offered By Department</td><td>Mechanical Engineering</td><td>Structure(LTPC)</td><td>0</td><td>0</td><td>3</td><td>1.5</td></tr>
<tr><td>To be offered for</td><td>B.Tech</td><td>Course Type</td><td colspan="4">Core</td></tr>
<tr><td>Prerequisite</td><td>Engineering Thermodynamics, Fluid Mechanics and Heat Transfer</td><td>Approved In</td><td colspan="4">Senate-44</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">The objective of this course is to provide an experimental exposure for fluid mechanics and heat transfer concepts such as viscosity, pressure, flow, hydrostatic forces, conduction, convection, radiation, etc.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">To acquire practical knowledge in various fluid mechanic, fluid machinery, and Heat transfer concepts</td></tr>
<tr><td>Course Contents (with approximate breakup of hours for lecture/ tutorial/practice)</td><td colspan="6">The following fluid mechanics and heat transfer experiments will be performed
1. Buoyancy and stability of bodies through metacentric height.
2. Flow Visualization
3. Study of Losses in Flow through Valves
4. Flow Measuring devices
5. Performance analysis of impulse turbine
6. Performance Analysis of Francis Turbine
7. Heat Transfer from Fins
8. Heat Transfer Coefficient in Forced Convection
9. Heat Transfer Coefficient in Natural Convection.
10. Emissivity Measurement.</td></tr>
<tr><td>Essential Reading</td><td colspan="6">1. IIITD&M Laboratory manual for Fluid Mechanics and Heat Transfer Practice.</td></tr>
<tr><td>Supplementary Reading</td><td colspan="6">1. Fluid Mechanics and Heat Transfer Laboratory Manual, IIITDM Kancheepuram.
2. Van Dyke, Milton. An Album of Fluid Motion. Stanford, Calif: Parabolic Press, 1982.
3. Ascher Shapiro. National Committee for Fluid Mechanics Films (NCFMF) in cooperation with the Education Development Center. (A series of 39 videos and accompanying texts which revolutionized the teaching of fluid mechanics)</td></tr>
</table>

Curriculum & Syllabus

Course Name	Mechanical Design Practice	Course Code	ME2009			
Offered By Department	Mechanical Engineering	Structure(LTPC)	0	0	4	2
To be offered for	B.Tech.	Course Type	Core			
Prerequisite	Engineering mechanics	Approved In	Senate-44			
Learning Objectives	To understand the kinematics and kinetics of various mechanisms.					
Learning Outcomes	At the end of the course, a student will be able: • To analyses the effects of force, motion and their interactions on simple machineries. • To investigate the resonance conditions in slender shafts and simple vibrating systems					
Course Contents (with approximate breakup of hours for lecture/ tutorial/practice)	Experiments on kinematic simulations for few mechanisms and inversions. Experiments based on the concepts of kinematics and dynamics of machine elements and machineries, like cams, balancing of masses, gyroscope, gear-trains. Experiments related to resonance in shafts, and different damping conditions of longitudinal vibrations.					
Essential Reading	1. IIITD&M Laboratory manual for Mechanical Design Practice					
Supplementary Reading	1. J.J. Uicker, G.R. Pennock and J.E. Shigley, Theory of Machines and Mechanisms, Oxford University Press, 4th Edition, 2014. 2. A. Ghosh and A. K. Mallik, Theory of Mechanism and Machines, Affiliated East – West Press Private Ltd., 2009. 3. Norton, R.L., Design of Machinery, Third Edition, Tata McGraw Hill, New Delhi, 2005.					

Curriculum & Syllabus

Course Name	Manufacturing Processes Practice - 2	Course Code	ME2010			
Offered By Department	Mechanical Engineering	Structure(LTPC)	0	0	3	1.5
To be offered for	B.Tech	Course Type	Core			
Prerequisite	Basics of Manufacturing Processes	Approved In	Senate-44			
Learning Objectives	To study and practice the various operations that can be performed in lathe, milling machines etc. and to equip with the practical knowledge required in the core industries.					
Learning Outcomes	At the end of this course the student will be able to select and apply • Methods to solve problems on cutting forces, tool life and analytical methods of estimating cutting temperature. • Suitable machining operations to subtractive remove the materials and thus to get the component/work piece with desired geometry.					
Course Contents	**Lathe Exercises** Machining and machining time estimations for ● Taper Turning ● External Thread cutting ● Internal Thread Cutting ● Knurling **Milling Exercises** ● Simple prismatic parts ● Contour milling using vertical milling machine ● Spur gear cutting in milling machine ● Helical gear cutting in milling machine **Drilling Exercises** ● Effect of Primary Cutting Edges ● Effect of Secondary Cutting Edges **Grinding Exercises** ● Plain Surface grinding ● Cylindrical grinding **Determination of material removal rate in various processes** **Measurement of cutting forces in basic processes**					
Essential Reading	1. S. Kalpakjian, S. R. Schmidt, Manufacturing Engineering and Technology, 7th edition, Pearson India, 2009. ISBN: 978-0133128741					
Supplementary Reading	1. M. P. Groover, Principles of Modern Manufacturing, 5th edition, Wiley, 2014. ISBN: 978-8126547371					

Curriculum & Syllabus

Course Name	Introduction of Data Science for Engineers	Course Code	CS2005			
Offered by Department	Computer Science and Engineering	Structure (LTPC)	3	0	2	4
To be offered for	B.Tech	Course Type	Core			
Prerequisite	NIL	Approved In	Senate-44			
Learning Objectives	This course covers the basic concepts of Data Science to help the student to learn, understand and practice data analytics encompassing concepts from descriptive, inferential statistics and predictive techniques and big data concepts.					
Learning Outcomes	• Ability to identify the characteristics of datasets; Ability to select and implement machine learning techniques suitable for the respective application; • Ability to solve problems associated with big data characteristics such as high dimensionality; • Ability to integrate machine learning libraries and mathematical and statistical tools					
Course Contents (with approximate breakup of hours for lecture/ tutorial/practice)	• Introduction to relevant industry applications and analytics – Descriptive Statistics – Data Visualization & Interpretation -Measures of Central Tendency & Dispersion - Basic and advanced plots such as Stem-Leaf Plots, Histograms, Pie charts, Box Plots, Violin Plots etc. – Merits of Demerits & Interpretation (10) • Inferential Statistics – Hypothesis Testing - Tests of Significance – Analysis of Variance - Regression – Linear and Logistic (8) • Predictive Analytics – Supervised and Unsupervised – Association Rules, Classification, Clustering, Outlier Analysis, Time Series Modeling (14) • Big Data Characteristics – Map Reduce – Deduplication, Distributed Storage, Implementation using Hadoop / Spark platforms (8) • **Practice Component:** Concepts from Descriptive Statistics, Inferential and Predictive Analytics would be test driven using platforms such as Python, R etc. ML support in these platforms for rule mining and application, classification & clustering algorithms etc. would also be test driven as part of the practice exercises. Modern technologies for big data handling such as Spark – support for Map reduce would also be test driven. Applications relevant to the student's stream of specialization would be explored for exercises / course project as case studies. (14 sessions – weekly exercises)					
Essential Reading	1. J Han, M Kamber, Data Mining Concepts & Techniques, Elsevier, 3rd Edition, 2007, ISBN 9780123814791					
Supplementary Reading	1. Joel Grus, Data Science from Scratch, Orielly, 2nd Edn, 2019, ISBN 9781492041139 2. Leskovec, Anand Rajaraman,, Ullmann, Mining of Massive Data Sets, Cambridge University Press, Open Source free version , ISBN 9781107015357 3. P Bruce, Practical Statistics for Data Scientists, O'Reilly, 2017, iSBN 9789352135653					

Curriculum & Syllabus

Course Name	Entrepreneurship and Management Functions	Course Code	DS3000			
Offered by Department	SIDI	Structure (LIPC)	1	2	0	3
To be offered for	B.Tech	Course Type (Core / Elective)	Core			
Prerequisite	Systems Thinking and Design	Approved In	Senate-43			
Learning objectives	The objective of this course is to provide engineering students an exposure to the basic concepts of entrepreneurship and management, with a specific focus on the process of turning an idea into a commercially viable venture.					
Learning Outcomes	At the end of the course, the students will learn how to • Understand the market & competition • Prepare a business case for the product/idea					
Contents of the course	Module 1: Introduction • Division of labor and creation of value • Evolution of organizations, industries and sectors, for profit and non-profit • Role of Entrepreneurs and Managers in value creation • Principles of Management - Planning, Organizing, Resourcing, Directing (4) Module 2: Strategy & Planning • Understanding industry dynamics & competition (Porter's Framework) • Understanding the industry value chain and firm positioning (6) Module 3: Organizing • Typical organizational functions (R&D, Marketing & Sales, HR, Operations) • Cybernetics of organizational functions (Stafford Beer's viable systems model) • Types of organization structures (product, functional, matrix, global) (6) Module 4: Resource Management • Financial management (Sources of funding, how to read a P&L, balance sheet) • Human resource management (Interviewing, compensation, motivation) • Global sourcing and supply chain management (8) Module 5: Management Information & Decision Making (4) Module 6: Legal and Regulatory environment (4)						
Essential Reading	1. Peter F Drucker, *The Practice of Management*, Harper Collins, 2006, ISBN: 978-0060878979 2. Hentry Mintzberg, *Managing*, Berret-Koehler Publishers, 2009, ISBN: 978-1605098746 3. Michael Porter, *On competition: Updated and Expanded Edition*, HBS, 2008, ISBN: 978-1422126967 4. Vasanta Desai, *Dynamics of Entrepreneurial Development and Management*, HimalayaPublishing House, ISBN:9788183184113.					
Supplementary Reading	1. Walter Isaacson, *Steve Jobs*, 2011, ISBN:978-1451648539 2. Eric Ries, *The Lean Startup*, Portfolio Penguin, 2011, ISBN: 978-0307887894 3. Vineet Bajpai, Build from scratch, Jaico books, 2013, ISBN: 9788184952919.					

Curriculum & Syllabus

Course Name	Design of Machine Elements	Course Code	ME3000			
Offered By Department	Mechanical Engineering	Structure(LTPC)	3	1	0	4
To be offered for	B.Tech	Course Type	Core			
Prerequisite	Engineering Mechanics, Mechanics of Materials	Approved In	Senate-44			
Learning Objectives	To understand design concepts and procedures necessary to design and/or select a machine component in terms of geometry and materials					
Learning Outcomes	At the end of the course, a student will be able to: • analyze the stresses in machine elements and structural members under various loads • apply multidimensional failure criteria in the analysis and design of machine components • design and select power transmission systems involving belts, clutches, gears					
Course Contents (with approximate breakup of hours for lecture/ tutorial/practice)	Review of failure theories; Design for variable loading - fatigue strength and design; design of shafts and springs. (L11+T4) Design of rivets, bolts and Power Screws. (L6+T2) Theory of friction drives. Design and selection of belt drives; Design of clutches. (L7+T2) Design of Gears – spur, helical and worm gears – Contact and bending fatigue strength – Gear accuracy. (L10+T4) Tribology – Lubricant theories; Design of Journal bearings; Selection of ball and roller bearings. (L8+T2)					
Essential Reading	1. Richard G Budynas and J Keith Nisbett, Shigley's Mechanical Engineering Design, McGraw-Hill Education, 10th Edition, 2017					
Supplementary Reading	1. V Bhandari, Design of Machine Elements, McGraw-Hill Education, 4th Edition, 2017. 2. Robert L. Norton, Machine Design, Pearson Education, 5th Edition, 2018					

Curriculum & Syllabus

Course Name	Measurement and Automation	Course Code	ME3001			
Offered By Department	Mechanical Engineering	Structure(LTPC)	3	1	0	4
To be offered for	B.Tech	Course Type	Core			
Prerequisite	NIL	Approved In	Senate-44			
Learning Objectives	● To understand the importance of automation in the field of manufacturing. ● Analyze the characteristics of measurement systems.					
Learning Outcomes	At the end of the course student will able to: • Apply basic principles of measuring systems and applications of robot in automation industries. • Analyze the magnetic measurements and working principle of various transducers • Understand hydraulic and pneumatic systems, and their performance characteristics. • Describe the importance and application of automation in Industry.					
Course Contents (with approximate breakup of hours for lecture/ tutorial/practice)	**General principles of measurements:** Measurement system, True value, Accuracy, Precision, Resolution, Drift, Hysteresis, Dead-band, Sensitivity, Significance, Mean, Standard deviation, Six-sigma estimation. ***(3L +1T)*** **Magnetic Measurements:** Measurement of flux and permeability, BH curve and permeability measurement, Determination of BH curve. Transducers- Definition and classification, Transducers for measurement of displacement, Velocity, Flow, Force, Pressure, Strain and temperature, Basic principles of LVDT, Electromagnetic and ultrasonic flow meters, Piezoelectric force transducer, Load cell, Strain gauge, Thermistors, Thermocouple. ***(12 L + 4 T)*** **Hydraulic Systems:** Hydraulic systems, Flow, Pressure and direction control valves, Actuators, Supporting and control elements, Pumps, Servo valves and actuators, Electro hydraulic servo-valves, Proportional valves and their application, Design of hydraulic circuits for manufacturing automation and performance analysis. ***(11 L + 4 T)*** **Pneumatic Systems:** Distribution and conditioning of compressed air, System components and graphic representations, Design of circuits-switching circuits and sequential circuits, Cascade methods, Step counter method, Compound circuit design. ***(11 L + 4 T)*** **Automated flow lines analysis:** Automation strategies, Historical developments of the assembly process, Selection of assembly, Design for automated assembly, transfer systems, Vibratory bowl feeder mechanism, Non-vibratory feeder's mechanism, Analysis and design of part orienting devices, Feed tracks and part placing mechanisms, Robot based automation. ***(5 L + 1 T)***					
Essential Reading	1. F.W. Roller, Electric and Magnetic Measurements and Measuring Instruments, Forgotten books press, 2018. 2. Anthony Esposito, Fluid power with applications, 7th Ed., 2016, Prentice Hall. 3. M.P. Grover, Automation, Production Systems and Computer-Integrated Manufacturing, 5th Ed, Pearson, 2020. 4. S.R. Deb and S. Deb, Robotics Technology and Flexible Automation, McGraw Hill, 2017.					
Supplementary Reading	1. W. Bolton, Pneumatic & Hydraulic Systems, Butterworth-Heinemann, ISBN: 9780080966748, 2011. 2. A. Moris and R. Langari, Measurement and Instrumentation, 3rd Ed, 2020. 3. C.P. Boothroyd and L.E. Murch, Assembly Automation and Product Design Automatic Assembly, CRC Press, 2005.					

Curriculum & Syllabus

Course Name	Thermal Engineering Practice	Course Code	ME3002			
Offered By Department	Mechanical Engineering	Structure (LTPC)	0	0	3	1.5
To be offered for	B.Tech	Course Type	Core			
Prerequisite	Engineering Thermodynamics, Fluid Mechanics and Heat Transfer	Approved In	Senate-44			
Learning Objectives	In this practice course, undergraduate engineering students will conduct experiments to understand the various concepts taught in thermal engineering courses.					
Learning Outcomes	To acquire practical knowledge in various modern thermal systems					
Course Contents (with approximate breakup of hours for lecture/ tutorial/practice)	To familiarize students with thermal engineering related equipment and experimental setups such as Flash-point & fire-point, Calorific value, Reciprocating compressor, Refrigeration system, Air-conditioning system, Mini power-plant(Rankine Cycle), Solar water-heater, Valve-timing diagram, SI-Engine, Cooling-tower					
Essential Reading	1. IIITD&M Laboratory manual for Thermal Engineering Practice					
Supplementary Reading	1. Eastop, T. D., and A. McConkey. "Applied Thermodynamics for Engineering Technologists", Pearson Education India (2002).					

Curriculum & Syllabus

Course Name	Production Drawing & Inspection Practice	Course Code	ME3003			
Offered By Department	Mechanical Engineering	Structure(LTCP)	0	0	3	1.5
To be offered for	B.Tech	Course Type	Core			
Prerequisite	NIL	Approved In	Senate 44			
Learning Objectives	• To familiarize with 3D modeling and to gain an understanding of industrial drafting practices • To familiarize with precision measurement methods and inspection practices followed in industrial metrology.					
Learning Outcomes	At the end of the course, a student will be able to: • Develop 3D models of machine components and generate 2D drawing from 3D models; digitize existing products using reverse engineering • Create assembled and exploded views of machine components • Apply inspection practices to industry scale products and systems.					
Course Contents (with approximate breakup of hours for lecture/ tutorial/practice)	Part modeling of machine components; Assembly of machine components; Machine drawing – drafting of assembly. Production drawings of machine parts – Dimensional and geometric tolerances; surface roughness and welding symbols; Bill of materials and process charts. Calibration experiments using precision measurement methods and devices; gear and screw–thread metrology; flatness measurement; quality control and statistical inferencing – Hypothesis testing.					
Essential Reading	1. IIITD&M Laboratory manual for Metrology & Inspection Practice					
Supplementary Reading	1. Bertoline, Wiebe, Miller, Nasma., "Technical Graphics Communication," IR WIN Graphic Series, 2008. 2. S. Bogolyubov. A. Voinov., "Engineering Drawing," Van Nostrand Reinhold Company, 2001. 3. D. E. Hewitt., "Engineering Drawing and Design for Mechanical Technicians," The Macmillan Press Ltd, London, 2006. 4. Michael F. Ashby, "Materials and the Environment: ECO-Informed Material Choice, Elsevier, 2012.					

Curriculum & Syllabus

<table>
<tr><td>Course Name</td><td>Prototyping & Testing</td><td>Course Code</td><td colspan="4">DS3001</td></tr>
<tr><td>Offered by Department</td><td>SIDI</td><td>Structure(LT PC)</td><td>1</td><td>2</td><td>0</td><td>3</td></tr>
<tr><td>To be offered for</td><td>B.Tech</td><td>Course Type</td><td colspan="4">Elective</td></tr>
<tr><td>Prerequisite</td><td>NIL</td><td>Approved In</td><td colspan="4">Senate-43</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">The objective of the course is to help students develop rapid prototyping skills andrealize a minimum viable product</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">• Students will develop skills in rapid prototyping; project management and focusingon delivering outcomes</td></tr>
<tr><td>Course Contents (with approximate breakup of hours for lecture/ tutorial/practice)</td><td colspan="6">1. Minimum viable product plan (3 hours)
• Markets and Needs
• Business Goals
• Key features
2. Core Product Architecture (6 hours)
• Storyboarding of the product core.
• Framework for mechanical, electronics and computing paradigm
3. Design for Manufacture & Assembly (3 hours)
• Manufacturing Process: Form
• Assembly constraints: Fit
4. Developing the Proof of Concept (30 hours)
• Build
• Assemble
• Iterate
• Validate
• Pitch
Evaluation: Continuous assessment (80%); Final PoC demo (20%)
2 one-day hackathons may be organized during this period (one weekends) to accelerate PoC development</td></tr>
<tr><td>Essential & Supplementary Readings</td><td colspan="6">1. How to Solve Big Problems and Test New Ideas in Just Five Days by Jake Knapp,John Zeratsky, Braden Kowitz
2. The Total Inventors Manual: Transform Your Idea into a Top-Selling Product by Sean Michael Ragan
3. Prototyping and Model making for Product Design by Bjarki Hallgrimsson
Bringing a Hardware Product to Market: Navigating the Wild Ride from Conceptto Mass Production by Elaine Chen</td></tr>
</table>

Curriculum & Syllabus

Course Name	Professional Communication	Course Code	HS3001			
Offered By Department	SH-English	Structure(LTP C)	1	0	2	2
To be offered for	B.Tech.	Course Type	Core			
Prerequisite	NIL	Approved In	Senate-44			
Learning Objectives	• Develop the capability to apply for a job and participate in selection process • Acquire interview skills • Gain proficiency in language skills indispensable for a successful professional • Develop emotional intelligence					
Learning Outcomes	• Prepare résumé and cover letter • Ready to perform at different levels of the interview process • Able to use interpersonal skills in challenging situations • Competent to draft various documents for specific purposes					
Course Contents (with approximate breakup of hours for lecture/ tutorial/practice)	• Preparing cover letter, résumé, digital profile; video profile; Email etiquette (L2, P4) • Interview skills, Group discussion and impromptu speech (L2, P6) • Social communication skills (L4, P6) ➢ Conversational English appropriateness, context based speaking in general situations, discussion and associated vocabulary in professional situations) ➢ Non-verbal communication – relevance and effective use of paralinguistic features – body language, chronemics, haptics, proxemics ➢ Emotional intelligence (EI) and social intelligence at workplace – theoretical perspectives and their application in relevant workplace situations – EI and leadership skills – assessments and best practices in organizations • Conflict management and communication at workplace (L4, P6) ➢ Cross-cultural communication, Argumentation, negotiation, persuasion, decision making, case study of challenging situations ➢ Organizing a meeting, working as part of a team, briefing ➢ Business presentations – Preparing effective presentations, delivering presentations and handling questions • Writing proposals, statement of purpose, research article, agreements, summary Proofreading (L1, P4) • Training for proficiency assessment (L1,P2)					
Essential& Supplementary Reading	1. Tebeaux, Elizabeth, and Sam Dragga. *The Essentials of Technical Communication*. OUP, 2018. 2. Sabin, William A. *The Gregg Reference Manual: A Manual of Style, Grammar, Usage, and Formatting*. McGraw-Hill, 2011, pp 408-421. 3. Raman, Meenakshi and Sangeeta Sharma. Technical Communication: Principles and Practice. OUP, 2015. 4. Caruso, David R. and Peter Salovey. *The Emotionally Intelligent Manager: How to Develop and Use the Four Key Emotional Skills of Leadership*. John Wiley and Sons, 2004. 5. https://learnenglish.britishcouncil.org/business-english/youre-hired/episode-01 6. https://www.youtube.com/watch?v=HAnw168huqA 7. https://www.youtube.com/watch?v=azrqlQ_SLW8 8. https://owl.purdue.edu/owl/purdue_owl.html 9. Turabian,Kate L. *Student's Guide to Writing College Papers*. University of Chicago Press, 2010.					