I B.TECH I SEMESTER SYLLABUS

CALCULUS AND APPLICATIONS

I Semester

Course Code:	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A5BS01	BSC	3	1	-	4	30	70	100
Contact Classes: 44	Tutorial Classes: 08	Practical Classes:--				Total Classes: 52		

Course Objectives

To learn
1. Concept of Rank of a matrix, Consistency and solving system of linear equations.
2. The concept of differential equations and solve them using appropriate methods.
3. Usage of the appropriate test to find the convergence and divergence of the given series.
4. Evaluation of differential equation using Laplace Transform techniques.
5. The partial derivatives of several variable functions.

UNIT-I	THEORY OF MATRICES	Classes: 10

Finding rank of a matrix by reducing to Echelon form, Consistency of system of linear equations (homogeneous and non-homogeneous) using the rank of a matrix, Eigen values and Eigen vectors and its properties(with out proof), Cayley-Hamilton theorem (Statement and verification)-Finding inverse and powers of a matrix by Cayley-Hamilton theorem, Diagonalization of matrices.

UNIT-II	ORDINARY DIFFERENTIAL EQUATIONS	Classes: 12

Introduction- Exact and reducible to Exact differential equations-Newton's Law of cooling-Law of Growth and Decay. Linear differential equations of second and higher order with constant coefficients - Non-Homogeneous term of the type $Q(x) = e^{ax}$, Sin ax, Cosax, $e^{ax}v(x)$, $x^n v(x)$ - Method of variation of parameters.

UNIT-III	SEQUENCES AND SERIES	Classes: 08

Basic definitions of Sequences and series – Convergence and divergence –Comparison Test- Ratio Test – Raabe's Test-Integral Test – Cauchy's n^{th} root Test –Absolute and Conditional convergence – Power Series.

UNIT-IV	LAPLACE TRANSFORMS	Classes: 12

Laplace transforms of elementary functions- First shifting theorem - Change of scale property – Multiplication by t^n- Division by t – Laplace transforms of derivatives and integrals – Unit step function – Second shifting theorem – Periodic function – Evaluation of integrals by Laplace transforms – Inverse Laplace transforms- Method of partial fractions – Other methods of finding inverse transforms – Convolution theorem – Applications of Laplace transforms to ordinary differential equations.

UNIT-V	CALCULUS OF SEVERAL VARIABLES	Classes: 10

Limit, Continuity - Partial derivative- Partial derivatives of higher order -Total derivative –

Chain rule,Jacobians-functional dependence & independence.

Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's

method (with constraints)

Text Books:

1. Ervin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. B.S.Grewal, Higher Engineering Mathematics, Khanna publishers, 36th Edition, 2010.

Reference Books:

1. G.B.Thomas, calculus and analytical geometry,9th Edition, Pearson Reprint 2006.
2. N.P Bali and Manish Goyal ,A Text of Engineering Mathematics,Laxmi publications,2008.
3. E.L.Ince, Ordinary differential Equations,Dover publications,1958.

Web references:

1. https://www.efunda.com/math/math_home/math.cfm
2. https://www.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/details.php?ebook=10166

MOOCS Course:

1. https://swayam.gov.in/
2. https://onlinecourses.nptel.ac.in/

COURSE OUTCOMES

At the end of the course, student will be able to:

1. Solve the system of linear equations using rank of the matrices.
2. Identify the different types of differential equations and solve them using appropriate methods.
3. Apply the appropriate test to find the convergence and divergence of the given series.
4. Solve the differential equations using Laplace transform techniques.
5. Find the Maxima and Minima of several variable functions.

PHYSICS OF MATERIALS ENGINEERING & SCIENCE

I Semester:

Course Code:	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A5BS10	BSC	3	1	0	4	30	70	100
Contact Classes: 44	Tutorial Classes: 08	Practical Classes: -				Total Classes: 52		

COURSE OBJECTIVES :

1. Describe the chemical reaction and phase transformation in materials by using modern thermodynamic models.
2. Learn the fundamentals of transport properties of materials.
3 Describe the temperature dependence of magnetic susceptibility of a given material .
4. Learn the basic principles of laser and optical fiber.
5. Understand the development of nano technology and synthesis of nano materials by using different techniques.

UNIT-I	THE STRUCTURE OF MATERIALS AND THERMODYNAMICS OF CONDENSED PHASES	Classes: 10

The Structure of Materials: Introduction – Structure of Metals and Alloys, Structure of Ceramics and Glasses – Rock salt structure, Diamond structure , structure of SiO_4 .

Thermodynamics of Condensed Phases: Introduction – Thermodynamics of Metals and Alloys, - Gibbs rule , Cu- Ni phase diagram , Thermodynamics of Ceramics and Glasses- Cu- Fe-O system

UNIT-II	KINETIC PROCESSES IN MATERIALS AND TRANSPORT PROPERTIES OF MATERIALS	Classes: 12

Kinetic Processes in Materials: Introduction – Kinetic Processes in Metals and Alloys, Kinetic Processes in Ceramics and glasses – Nucleation and Growth.

Transport Properties of Materials: Introduction -Momentum Transport properties of Materials, Heat Transport properties of Materials, Mass Transport properties of materials.

UNIT-III	PROPERTIES OF MATERIALS	Classes: 08

Thermal properties - Heat Capacity, thermal expansion, thermal conductivity, thermal stresses.

Magnetic properties – Introduction, Types of magnetic materials, influence of temperature on magnetic behavior, Hysteresis curve, Soft and Hard magnetic materials, Magnetic storage, Ferrite applications.

UNIT-IV	LASER & FIBER OPTICS	Classes: 12

Lasers: Characteristics of Laser, Basic processes between two energy levels, pumping mechanism, meta stable state and population inversion. Working of Nd-YAG laser, applications of lasers in different fields.

Fiber Optics: Structure of fibers, TIR, Acceptance angle and NA. Types of fibers – SI and GI fiber properties. Fiber optic communication system with block diagram. Fiber optic sensors – Basic Principle, working of Pressure and Temperature Sensors. Applications of fibers in different fields.

UNIT-V	INTRODUCTION TO ENGINEERED MATERIALS	Classes: 10

Synthesis of Nano materials: Introduction to nano particles, nano scale, properties of nano materials. Techniques for synthesis of nano materials – Sol gel, CVD methods.
Characterization of Nano materials: Imaging methods – SEM, TEM and STM. Applications of Nano materials in engineering and Biomedical fields and other fields.

Text Books:

1. Engineering Physics, B.K. Pandey, S. Chaturvedi – Cengage Learing
2. Haliday and Resnick, Physics – wiley
3. P.K Palanisamy, Engineering Physics, Sitech Publications, 2013, IVthEdn.
4. Essentials of Nano Tecnology by Jeremy Ramsden.
5. An introduction to materials engineering and science by Brian S. Mitchell

Reference Books:

1. Hecht, “Optics”, Pearson Education, 2008.
2. D. A. Neamen, “Semiconductor Physics and Devices”, Times Mirror High EducationGroup, Chicago, 1997.
3. Fundamentals of material science and engineering by William D. Callister, Jr. David G. Rethwisch

Web references:

1. https://www.edx.org/course?search_query=semiconductor+physics
2. https://www.edx.org/course/nanotechnology-fundamentals-purduex-nano530x
3. https://www.edx.org/course/physics-electronic-polymers-pep-purduex-nano600

E -Text Books:

1. http://www.phys.sinica.edu.tw/TIGP-NANO/Course/2010_Fall/classnotes/NanoB_week14.pdf
2. https://www.scribd.com/document/70908178/Semiconductor-Devices-Basic-Principles-Jasprit-Singh
3. https://www.scribd.com/doc/105174065/Fundamentals-of-Photonics
4. ftp://nozdr.ru/biblio/kolxo3/P/PE/PEo/Thyagarajan%20K.,%20Ghatak%20A.%20Lasers..%20Fundamentals%20and%20Applications%20(2ed.,%20GTP,%20Springer,%202010)(ISBN%20144196441X)(O)(674s)_PEo_.pdf
5. https://subodhtripathi.files.wordpress.com/2012/01/optical-fiber-communications-by-gerd-keiser_2.pdf
6. http://www.hailienene.com/resources/nano-technology.pdf

MOOCS Course:

1. http://nptel.ac.in/courses/118104008/1 (Fundamentals of Nano technology)
2. http://nptel.ac.in/courses/118104008/13 (Nano structures, synthesis and characterization)
3. https://nptel.ac.in/courses/113/104/113104096/(mateiral science)

4. https://nptel.ac.in/courses/113/102/113102080/(Metallurgy and material science)

COURSE OUTCOMES

At the end of the course, student will be able to:

1. Analyze the bonding scheme and its physical properties of a given material.
2. Evaluate the dimensionality, rates of a nucleation and growth process from kinetic data.
3. Evaluate the curie and Neel temperature of a given substance.
4. Justify how the graded index optical fiber is more efficient than step index optical fiber in fiber optic communication system.
5. Recommend appropriate synthesis method and explain the characterization techniques.

ENGINEERING MECHANICS

I SEMESTER

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A5AE01	ESC	3	1	-	4	30	70	100

COURSE OBJECTIVES:

The course should enable the students to:

1. Resolve various force systems and calculate reactions of various supports on rigid bodies in equilibrium
2. Analyze the frictional forces of rigid bodies on rough horizontal and inclined planes.
3. Evaluate Geometric properties of composite areas and solids.
4. Analyze rigid bodies in motion, work-energy problems and their relationship to engineering applications
5. Develop mathematical model of dynamic systems subjected to simple harmonic motion.

UNIT-I	INTRODUCTION TO ENGINEERING MECHANICS & EQUILIBRIUM OF PLANAR SYSTEM OF FORCES	Classes: 15

Introduction to engineering mechanics: Basic concepts, Classification of a force system, Parallelogram law, Resultant of coplanar concurrent force system, Moment of a force, its applications, Varignon's theorem, Resultant of coplanar non-concurrent force systems, Couples.

Equilibrium of Planar System of forces: Equilibrium, Conditions of equilibrium, Lami's theorem, free body diagrams, Types of supports, their reactions, Analysis of beams.

UNIT-II	ANALYSIS OF PERFECT FRAMES & FRICTION	Classes: 12

Analysis of perfect frames: Types of frames, Method of joints and Method of Sections

Friction: Introduction, types of friction, laws of friction, coefficient of friction, angle of friction, angle of repose, analysis of bodies on rough horizontal, inclined planes, wedge friction, ladder friction and screw friction

UNIT-III	CENTROID, CENTRE OF GRAVITY & MOMENT OF INERTIA	Classes: 12

Centroid & Centre of gravity: Introduction, centroids & centre of gravity of simple figures (from first principles), centroid of composite sections, centre of gravity of composite solids, theorems of pappus &guldinus.

Moment of Inertia: Area moment of inertia of plane sections (from first principles), Parallel axis theorem, Perpendicular axis theorem, Moment of inertia of standard sections and composite sections.

UNIT-IV	KINEMATICS & KINETICS	Classes: 11

Kinematics of a particle: Rectilinear motion, curvilinear motion, direct and oblique impact.

Kinetics of rigid bodies: Analysis of connecting bodies,kinetics of rigid body rotation, D' Alembert's principle, work-energy theorem, impulse-momentum principle, their applications

UNIT-V	VIRTUAL WORK & MECHANICAL VIBRATIONS	Classes: 12

Virtual work: Concept of virtual work, Principle of virtual work, its applications

Mechanical Vibrations: Basic terminology, free and forced vibrations, resonance, simple harmonic motion, simple, compound and torsional pendulums.

Text Books:

1. Reddy Vijay Kumar and K. Suresh Kumar, Singer's Engineering Mechanics
2. Engineering Mechanics/Timoshenko and D.H. Young, Mc Graw Hill Book Company
3. Bansal R.K, A Text book of Engineering Mechanics, Laxmi Publications

Reference Books:

1. Engineering Mechanics/Irving Shames/Prentice Hall
2. Engineering Mechanics/N.H Dubey/Tata Mc Graw Hill
3. Engineering Mechanics/D. P Sharma/ Pearson
4. Engineering Mechanics /M. V Seshagiri Rao & D Rama Durgaiah / University Press
5. Tayal A.K, Engineering Mechanics, Umesh Publications
6. B. A. Forouzan, R. F. Gillberg, "C Programming and Data Structures", Cengage Learning, India, 3rd

Web References:

1. http://nptel.ac.in/courses/112107146/
2. http://nptel.ac.in/courses/112107147/

E-Text Books:

1. https://www.pdfdrive.net/engineering-mechanics-e15629836.html
2. https://www.pdfdrive.net/engineering-mechanics-dynamics-si-version-e4362556.html

https://www.pdfdrive.net/engineering-mechanics-statics-3rd-ed-e4229691.html

MOOC Course

1. https://www.coursera.org/learn/engineering-mechanics-statics
2. https://www.edx.org/course/engineering-mechanics

COURSE OUTCOMES:

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

1. Evaluate magnitude, direction and position of resultant of different system of forces.
2. Analyze of forces in members and concept of friction
3. Calculate centre of gravity and moment of inertia of plane areas and composite bodies.
4. Analyze general plane motion for particle and rigid bodies
5. Assess virtual work and basic mechanical vibrations

ENGINEERING DRAWING

I-Semester

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A5AE02	ESC	1	-	4	3	30	70	100

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COURSE OBJECTIVES:

The course should enable the students to:

1. Create awareness and emphasize the need for Engineering Drawing in various branches of engineering.
2. Enable the student with various concepts of dimensioning, conventions and standards related to engineering drawings.
3. Follow the basic drawing standards and conventions.
4. Develop skills in three-dimensional visualization of engineering component.

UNIT-I	INTRODUCTION TO ENGINEERING DRAWING	Classes: 07

Introduction to Engineering Drawing: Principles of Engineering Graphics and their significance, usage of drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute.

UNIT-II	DRAWING OF PROJECTIONS OR VIEWS: ORTHOGRAPHIC PROJECTION IN FIRST ANGLE PROJECTION ONLY	Classes: 10

Principles of orthographic projections – conventions – first and third angle projections. Projections of points-Projection of lines inclined to both the planes.
PROJECTIONS OF PLANES: Projections of regular planes, inclined to both planes.

UNIT-III	PROJECTION OF REGULAR SOLIDS	Classes: 08

PROJECTION OF SOLIDS-Solids inclined to one plane and both planes (Auxiliary plane method)

Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone

UNIT-IV	DEVELOPMENT OF SURFACES/SOLIDS	Classes: 04

DEVELOPMENT OF SURFACE/SOLIDS: Theory of development, development of lateral surface along with base

UNIT-V	ISOMETRIC DRAWINGS	Classes: 05

Divisions of pictorial projection, theory of Isometric Drawing- Isometric view and Isometric projections; Drawing Isometric circles, Dimensioning, Isometric Objects; Conversion of Isometric view to Orthographic views and Orthographic to isometric views, Missing views

Text Books:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers .

Reference Books:

1. Johle (2009), Engineering Drawing, Tata Mc Graw Hill, New Delhi, India.

Web References:

1. nptel.ac.in/courses/112103019/
2. web.iitd.ac.in/~achawla/public_html/201/lectures/sp46.pdf

E-Text Books:

1. https://www.researchgate.net/publication/305754529_A_Textbook_of_Engineering_Drawing_A_Textbook
2. https://www.researchgate.net/publication/305754529_A_Textbook_of_Engineering_Drawing

MOOC Course

https://onlinecourses.nptel.ac.in/noc20_me79/preview

COURSE OUTCOMES:

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

1. Sketch the various curves used in engineering and their applications
2. Apply the knowledge of quadrant system and say to which quadrant and angle of project the object belongs.
3. Evaluate the given object position and draw the projections of objects
4. Analyze the given sectioned objects like in sheet metal applications.
5. Develop the new drawings for the industry requirements

ENGINEERING PHYSICS LABORATORY

I Semester

Course Code:	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A5BS11	BSC	0	0	3	2	30	70	100
Contact Classes: 00	Tutorial Classes: 00	Practical Classes: -39				Total Classes: 39		

COURSE OBJECTIVES

The course should enable the students to:

1. To provide an experimental foundation for the theoretical concepts introduced in the lectures.
2. To teach how to make careful experimental observations and how to think about and draw conclusions from such data.
3. To help students understand the role of direct observation in physics and to distinguish between inferences based on theory and the outcomes of experiments.
4. To introduce the concepts and techniques which have a wide application in experimental science but have not been introduced in the standard courses.
5. To teach how to write a technical report this communicates scientific information in a clear and concise manner.

LIST OF EXPERIMENTS

Experiment-1	**Energy gap of P-N junction diode:** To determine the energy gap of a semiconductor diode.
Experiment-2	**Solar Cell:** To study the V-I and P-I characteristics of solar cell.
Experiment-3	**Light emitting diode:** Plot V-I characteristics of light emitting diode Plot V-I characteristics of light emitting diode.
Experiment-4	**Hall effect:** To determine Hall co-efficient of a given semiconductor
Experiment-5	**Meldes Experiment:** To determine the frequency of a tuning fork by using Melde's experiment
Experiment-6	**Optical fiber:** To determine the numerical aperture and acceptance angle of an optical fiber.
Experiment-7	**LASER:** To determine the wavelength of a given laser source by using diffraction grating method.
Experiment-8	**LCR Circuit:** To determine the Resonance frequency and Quality factor of a LCR Circuit.
Experiment-9	**Newton's rings:** To determine the radius of curvature of a given plano convex lens by forming Newton's rings **.**
Experiment-10	**Torsional Pendulum:** To determine the rigidity modulus of a given metal wire by using torsional pendulum.

Experiment-11	**R-C Circuit:** To determine the time constant of R-C circuit
Experiment-12	**PIN photo diode:** To determine the V-I characteristics of PIN photo diode.

Reference Books:

1. "Semiconductor Physics and Devices: Basic Principles" by Donald A Neamen.
2. "Optics, Principles and Applications" by K K Sharma.
3. "Principles of Optics" by M Born and E Wolf.
4. "Oscillations and Waves" by Satya Prakash and Vinay Dua.
5. "Waves and Oscillations" by N Subrahmanyam and Brij Lal.

Web References:

1. **http://www.*arxiv.org/pdf/1510.00032***
2. http://www nptel.ac.in/courses/122103010/
3. http://www. researchgate.net/.../276417736_Video_Presentations_in_Engineering-Ph...
4. http://www. wileyindia.com/engineering-physics-theory-and-practical.html

Learning Outcomes:

By the end of the course students will be able:

1. **Analyze** the electric properties of semiconductor material by determining energy gap of semiconductors, threshold voltage of LEDs and efficiency issues of solar cell with careful experimental and draw conclusions from such data.
2. **Evaluate** the mechanical properties of a given material using dynamic method in torsional pendulum and analyze how stationary waves are produced to determine A.C frequency using Melde's experiment.
3. **Estimate** the optical properties of fiber by determining acceptance angle, NA of optical fiber and calculate the wavelength of given laser beam by diffraction phenomenon.

WORKSHOP AND MANUFACTURING PRACTICES

I Semester

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
A5AE03	ESC	-	-	3	2	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 56				Total Classes:70		

COURSE OBJECTIVES:

Student will be able to:

1. Get the hands on experience on various trades.
2. Perform various machining operations.
3. Capable to make useful products using one or more operations.
4. Learn various manufacturing processes.

COURSE OUTCOMES:

Student will be able to:

1. Fabricate components with their own hands
2. Get practical knowledge of the dimensional accuracies and tolerances possible with different manufacturing processes
3. Assemble different components
4. Produce small devices of their interest

LIST OF EXPERIMENTS

WEEKS	BASIC TRADES	BASIC MANUFACTURING
	Fitting	**Machine Shop**
Week 1	Filing Four Sides of Work piece	Facing & Step Turning on Lathe
Week 2	L Fit	Milling and Drilling
	Carpentry	**Black Smithy**
Week 3	Half Lap Joint	Convert round rod to S-hook
Week 4	Dove Tail Joint	Convert round rod to Chisel
	Tin Smithy	**Casting**
Week 5	Tin Smithy- Prepare a Rectangular Tray	Preparation of Mould Cavity for Multi Piece Pattern
Week 6	Prepare A Square Tin	Casting of Simple pattern

	Electrical	Welding Shop
Week 7	House Wiring Parallel and Series Connection	Lap/Butt joint Using Arc Welding
Week 8	House Wiring Two Way Switch	Lap/Butt joint Using Gas Welding
	Electronics	**Plastic Moulding**
Week 9	Soldering Parallel Connection	Injection moulding of Simple Components
Week 10	Soldering Series Connection	
Week 11	Making useful product using 3 or more operations.	Making useful product using 3 or more operations.

TEXT BOOKS:

1. Workshop Manual by P. Kannaiah and K. L. Narayana.
2. Rao P.N., "Manufacturing Technology", Tata McGraw Hill House, Vol. I and Vol. II.

REFERENCE BOOKS:

1. HajraChoudhury S.K., HajraChoudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Media promoters and publishers private limited, Mumbai, Vol. I 2008 and Vol. II 2010.
2. Kalpakjian S. and Steven S. Schmid, "Manufacturing Engineering and Technology", Pearson Education India Edition, 4thedition,2002.

E-TEXT BOOKS:

1. https://blogpuneet.files.wordpress.com/2013/07/introduction-to-basic-manufacturing-processes-and-workshop-technology.pdf
2. https://soaneemrana.org/onewebmedia/Manufacturing%20Processes%20By%20H.N.%20Gupta.pdf

MOOC COURSE:

1. https://www.class-central.com/course/edx-fundamentals-of-manufacturing-processes-7224