GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
COURSE CURRICULUM

Course Title: Basics Mathematics
(Code: 3300001)

Diploma Programmes in which this course is offered	Semester in which offered
Automobile Engineering, Biomedical Engineering, Ceramic Engineering, Chemical Engineering, Civil Engineering, Computer Engineering, Electrical Engineering, Electronics & Communication Engineering, Environment Engineering, Fabrication Technology, Information Technology, Instrumentation & Control Engineering, Mechanical Engineering, Mechatronics Engineering, Metallurgy Engineering, Mining Engineering, Plastic Engineering, Power Elctronics Engineering, Printing Technology, Textile Manufacturing Technology, Textile Processing Technology, Transportation Engineering	**First Semester**

1.   RATIONALE

The subject is classified under Basic Sciences and students are intended to know about the basic concepts and principles of Mathematics as a tool to analyze the Engineering problems. Mathematics has the potential to understand the Core Technological studies.

2.   LIST OF COMPETENCIES

The course content should be taught so as to understand and perform the Engineering concepts and computations. Aim to develop the different types of Mathematical skills leading to the achievement of the following competencies:

i.   **Apply the concepts and principles of mathematics to solve simple engineering problems**

3.   TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	**T**	**P**	**C**	**ESE**	**PA**	**ESE**	**PA**	
2	2	0	4	70	30	0	0	**100**

Legends:
L-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** -Practical;**C** – Credit;
ESE -End Semester Examination; **PA** - Progressive Assessment.

4.   DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – I **Logarithm**	1.1 Solve simple problems using concepts of Logarithms	Concept ,Rules and related Examples
Unit– II **Determinants and Matrices**	2.1 Solve simultaneous equations using concepts of Determinants and Matrices	Idea of Determinant and Matrix, Addition/Subtraction, Product, Inverse up to 3X3 matrix, Solution of Simultaneous Equations(up to three variables)
Unit– III **Trigonometry**	3.1 Solve simple problems using concepts of Trigonometry	Units of Angles(degree and radian), Allied & Compound Angles, Multiple –Submultiples angles, Graph of Sine and Cosine, Periodic function, sum and factor formulae, Inverse trigonometric function
Unit– IV **Vectors**	4.1 Solve simple problems using concepts of Vectors	Basic concept of Vector and Scalar, addition & subtraction, Product of Vectors, Geometric meaning of Scalar and Vector Product. Angle between two vectors, Applications of Dot (scalar) and Cross (vector) Product, Work Done and Moment of Force.
Unit-V **Menstruation**	5.1 Calculate the surface area and volume of different shapes and bodies.	Area of Triangle, Square, Rectangle, Trapezium, Parallelogram, Rhombus and Circle Surface & Volume of Cuboids, Cone, Cylinder and Sphere.

5.   SUGGESTED SPRCIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
1.	Logarithms	03	4	4	2	10
2.	Determinants and Matrices	08	6	8	4	18
3.	Trigonometry	08	8	6	4	18
4.	Vectors	06	5	5	4	14
5.	Mensuration	03	3	3	4	10
Total		**28**	**26**	**26**	**18**	**70**

Legends:
R = Remembrance; U= Understanding; A= Application and above levels (Revised Bloom's Taxonomy)

6.   SUGGESTED LIST OF EXERCISES (During tutorial hours)

The exercises should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the competency.

S. No.	Unit No.	Exercises/Tutorial
1	1	Logarithms-Simple Examples related Definition and Rules
2		Examples on various types and Graphs
3	2	Determinants, Simple Examples on Matrix Addition/Subtraction and Product
4		Co-factors, Adjoint and Inverse of Matrix
5	2	Solution of Simultaneous Equation using 3X3 Matrix and its Applications
6	3	Practice Examples: Allied & Compound Angles
7		Practice Examples: Periodic functions, Sum/Diff and factor formulae, Inverse Trigonometric function etc.
8		Simple Graphs of Sine and Cosine Functions(Explain Spherical Trigonometry, if possible, for Applications)
9	4	Practice Simple Examples Vectors
10		Example related to Dot and Cross Products and Applications
11	5	Examples on Area
12		Surface Area & Volume and its Applications

Note: The above Tutor sessions are for guideline only. The remaining Tutorial hours are for revision and practice.

7.   SUGGESTED LIST OF STUENT ACTIVITIES

Following is the list of proposed student activities like: course/topic based seminars, internet based assignments, teacher guided self learning activities, course/library/internet/lab based Mini-Projects etc. These could be individual or group-based.

1. Applications to solve identified Engineering problems and use of Internet.
2. Learn MathCAD to use Mathematical Tools and solve the problems of Calculus.
3. .Learn MATLAB and use to solve the identified problems.

8.   SUGGESTED LEARNING RESOURCES

A.   List of Books

S.No.	Author	Title of Books	Publication
1	Anthony croft and others	Engineering Mathematics (third edition)	Pearson Education
2	W R Neelkanth	Applied Mathematics-I	Sapna Publication
3	S P Deshpande	Polytechnic Mathematics	Pune Vidyarthi Gruh Prakashan
4	Rudra Pratap	Getting Started with MATLAB-7	OXFORD University Press

B. List of Major Equipment/ Instrument

1. Simple Calculator
2. Computer System with Printer, Internet
3. LCD Projector

C. List of Software/Learning Websites

1. Excel
2. DPlot
3. MathCAD
4. MATLAB

You may use other Software like Mathematica and other Graph

Plotting software. Use wikipedia.org, mathworld.wolfram.com Etc…

9.   COURSE CURRICULUM DEVELOPMENT COMMITTEE:

Faculty Members from Polytechnics

- **Dr.N.R.Pandya**, HOD-General Dept. Govt. Polytechnic, Ahmedabad
- **Dr N. A. Dani**, Lecturer, Govt. Polytechnic, Junagadh.
- **Smt R. L. Wadhwa**, Lecturer, Govt. Polytechnic, Ahmedabad
- **Shri H. C. Suthar**, Lecturer, BPTI, Bhavnagar
- **Shri P. N. Joshi**, Lecturer, Govt. Polytechnic, Rajkot
- **Shri P. T. Polara**, Lecturer, Om Institute of Engg. And Tech, Junagadh,
- **Smt Ami C. Shah**, Lecturer, BBIT, V. V. Nagar.

Coordinator and Faculty Member From NITTTR Bhopal

- **Dr. P. K. Purohit**, Associate Professor, Dept. of Science, NITTTR, Bhopal

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
COURSE CURRICULUM

Course Title: English
(Code: 3300002)

Diploma Programmes in which this course is offered	Semester in which offered
Architectural Assistantship, Automobile Engineering, Biomedical Engineering, Ceramic Engineering, Chemical Engineering, Civil Engineering,Computer Aided Costume Design & Dress Making, Computer Engineering, Electrical Engineering, Electronics & Communication Engineering, Environment Engineering, Fabrication Technology, Information Technology, Instrumentation & Control Engineering, Mechanical Engineering, Mechatronics Engineering, Metallurgy Engineering, Mining Engineering, Plastic Engineering, Power Elctronics Engineering, Printing Technology, Textile Designing, Textile Manufacturing Technology, Textile Processing Technology, Transportation Engineering	**First Semester**

1.   RATIONALE

English language has become a dire need to deal successfully in the globalized and competitive market and hence this curriculum aims at developing the functional and communicative abilities of the students in English. Proficiency in English is one of the basic needs of technical students. A technician has to communicate all the time with peers, superiors, subordinates and clients in his professional life. Hence this course is being offered.

2.   LIST OF COMPETENCIES

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competencies:

> **i.   Communicate verbally and in writing in English.**
>
> **ii.   Comprehend the given passages and summarize them.**

3.   TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Tutorial Marks		
L	T	P	C	ESE	PA	ESE	PA	
3	2	0	5	70	30	20	30	150

Legends: L-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** - Practical; **C** – Credit; **ESE** - End Semester Examination; **PA** - Progressive Assessment.

4.   DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes		Topics and Sub-topics
	Writing Skills	**Speaking Skills**	
Unit – I Grammar	1.1 Apply correct verb in the given sentence	1b. Use grammatically correct sentence in day to day communication	**1.1 Tenses** - Present Tense (Simple, Continuous, Perfect, Perfect Continuous) - Past Tense (Simple, Continuous, Perfect) - Future Tense (Simple)
	1.2 Distinguish among various Determiners	1d. Distinguish among determiners and apply correctly in communicative usage.	**1.2 Determiners** - Articles (A, An, The) Some, Any, Much, Many, All, Both, Few, A few, The few, Little, A little, The little, Each, Every.
	1.3 Use appropriate modal auxiliaries in a given expression	1f. Choose appropriate modals in situations where different modes of expressions are used.	**1.3 Modal Auxiliaries** Can, Could, May, Might, Shall, Should, Will, Would, Must, Have to, Need, Ought to
	1.4 Choose the correct verb for the given subject	1h. Use the correct verb depending on the subject in a sentence.	**1.4 Subject- Verb Agreement**
	1.5 Distinguish between Active and Passive structures. Apply correct model auxiliary in the given sentence.	1j. Apply the correct voice in formal communication	**1.5 The Passive Voice** Simple Tenses, Perfect Tenses And Modal Auxiliary Verbs
	1.6 Use appropriate preposition in a sentence	1l. Usage of correct preposition as per time, place and direction.	**1.6 Prepositions**: Time, Place and Direction
	1.7 Identify different connectors and their usage.	1n. Join words or sentences using connectors and bring out the desired meaning.	**1.7 Connectors**: And, But, Or, Nor, Though, Although, If, Unless, Otherwise, Because, as, Therefore, So, Who, Whom, Whose, Which, Where, When, Why.

Unit	Major Learning Outcomes		Topics and Sub-topics
	Writing Skills	**Speaking Skills**	
Unit – II Comprehe nsion Passages	2.1 Formulate sentences using new words. 2.2 Enrich vocabulary through reading. 2.3 Write short as well as long answers to questions. 2.4 Express ideas in English in written form effectively	2e.Discuss the content of the passage/story in the class. 2f. Ask appropriate questions as well to answer them. 2g. Follow oral instructions and interpret them to others. 2h. Present topics effectively and clearly. 2i.Use dictionary, thesaurus and other reference books. 2j.Describe an object or product. 2k. Use correct pronunciations and intonations. 2l. Give instructions orally	**2.1 Comprehension Passages** • Lincoln's Letter to His Son's Teacher (Abraham Lincoln) • What we must Learn from the West (Narayana Murthy) • Dabbawallas: Mumbai's Best Managed Business (Amberish K. Diwanji) • Internet (Jagdish Joshi) **2.2 Vocabulary Items:** -Matching items (word and its Meaning) - One word Substitution - Phrases and idioms - S ynonyms and Antonyms from given MCQs
Unit – III Short Stories		3a Express ideas and views on given topics. 3b. Speak briefly on a given topic fluently and clearly. 3c. Participate in formal and informal conversations 3d. Recapitulate orally the facts or ideas presented by the speaker	• My Lost Dollar by Stephen Leacock • The Snake in the Grass by R K Narayan • A Day's Wait by Earnest Hemingway
Unit – IV Writing Skills	4.1 Write letters and dialogues on given topics / situations.	4b.Face oral examinations and interviews	**4.1 Dialogue Writing** **4.2 Samples for Practice:** - Meeting ad Parting - Introducing and Influencing - Requests - Agreeing and Disagreeing - Inquiries and Information **4.3 Letter:** - Placing an order - Letter to Inquiry - Letter of Complaint - Letter of Adjustment - Letter seeking permission
Unit – V Speaking Skills		5a.Follow correct pronunciation, stress and intonation in everyday conversation.	**For 28 hours of practical periods**, digital language laboratory is recommended to be established in every polytechnic. But as polytechnics currently do not have digital language laboratories practical periods will be engaged encouraging the students to speak as per the text taught in the class.

5.   SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit Title	Teaching Hours 42+28	Distribution of Theory Marks			
		R Level	U Level	A Level	Total
Unit – I Grammar	14	8	8	9	25
Unit – II Comprehension Passages	07	4	6	5	15
Unit – III Short Stories	07	4	5	5	14
Unit – IV Writing Skills	14	3	6	6	15
Unit – V Speaking Skills	28	1			01
Total	**70**	**20**	**25**	**25**	**70**

Legends: R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxomonoy)

6.   SUGGESTED LIST OF TUTORIAL EXERCISES

The tutorial exercises should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the above mentioned competencies.

S. No.	Unit No.	Experiment
1	I	**Conversation** 1. Introducing oneself 2. Introduction about family 3. Discussion about the weather 4. Seeking Permission to do something 5. Description about hobbies 6. Seeking Information at Railway Station/ Airport 7. Taking Appointments from superiors and industry personnel 8. Conversation with the Cashier- College/ bank 9. Discussing holiday plans 10. Asking about products in a shopping mall 11. Talking on the Telephonic 12. Wishing Birthday to a Friend 13. Talking about Favourite Sports
2	II	**Presentation Skills** General Presentations pertaining to Unit I, II, III

7.   SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

Following is the list of proposed student activities like:

- course/topic based seminars,
- internet based assignments,
- teacher guided self learning activities,
- course/library/internet/lab based mini-projects etc.
  These could be individual or group-based.

8.   SUGGESTED LEARNING RESOURCES

A. Text Book

Sr. No.	Author/s	Title of Books	Publication
1	Juneja & Qureshi	**Active English**	Macmillan

B. List of Reference Books

Sr. No.	Author/s	Title of Books	Publication
1	Wren & Martin	High School English Grammar	S. Chand & Co. Ltd
2	M. Gnanamurali	English Grammar at Glance	S. Chand & Co. Ltd.
3	E. Suresh Kumar & Others	Effective English	Pearson
4	S. Chandrashekhar & Others	English Communication for Polytechnics	Orient BlackSwan
5	-	English Fluency Step 1 & 2	Macmillan
6	-	Active English Dictionary	Longman

C. List of Major Equipment/ Instrument

   i. Digital English Language Laboratory

   ii. Computers for language laboratory software

   iii. Headphones with microphone

   iv. Computer furniture

D. List of Software/Learning Websites

   i. http://www.free-english-study.com/

   ii. http://www.english-online.org.uk/course.htm

   iii. http://www.english-online.org.uk/

   iv. http://www.talkenglish.com/

   v. http://www.learnenglish.de/

9.   COURSE CURRICULUM DEVELOPMENT COMMITTEE

Polytechnic Faculty Members

- **Prof. K. H. Talati**, Govt. Polytechnic, Gandhinagar (Convener)
- **Ms. Almas Juneja**, Gujarat Technological University, Ahmedabad.
- **Shri. D. M. Patel**, Govt. Polytechnic, Ahmedabad.
- **Dr. Sonal K. Mehta**, Govt. Girls Polytechnic, Ahmedabad.
- **Shri. Bhadresh J. Dave**, Govt. Polytechnic, Rajkot.
- **Dr. Peena Thanki**, Govt. Polytechnic, Jamnagar.
- **Dr. Chetan Trivedi**, Govt. Engineering College, Bhavnagar.
- **Dr. Raviraj Raval**, Govt. Polytechnic, Rajkot.
- **Shri Vaseem Qureshi**, Vishwakarma Govt. Engineering College, Chandkheda, Ahmedabad.

NITTTR Bhopal Faculty and Co-ordinator

- **Dr. Joshua Earnest,** , NITTTR, Bhopal
- **Prof.(Mrs.) Susan S. Mathew,** NITTTR, Bhopal

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
COURSE CURRICULUM

Course Title: Engineering Physics (Group-1)
(Code: 3300004)

Diploma Programmes in which this course is offered	Semester in which offered
Automobile Engineering, Ceramic Engineering, Civil Engineering, Environment Engineering, Fabrication Technology, Mechanical Engineering, Mechatronics Engineering, Metallurgy Engineering, Mining Engineering, Plastic Engineering, Transportation Engineering	**First Semester**
Chemical Engineering, Textile Manufactureing Technology,Textile Processing Technology	**Second Semester**

1.   RATIONALE

As Physics is the mother of all engineering disciplines, students must have some basic knowledge on physics to understand their core engineering subjects more comfortably. Accordingly, in reviewing the syllabus, emphasis has been given on the principles, laws, working formulae and basic ideas of physics to help them study the core subjects. Complicated derivations have been avoided because applications of the laws and principles of physics are more important for engineering students.

As Physics is considered as basic science its principles, laws, hypothesis, concepts, ideas are playing important role in reinforcing the knowledge of technology. Deep thought is given while selecting topics in physics. They are different for various branches of engineering. This will provide sound background for self-development in future to cope up with new innovations. Topics are relevant to particular program and students will be motivated to learn and can enjoy the course of Physics as if it is one of the subjects of their own stream.

Engineering, being the science of measurement and design, has been offspring of Physics
that plays the primary role in all professional disciplines of engineering. The different streams of Physics like Optics, Acoustics, Dynamics, Semiconductor Physics, Surface Physics, Nuclear physics, Energy Studies, Materials Science, etc provide Fundamental Facts, Principles, Laws, and Proper Sequence of Events to streamline Engineering knowledge.

Note:- Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to appreciate learning of these concepts and principles.
Laboratory experiments have been set up keeping consistency with the theory so that the students can understand the applications of the laws and principles of physics.

2.   LIST OF COMPETENCIES

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competencies………….

i. Apply principles and concepts of Physics for solving various Engineering Problems

3.   TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	
3	0	2	5	70	30	20	30	150

Legends: L-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** - Practical; **C** – Credit;
ESE - End Semester Examination; **PA** - Progressive Assessment.

4.   DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – I	1.1 Explain Physical Quantities and their units. 1.2 Measure given dimensions by using appropriate instruments accurately. 1.3 Calculate error in the measurement 1.4 Solve numerical based on above outcomes	**SI Units & Measurements** 1.1 Need of measurement and unit in engineering and science, definition of unit , requirements of standard unit, systems of units-CGS,MKS and SI, fundamental and derived quantities and their units 1.2 Least count and range of instrument, least count of vernier caliper, micrometer screw gauge 1.3 Definition of accuracy, precision and error, estimation of errors -absolute error, relative error and percentage error, rules and identification of significant figures. (Numerical on above topics)
Unit– II	2.1 List Newton's laws of motion 2.2 Differentiate among various forces in nature 2.3 Define inertia, momentum and impulse of force 2.4 State Newton's laws of motion 2.5 State law of conservation of momentum 2.6 Solve numerical problems based on above topics	**Force and Motion:** Recapitulation of equations of motion, Newton's Ist law of motion, Force, basic forces in motion, gravitational force, electrostatic force, electromagnetic force, nuclear force, Inertia, types of inertia (inertia of rest, inertia of motion, inertia of direction), Momentum, Newton's IInd law of motion, measurement of force using second law, simple problems on $F = ma$ and equations of motion, Impulse of force, Impulse as the product of force and time, impulse as the difference of momentum, examples of impulse, simple problems on impulse, Newtons IIIrd law of motion and its examples. Law of conservation of momentum, Statement, simple problems (Numerical on above topics)
Unit– III	3.1 Comprehend the concept of elasticity and Define Stress, Strain and Elastic limit.	**General properties of matter** **3.1 Elasticity** Deforming force, restoring force, elastic and plastic

Unit	Major Learning Outcomes	Topics and Sub-topics
	3.2 State Hooke's law. 3.3 Explain the term elastic fatigue. 3.4 Distinguish between Streamline and Turbulent flow 3.5 Define coefficient of viscosity. 3.6 Apply the principle of viscosity in solving problems. 3.7 State significance of Reynold's number 3.8 Explain terminal velocity. 3.9 Mention Stoke's formula. 3.10 Explain the effect of temperature on viscosity 3.11 Comprehend the phenomenon of surface tension and its applications. 3.12 Define surface tension. 3.13 Explain angle of contact and capillarity. 3.14 Solve problems related to surface tension.	body, stress and strain with their types. elastic limit, Hooke's law, Young's modulus, bulk modulus, modulus of rigidity and relation between them (no derivation), stress strain diagram. behavior of wire under continuously increasing load, yield point, ultimate stress, breaking stress, factor of safety. **3.2 Surface Tension.** Molecular force, cohesive and adhesive force, Molecular range, sphere of influence, Laplace's molecular theory, Definition of surface tension and its S.I. unit, angle of contact, capillary action with examples, shape of meniscus for water and mercury, relation between surface tension , capillary rise and radius of capillary (no derivation),effect of impurity and temperature on surface tension **3.3 Viscosity** Fluid friction, viscous force, Definition of viscosity, velocity gradient, Newton's law of viscosity, coefficient of viscosity and its S.I. unit, streamline and turbulent flow with examples, critical velocity, Reynolds's number and its significance, free fall of spherical body through viscous medium (no derivation), up thrust force, terminal velocity, Stokes law (statement and formula). (Numericals on Above topics)
Unit– IV	4.1 Distinguish between Heat and Temperature. 4.2 Explain modes of Transmission of heat and their applications. 4.3 Define heat capacity and specific heat of substances. 4.4 Explain temperature 4.5 List various temperature scales and convert among temperatures	**Heat Transfer** 4.1 Three modes of transmission of heat -conduction, convection and radiation, good and bad conductor of heat with examples, law of thermal conductivity, coefficient of thermal conductivity and its S.I. unit. 4.2 Heat capacity and specific heat of materials 4.3 Celsius, Fahrenheit and Kelvin temperature scales and their conversion formulae (Numericals on above topics)
Unit– V	5.1 Comprehend the concept of wave motion 5.2 Distinguish between transverse and longitudinal waves. 5.3 Define period, frequency, amplitude and wavelength 5.4 Explain principle of superposition of waves 5.5 Define resonance 5.6 Explain resonance. 5.7 State Formula for velocity of sound in air 5.8 Comprehend the Importance of Reverberation 5.9 State Sabine's formula and Factors affecting Reverberation time 5.10 Explain ultrasonic waves. Mention applications of	**Waves and Sound** Definition of wave motion, amplitude, period, frequency, and wavelength, relation between velocity, frequency and wavelength, longitudinal and transverse wave, principle of superposition of waves, definition of resonance with examples, Formula for velocity of sound in air and various factors affecting it **Ultrasonic Waves** Definition, Properties of ultrasonic waves Uses of ultrasonic waves. **Acoustics Of Building** Importance of Reverberation, Reverberation time, Optimum time of Reverberation, Coefficient of absorption of Sound, Sabine's formula for Reverberation time, Factors affecting Reverberation time and acoustics of building. (Numericals on above topics)

Unit	Major Learning Outcomes	Topics and Sub-topics
	ultrasonic waves	
Unit– VI	6.1 State Properties Of Light 6.2 Define various phenomena of light 6.3 State Snell's law of refraction. 6.4 Explain importance and list applications of nanotechnology in engineering field	**Light and Nanotechnology** Properties Of Light, Electromagnetic spectrum, Reflection, refraction, snell's law, diffraction, polarization, interference of light, constructive and destructive interference (Only definitions), physical significance of refractive index, dispersion of light Introduction to Nanotechnology (Numericals on above topics)
Unit – VII	7.1 Define radio activity 7.2 Distinguish between Natural & Artificial radioactivity 7.3 State relation between Half Life, Average Life & Decay Constant. 7.4 Describe properties of Alpha, Beta and Gamma rays.	**Radioactivity** 7**.1 Radioactivity** Definition, Natural & Artificial radioactivity, Units and Laws of Radioactivity, Half Life, Average Life & Decay Constant. 7**.2 Radioactive Rays** Properties and uses of alpha particles, beta particles and gamma rays (Numericals on Above topics)

5.   SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
1.	SI Units & Measurements	05	03	02	05	10
2.	Force and Motion	05	02	02	04	08
3.	General Properties of Matter	10	04	06	08	18
4.	Heat Transfer	04	02	02	02	06
5.	Waves and sound	07	04	04	04	12
6.	Light and Nanotechnology	07	03	03	04	10
7.	Radioactivity	04	02	02	02	06
	Total	**42**	**20**	**21**	**29**	**70**

Legends:
R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

6. SUGGESTED LIST OF EXERCISES/PRACTICAL/EXPERIMENTS

The exercises/practical/experiments should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the competency.   Following is the list of exercises/practical/experiments for guidance.

S. No.	Unit No.	Experiment /Practical Exercises
1	1	Linear Measurement by Vernier calipers
2	1	Linear Measurement by Micrometer screw
3	3	Measurement of Surface tension
4	3	Measurement of Viscosity
5	3	Measurement of Young's Modulus
6	3	To determine Force constant with the help of periodic time of oscillations of spring
7	3	Measurement of specific gravity
8	6	To calculate refractive index of material of prism using spectrometer device.
9	4	Joule's mechanical equivalent of heat
10	4	Measurement of co-efficient of thermal conductivity
11	5	To study the relation between the length of a stretched string and the tension in it with the help of a sonometer.
12	6	To calculate SA/V ratio of simple objects to understand nanotechnology

Minimum 8 experiments/practical exercises should be performed from the above list

- Hours distribution for Physics Experiments :

Sr. No.	Description	Hours
1	An introduction to Physics laboratory and its experiments (for the set of first four experiments)	02
2	Set of first four experiments	08
3	An introduction to experiments (for the set of next four experiments)	02
4	Set of next four experiments	08
5	Mini project	06
6	Viva and Submission	02

7.   SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

Following is the list of proposed student activities like:
Laboratory based mini projects:

1. To calculate acoustics of given class room
2. To prepare models of Vernier calipers, micrometer screw gauge and travelling microscope

And many more Teacher guided self learning activities:
1. To prepare a chart of applications of nanotechnology in engineering field
2. To prepare models to explain different concepts

And many more Course/topic based seminars:
1. Seminar by student on any relevant topic

8.   SUGGESTED LEARNING RESOURCES

A. List of Books

Sr No.	Author	Title of Books	Publication
1	Sears And Zemansky	University Physics	Pearson Publication
2	Paul G Hewitt	Conceptual Physics	Pearson Publication
3	Halliday & Resnick	Physics	Wiley India
4	G Vijayakumari	Engineering Physics, 4e	Vikas-Gtu Students' Series
5	Arvind Kumar & Shrish Barve	How And Why In Basic Mechanics	Universities Press
6	Ncert	Physics Part 1 And 2	Ncert
7	Giancoli	Physics For Scientists And Engineers	
8	H C Verma	Concepts Of Physics	
9	Gomber & Gogia	Fundamentals Of Physics	Pradeep Publications, Jalandhar

B. List of Major Equipment/ Instrument

1. Redwood's Viscometer
2. Digital Vernier Calipers And . Digital Micrometer Screw Guage
3. Digital Travelling Microscope
4. Joule's Calorimeter
5. Searle's Thermal Conductivity Apparatus
6. Visible Light Spectrometer

C. List of Software/Learning Websites

1. www.physicsclassroom.com
2. www.physics.org
3. www.fearofphysics.com
4. www.sciencejoywagon.com/physicszone
5. www.science.howstuffworks.com

9.   COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Dr. S. B. Chhag**, Lecturer in Physics, Science Deptt, Govt. Polytechnic, Rajkot
- **Ku. B. K. Faldu**, Lecturer in Physics, Science Deptt, Govt. Polytechnic, Ahmedabad
- **Shri D. V. Mehta**, Lecturer in Physics, Science Deptt, RCTI, Ahmedabad
- **Shri S. B. Singhania**, Lecturer in Physics, Science Deptt, Govt. Polytechnic, Ahmedabad
- **Dr. U. N. Trivedi,** Lecturer in Physics, Science Deptt, RCTI, Ahmedabad

Coordinator and Faculty Members From NITTTR Bhopal

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GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
COURSE CURRICULUM

Course Title: Basics Engineering Drawing
(Code: 3300007)

Diploma Programmes in which this course is offered	Semester in which offered
Automobile Engineering, Ceramic Engineering, Civil Engineering, Environment Engineering, Mechanical Engineering, Mechatronics Engineering, Metallurgy Engineering, Mining Engineering, Printing Technology, Textile Manufacturing Technology, Textile Processing, Transportation Engineering	**First Semester**
Chemical Engineering, Electrical Engineering, Fabrication Technology, Plastic Engineering	**Second Semester**

1 RATIONALE:

Engineering drawing is an effective language of engineers. It is the foundation block which strengthens the engineering & technological structure. Moreover, it is the transmitting link between ideas and realization. It is an attempt to develop fundamental understanding and application of engineering drawing. It covers knowledge & application of drawing instruments & also familiarizes the learner about Bureau of Indian standards. The curriculum aims at developing the ability to draw and read various drawings, curves & projections.

The subject mainly focuses on use of drawing instruments, developing imagination and translating ideas. Developing the sense of drawing sequence and use of drawing instruments effectively yields not only with productive preparation of computer aided graphics but also yields with effective industrial applications ranging from marking to performance of operations.

2 LIST OF COMPETENCIES:

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competencies:

 i.   **Prepare engineering drawings manually with given geometrical dimensions using prevailing drawing standards and drafting instruments. .**
 ii. **Visualize the shape of simple object from orthographic views and vise versa.**

3. TEACHING AND EXAMINATION SCHEME:

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	
2	0	4	6	70	30	40	60	**200**

Legends: L-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** - Practical; **C** – Credit; **ESE** - End Semester Examination; **PA** - Progressive Assessment.

4. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes	Sub-topics
Unit – 1 **ENGINEERING DRAWING AIDS**	1.1 Use drawing equipments, instruments and materials effectively.	1.1 Drawing equipments, instruments and materials. (a) Equipments-types, specifications, method to use them, applications. (b) Instruments-types, specifications, methods to use them and applications. (c) Pencils-grades, applications, types of points and applications. (d) Other materials-types and applications.
Unit– 2 **PLANNING, LAYOUT AND SCALLING OF DRAWING**	2.1 Follow and apply standard practice as per bureau of I.S. for planning and layout 2.2 Choose appropriate scale factor for the drawing as per given situation	2.1 I.S. codes for planning and layout. 2.2 Scaling technique used in drawing.
Unit– 3 **LINES, LETTERING AND DIMENSIONING**	3.1 Write annotations on a drawing where ever necessary. 3.2 Choose appropriate line and dimensioning style for a given geometrical entity.	3.1 Different types of lines. 3.2 Vertical capital and lower case letters. 3.3 Inclined capital and lower case letters. 3.4 Numerals and Greek alphabets. 3.5 Dimensioning methods. (a) Aligned method. (b) Unilateral with chain, parallel, progressive and combined dimensioning.

Unit	Major Learning Outcomes	Sub-topics

Unit– 4
 	
GEOMETRIC CONSTRUCTION
	4.1 Develop the ability to draw polygons, circles and lines with different geometric conditions.	4.2 Geometric construction related with line like bisecting a line, to draw perpendicular with a given line, divide a line, etc.
		4.3 Geometric construction related with angle like bisect an angle, trisect an angle, etc.
		4.4 To construct polygon.
		    a: Triangle
		    b: Square / Rectangle.
		    c: Pentagon with special method.
		    d: Hexagon with special method.
		4.5 To draw tangents.
		4.6 Geometric construction related with circle & arc.

Unit–5
 	
ENGINEERING CURVES
	5.1 Able to draw engineering curves with proficiency and speed as per given dimensions.	5.2 Conic sections.
		  (a) Concept and understanding of focus, directrix, vertex and eccentricity and drawing of conic sections.
		  (b) Using various methods, understand construction of :
		      i. Ellipse.
		      ii. Parabola.
		      iii. Hyperbola.
		5.3 Cycloidal Curves(Cycloid, Epicycloid, Hypocycloid)
		5.4 Involutes.
		  (a) Involutes of a circle
		  (b) Involutes of a polygon
		5.5 Spiral (Archimedean spiral only).

Unit– 6
 	
PROJECTION OF POINTS, LINES AND PLANES
	6.1 Draw the projection of points, lines and planes with different conditions.
	6.2 Find out true shape and size of a inclined line or plane
		6.1 Reference planes, orthographic projections.
		6.2 Concept of quadrant.
		6.3 1st angle and 3rd angle projection and their symbols.
		6.4 Projection of points.
		6.5 Projection of lines – determination of true length and inclinations for following cases.
		  (a) Line parallel to one or both the plane.
		  (b) Line perpendicular to one of the plane.
		  (c) Line inclined to one plane and parallel to another.
		  (d) Line inclined to both the planes.
		6.6 Projection of Planes.
		  (a) Types of planes.
		  (b) Projection of planes parallel to one of the reference planes.
		  (c) Projection of plane inclined to one reference plane and perpendicular to another.
		  (d) Projection of planes inclined to both reference planes.
		
		Note :
		Triangle, Square / rectangle, pentagon, hexagon and circle shape should be included in various plane problems.

Unit	Major Learning Outcomes	Sub-topics

Unit– 7
 	
ORTHOGRAPHC PROJECTIONS
	7. 1 Draw the orthographic views of object containing lines, circles and arc geometry.
	7.2 Interpret given orthographic views and to imagine the actual shape of the component.
		7.1 Types of projections-orthographic, perspective, isometric and oblique: concept and applications.
		7.2 Various term associated with orthographic projections.
		    (a) Theory of projection.
		    (b) Methods of projection.
		    (c) Orthographic projection.
		    (d) Planes of projection.
		
		7.3 Conversion of simple pictorial views into Orthographic views. Illustrative problems on orthographic projection.
		7.4 B.I.S. code of practice.
		
		Note :
		(1) Problem should be restricted up to four views-Front view/Elevation, Top view/Plan and Side views only.
		(2) Use First Angle Method only.

Unit– 8 **ISOMETRIC PROJECTIONS**	8.1 Draw the isometric view from orthographic views of object/s containing lines, circles and arcs.	8.2 Isometric axis, lines and planes. 8.3 Isometric scales. 8.4 Isometric view and isometric drawing. 8.5 Difference between isometric projection and isometric drawing. 8.6 Illustrative problems limited to objects containing lines, circles and arcs shape only.

5.   SPECIFICATION TABLE WITH HOURS & MARKS (THEORY):

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
1.	Engineering drawing aids.	0	00	00	02	02
2.	Planning, layout and scaling of drawing.	0	02	00	03	05
3.	Lines, lettering and dimensioning.	0	00	02	00	02
4.	Geometric construction.	3	00	03	07	10
5.	Engineering curves.	6	02	00	10	12
6.	Projection of points, lines and planes.	8	03	00	14	17
7.	Orthographic projections.	6	00	00	12	12
8.	Isometric projections.	5	00	02	08	10
	Total	**28**	**07**	**07**	**56**	**70**

Legends:
R = Remembrance; U = Understanding; A = Application and above levels.

NOTES:

a: If midsem test is part of continuous evaluation, unit number 4, 5 and 6 (For Unit 6, except projections of planes) are to be considered.

b: Ask the questions from each topic as per weightage of marks. Choice of questions must be given from the same topic.

6. SUGGESTED LIST OF EXERCISES/PRACTICAL/EXPERIMENTS

The exercises/practical/experiments should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the competency. Following is the list of exercises/practical/experiments for guidance.

Ex. No.	Unit No.	Practical Exercises	Hours
1	1,2,3	**USE OF DRAWING INSTRUMENTS:** 1. Teacher will demonstrate- a: Use of drawing instruments. b: Planning and layout as per IS. c: Scaling technique. 2. Draw following. Problem – 1 Drawing horizontal, vertical, 30 degree, 45 degree, 60 & 75 degrees lines using Tee and Set squares/ drafter. Problem – 2 Types of lines. Problem – 3 Types of dimensioning. Problem – 4 Alphabets & numerical (Vertical & inclined as Per I.S.).	14
2	4	**GEOMETRIC CONSTRUCTION:** Drawing of set of lines with different conditions. (Two problems) Drawing Polygons. (Three Problems) Drawing circles and arcs with different geometric conditions and with line constraints. (Three problems)	06
3	5	**ENGINEERING CURVES – I:** Problem –1: Construction of ellipse using any two methods from arc of circle method, four centre method, rectangular method, eccentricity method and concentric circle method. Problem –2: Construction of parabola with any one method from rectangular method, tangent method and eccentricity method. Problem –3: Construction of hyperbola with any one method from eccentricity method and rectangular method. Problem –4: Construction of spiral. (Refer note c for dimensions).	04
4	5	**ENGINEERING CURVES – II:** Problem – 1: Construction of cycloid. Problem – 2: Construction of hypocycloid & epicycloids. Problem – 3: Construction of involute (circle).	04

		Problem – 4: Construction of involute (polygon). (Refer note c for dimensions).	
5	6	**PROJECTIONS OF POINTS AND LINES:** Draw projection of points-For 10 various conditions.(One problem) Draw projection of lines with different conditions. (Four problems) (Refer note c for dimensions).	06
6	6	**PROJECTIONS OF PLANE:** Draw projection of different planes with different conditions. (triangle, square / rectangular, pentagonal / hexagonal, and circular -one for each). (Four problems) (Refer note c for dimensions).	04
7	7	**ORTHOGRAPHIC PROJECTIONS**: Draw Orthographic projections of different objects. (Two problems) (Draw four views of each object). (Refer note c for dimensions).	08
8	8	**ISOMETRIC DRAWINGS:** Draw isometric drawings from given orthographic views (Three problems) (Refer note c for dimensions).	10
9	All	**PROBLEM BASED LEARNING:** Given the orthographic views of at least three objects with few missing lines, the student will try to imagine the corresponding objects, complete the views and draw these views in sketch book.	-
10	All	**SCHOOL WITHIN SCHOOL:** • Explain at least one problem for construction and method of drawing in sheet to all batch colleagues. Teacher will assign the problem of particular sheet to be explained to each batch student. • Each student will assess at least one sheet of other students (May be a group of 5-6 students identified by teacher can be taken) and will note down the mistakes committed by them. Student will also guide the students for correcting the mistakes, if any.	-

Notes :–

a: **Use both sides of sheet. For example, draw sheet number 2 on back side of sheet number 1, 4 on back of 3, and likewise.**

b: Theory & practice should be in first angle projections and IS codes should be followed wherever applicable.

c: The dimensions of line, axes, distances, angle, side of polygon, diameter, etc. must be varied for each student in batch so that each student will have same problems, but with different dimensions.

d: The sketchbook has to contain data of all problems, solutions of all problems and student activities performed. Students' activities are compulsory to be performed.

e: A hand out containing applicable standards from IS codes including title block as per IS standard should be given to each student by concerned teacher.

f: For 40 marks Practical Marks ESE, students are to be assessed for competencies achieved. Students are to be given data for practical ESE to prepare drawings.

7.   LIST OF STUDENT ACTIVITIES:

Following is the list of student activities to be performed by each student individually:

Activity No.	Details of student activity
1	Sketch the combinations of set squares to draw angles in step of 15^0.(15^0, 30^0, 45^0, 60^0, 75^0, 90^0, 105^0, 120^0, 135^0, 150^0, 165^0, 180^0).
2	Solve all problems for all sheets number 1 to 8 in sketch book (with dimensions).
3	List the shapes you are observing around you in real life with place/item. (For ellipse, parabola and hyperbola).
4	Take two simple objects. Sketch isometric of them. Also draw orthographic projections of them (all views).
5	Take one circular shape. Assume one point on circumference and mark it. Roll that shape on flat and circular surface. Observe the path of point.
6	List at least two questions individually which you would like to ask for followings: a: Ellipse. b: Involute of circle. c: Perspective projections. d: Use of geometric constructions. e: Quadrants.

8.   SUGGESTED LEARNING RESOURCES:

A. List of Books

Sr.No.	Title of Books	Author	Publication
1	Elements of Engineering Drawing.	N.D. Bhatt	Charotar Publishing House, Anand.
2	Engineering Drawing.	P.J.Shah	S.Chand, New Delhi.
3	Fundamentals of Engineering Drawing.	W.J.Luzzadar	Prentice-hall of India Pvt. Ltd.-New Delhi
4	Fundamentals of Drawing.	K.R.Gopalkrishna	Subhash Publications, Banglore.
5	Engineering Drawing	M.B.Shah, B.C.Rana	Pearsons.
6	Machine Drawing.	V. Laxminarayan & M.L.Mathur	Jain Brother, New Delhi.
7	Fundamentals of Engineering Drawing.	French & Vierck	McGraw-Hill

B. List of Major Equipments/ Instruments :

- Models- full and cut.
- Set of various industrial drawings being used by industries-up dated.
- Drawing equipments and instruments for class room teaching-large size.
- Drawing board-half imperial size.
- T-square or drafter (Drafting Machine).

- Set squires (45^0 and 30^0-60^0)
- Protector.
- Drawing instrument box (containing set of compasses and dividers).
- Drawing sheets.
- Drawing pencils.
- Eraser.
- Drawing pins / clips.
- Roller scale

C. List of Software/Learning Websites:

- rgpv-ed.blogspot.com/2009/02/**engineering-curves**.html
- http://www.slideshare.net/sahilsahil992/conic-section-1819818
- http://www.technologystudent.com/designpro/drawdex.htm
- http://www.engineeringdrawing.org/engg_curves/problem-3-8-engineering-curves/490/
- http://web.iitd.ac.in/~hirani/mel110-part3.pdf
- http://www.studyvilla.com/ed.aspx
- http://www.youtube.com/watch?v=a703_xNeDao
- http://www.youtube.com/watch?v=TCxTP_8ggNc
- http://www.youtube.com/watch?v=JpgFPZILTu8&feature=related
- http://www.youtube.com/watch?v=o1YPja2wCYQ&feature=related
- http://www.youtube.com/watch?v=dJyKV3Ay7vM&feature=fvwrel
- E-learning package from KOROS.
- E-learning package from Cognifront.
- CD with book-Engineering drawing, M.B. Shah-B.S. Rana (Pearson).
- Computer based learning material published by KOROS.

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

o **Prof.K. H. Patel**. Head Dept.of Mech., Engg., Dr. S. & S. Gandhi College of Engineering and Technology, Surat,

o **Shri.H. R. Sapramer**, Lecturer in Mech. Engineering, Dr. J.N.Mehta Government   Polytechnic, Amreli.

o **Prof.A.M. Talsaniya**, Lecturer in Mech. Engineering, Sir Bhavsinhji Polytechnic Institute, Bhavnagar.

Co-ordinator and Faculty Memberfrom NITTTR Bhopal

- **Prof. Sharad Pradhan**, Associate Professor, Dept. of Mech. Engg., NITTTR, Bhopal.

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
COURSE CURRICULUM

Course Title: Applied Mechanics
(Code: 3300008)

Diploma Programmes in which this course is offered	Semester in which offered
Automobile Engineering, Metallurgy Engineering	**First Semester**
Civil Engineering, Environment Engineering, Fabrication Technology, Mechanical Engineering, Mechatronics Engineering, Mining Engineering, Transportation Engineering	**Second Semester**

1.   RATIONALE

Applied mechanics, as its name suggests, bridges the gap between physical theory and its application to technology. As such, applied mechanics is used in many fields of engineering, especially mechanical and Metallurgy Engineering. In this context, it is commonly referred to as engineering mechanics. To impart basic knowledge of Engineering Mechanics where in Laws of Physics are applied to Solve Engineering problems, this programme / course will help the student to develop basic know how & awareness of the various laws of physics & it's real life applications in the various fields of engineering

2.   LIST OF COMPETENCIES

 The course content leading to the achievement of the following competencies;
i.   Apply the concepts of force, work and energy to calculate work done, power required & efficiency for various simple machines

3.   Teaching and Examination Scheme

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	**T**	**P**	**C**	**ESE**	**PA**	**ESE**	**PA**	
3	0	2	5	70	30	20	30	150

Legends: L-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** - Practical; **C** – Credit;
           ESE - End Semester Examination; **PA** - Progressive Assessment.

4.   DETAILED COURSE CONTENT

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – I **Introduction**	1.1 Define scope of Engineering Mechanics 1.2 Classify Scalar & Vector quantity 1.3 Diffrentiate the systems of Units	Scalar & Vector Quantities – like force , pressure , velocity , acceleration Static & Dynamic – Kinetics & Kinematics MKS , CGS & SI units and its conversion along with FPI and Metric System
Unit– II **Coplanar Concurrent Forces**	2.1 Understand Co - planer Concurrent Force system 2.2 Compute resultant & Equilibrium forces for given coplanar concurrent force system	**Force** – units , elements , **Laws/Principles** of forces such as Principle of Superposition , Principle of transmissibility Composition & Resolution of Forces **Resultant & Equilbrium** forces conditions of equilibrium **Analytical & graphical method** for Law of Parallelogram , Law of Triangle , Lami's Theorems , Law of Polygon
Unit– III **Coplanar Non-Concurrent Forces**	3.1 Differentiate Co-planar , parallel and non - concurrent forces 3.2 Compute resultant & Equilibrium forces for given coplanar concurrent force system 3.3 Calculate Support reactions of the given simply supported beam	**Principal of Moment** Moment , Couple , , application , properties of couple , conditions of equilibrium **types of supports**, end conditions – Hinge , free end , roller ,fix , **types of loads** like point load , U.D.L , U.V.L , Couple , **Analytical method** to Evaluate reactions in statically determinate beam subjected to point load and/ or U.D.L by analytical method of solving Statically determinate beams to
Unit – IV **Centroid & Centre of Gravity**	4.1 Distinguish between Centroid and Centre of Gravity 4.2 Compute Centroid & centre of gravity in different shape and lamina	**First moment of area**; to find Centroid –standard shapes of I , L , Channel & T sections , axis of symmetry **First moment of mass**; to find C.G of standard solids sections , Axis of symmetry
Unit – V **Friction**	5.1 Appreciate Friction and its Engineering applications 5.2 Calculate coefficient of friction for different surfaces	**Friction** , Laws of Friction , Angle of Friction , Angle of Repose, types of friction **Application of Lami's** theory and theory of resolution of forces , examples on friction for a block resting on horizontal plane & on inclined plane
Unit – VI **Work, Power & Energy**	6.1 Establish relation between Work, Power Energy 6.2 Calculate IHP and BHP in different conditions	**Work** – work done , force displacement diagram , torque , work done by torque **Power** – I.H.P and B.H.P of engine ,Equation of H.P in terms of Torque and R.P.M , Engineering Problems **Energy** – Kinetic & Potential energy and Engineering Problems
Unit – VII **Simple Machines**	7.1 Apply the principle & application of Simple Machines 7.2 Compare reversible & irreversible Machines, evaluate the efficiencies of various simple machines	**principles of machines** to evaluate Mechanical Advantage , Velocity Ratio of simple machine **pulley blocks ,** Draw Line sketch of different systems of **Simple and compound levers** ,Problems , Laws of Machines , reversible & non reversible machines

5.   SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1.	Introduction	02	04	00	00	04
2.	Coplanar Concurrent Forces	10	02	02	06	12
3.	Coplanar Non-Concurrent Forces	10	02	02	08	12
4.	Centroid and Centre of Gravity	04	02	02	06	10
5.	Friction	06	02	04	06	12
6.	Work, Power & Energy	04	02	02	06	10
7.	Simple Machines	06	02	02	08	12
	Total	**42**	**16**	**14**	**40**	**70**

Legends:

R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxomonoy

6.   SUGGESTED LIST OF EXERCISES/PRACTICAL/EXPERIMENTS

The exercises/practical/experiments should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the competency.   Following is the list of exercises/practical/experiments for guidance.

S. No.	Unit No.	Practical Exercise/Experiment
1	01	----
2	02	Verify and calculate resultant force through Law of Parallelogram , Polygon Law of Forces , Lami's Theorem
3	03	Verify reactions in beam through Graphical & analytical method
4	04	Calculate Centroid of lamina and Centroid of different sections
5	05	Calculate Co efficient of Sliding Friction for different surfaces – Wood , Glass
6	06	----
7	07	Work-out M.A & Efficiency of Simple purchase crab , simple wheel and axle , simple screw jack

7.   SUGGESTED LIST OF STUDENT ACTIVITIES

7.1 Students will prepare File/journal for the above mentioned Experiments.

7.2 Students may be given few exercises to calculate resultant/equilibrium force of the force system graphically & analytically verify the results. -unit 2

7.3 Student may be asked to collect photographs from internet which is related to field application of various topics.

8. SUGGESTED LEARNING ACTIVITIES

A. List of Books

Sr. No.	Title of Book	Author	Publication
1.	Engineering Mechanics	R S Khurmi	S. Chand , New Delhi
2.	Engineering Mechanics	D S Kumar	S. K. Kataria & Sons,
3.	Engineering Mechanics 7th edition	Bear & Jonstan	New media
4.	Applied Mechanics	H J Shah & Junarkar	CHAROTAR Publication

B. List of Major Equipment/ Instrument

7.4 Apparatus for Law of Parallelogram , Lami's theorem & law of Polygon

7.5 Apparatus for determination of coefficient of friction

7.6 Apparatus to determine CG of Lamina

7.7 Beam apparatus to find reactions

7.8 Simple purchase crab , simple wheel and axle , simple screw jack

C. List of Software/Learning Websites

Video Lectures on Applied Mechanics By Prof.SK. Gupta, Department of Applied Mechanics, IIT Delhi

www.tut.fi/.../Instituteof**AppliedMechanics**andOptimization/TME-51

ocw.mit.edu › ... › Mechanics of Materials

www.me.ust.hk/.../ME106-**applied**%20**mechanics**-lecture%201.pdf

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. B G RAJGOR** , HOD , Dept of Applied Mechanics, B & B Institute of Technology
- **Prof. J H GABRA** , I/C HOD , Dept of Applied Mechanics, G.P , Godhara

Co-ordinator and Faculty Members from NITTTR Bhopal

- **Dr. J.P.Tegar**, Professor Dept. of Civil and Environmental Engg, NITTTR, Bhopal.

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
COURSE CURRICULUM

Course Title: Engineering Workshop Practice
(Code: 3301901)

Diploma Programmes in which this course is offered	Semester in which offered
Automobile Engineering, Mechanical Engineering, Mechatronics Engineering, Metallurgy Engineering	**First Semester**
Ceramic Engineering, Fabrication Technology, Mining Engineering, Printing Technology, Textile Manufacturing Technology, Textile Processing Technology	**Second Semester**

1.   RATIONALE

Workshop practice is the backbone of the real industrial environment which helps to develop and enhance relevant technical hand skills required by the technician working in the various engineering industries and workshops. This course intends to impart basic know-how of various hand tools and their use in different sections of manufacturing. Irrespective of branch, the use of workshop practices in day to day industrial as well domestic life helps to dissolve the problems.

The workshop experiences would help to build the understanding of the complexity of the industrial job, along with time and skills requirements of the job. Workshop curricula build the hands on experiences which would help to learn manufacturing processes and production technology courses in successive semesters. Workshop practice is also important since only practice can make the man perfect.

The students are advised to undergo each skill experience with remembrance, understanding and application with special emphasis on attitude of enquiry to know why and how for the various instructions and practices imparted to them in each shop.

2.   LIST OF COMPETENCIES

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competencies.

i.   **Prepare simple jobs in fitting, carpentry, pipefitting and metal joining shop while following safe working and good housekeeping practices**.

3.   TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	**T**	**P**	**C**	**ESE**	**PA**	**ESE**	**PA**	
0	0	4	4	0	0	40	60	**100**

Legends: L-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** - Practical; **C** – Credit;
    ESE - End Semester Examination; **PA** - Progressive Assessment.

4. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes	Topics and Sub-topics
UNIT – 1 **INTRODUCTION TO WORKSHOP**	1.1 Sketch general workshop layout. 1.2 Follow preliminary safety rules in workshop.	1.1 Workshop layout. 1.2 Importance of various sections/shops of workshop. 1.3 Types of jobs done in each shop. 1.4 General safety rules and work procedure in workshop.
UNIT – 2 **FITTING**	2.1 Select appropriate fitting tools for the required application. 2.2 Prepare the simple jobs as per specification using fitting tools.	2.1 Sketch, specification and applications of fitting work holding tools-bench vise, V-block with clamp and C-clamp. 2.2 Sketch, specification , material ,applications and methods of using fitting marking and measuring tools-marking table, surface plate, angle plate, universal scribing block, try-square, scriber, divider, centre punch, letter punch, calipers, vernier caliper, etc. 2.3 Types, sketch, specification , material , applications and methods of using of fitting cutting tools-hacksaw, chisels, twist drill, taps, files, dies. 2.4 Types, sketch, specification, material, applications and methods of using of fitting finishing tools-files, reamers. 2.5 Sketch, specification and applications of miscellaneous tools-hammer, spanners, screw drivers sliding screw wrench. 2.6 Demonstration of various fitting operations such as chipping, filing, scraping, grinding, sawing, marking, drilling, tapping. 2.7 Preparation of simple and male- female joints. 2.8 Safety precautions. *Note: See List of Major Equipments/ Instruments at serial no. 8B.*
UNIT – 3 **TIN SMITHY**	3.1 Select appropriate tin smithy tool for the required application. 3.2 Prepare the simple job as per specification using tin smithy tools.	3.1 Concept and conversions of SWG and other gauges in use.. 3.2 Use of wire gauge. 3.3 Types of sheet metal joints and applications. 3.4 Types, sketch, specification, material, applications and methods of using tin smithy tools-hammers, stakes, scissors/snips, etc. 3.5 Demonstration of various tin smithy tools and sheet metal operations such as shearing, bending and joining. 3.6 Preparation of tin smithy job. 3.7 Safety precautions. *Note: See List of Major Equipments/ Instruments at serial no. 8B.*

UNIT – 4 CARPENTRY	4.1 Select appropriate carpentry tool for the required application. 4.2 Prepare the simple job as per specification using carpentry tools.	4.1 Types, sketch, specification, material, applications and methods of using of carpentry tools-saws, planner, chisels, hammers, pallet, marking gauge, vice, try square, rule, etc. 4.2 Types of woods and their applications. 4.3 Types of carpentry hardwares and their uses. 4.4 Demonstration of carpentry operations such as marking, sawing, planning, chiseling, grooving, boring, joining, etc. 4.5 Preparation of wooden joints. 4.6 Safety precautions. *Note: See List of Major Equipments/ Instruments at serial no. 8B.*
UNIT – 5 PIPE FITTING	5.1 Select appropriate pipe fitting tool for the required application. 5.2 Prepare the simple job as per specification using pipe fitting tools.	5.1 Types, specification, material and applications of pipes. 5.2 Types, specification, material and applications of pipe fittings. 5.3 Types, specifications, material, applications and demonstration of pipe fitting tools. 5.4 Demonstration of pipe fitting operations such as marking, cutting, bending, threading, assembling, dismantling, etc. 5.5 Types and application of various spanners such as flat, fix, ring, box, adjustable, etc. 5.6 Preparation of pipe fitting jobs. 5.7 Safety precautions. *Note: See List of Major Equipments/ Instruments at serial no. 8B.*
UNIT – 6 METAL JOINING	6.1 Select appropriate equipment and consumables for required application. 6.2 Prepare the simple jobs as per specification using proper metal joining and cutting method.	6.1 Types, specification, material and applications of arc welding transformers. 6.2 Types, specification, material and applications of arc welding accessories and consumables. 6.3 Demonstration of metal joining operations- arc welding, soldering and brazing. Show effect of current and speed. Also demonstrate various welding positions. 6.4 Demonstrate gas cutting operation. 6.5 Preparation of metal joints. 6.6 Safety precautions. *Note: See List of Major Equipments/ Instruments at serial no. 8B.*

6. SUGGESTED LIST OF EXERCISES/PRACTICAL/EXPERIMENTS

The exercises/practical/experiments should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the competency. Following is the list of exercises/practical/experiments for guidance.

S. No.	Unit No.	Practical Exercises	HOURS
1	I	Prepare carpentry and fitting shop layout.	02
2	II	Demonstrate use of different fitting tools –like work holding, marking, measuring, cutting, finishing and miscellaneous. Student will also prepare the report with sketch, specifications and applications of fitting tools demonstrated.	04
3	II	Prepare one simple and another male-female type fitting jobs as per given drawings- 2 jobs.	10
4	III	Demonstrate use of different tin smithy tools. Student will also prepare the report with sketch, specifications and applications of tin smithy tools demonstrated.	02
5	III	Prepare one tin smithy job as per drawing having shearing, bending, joining and riveting.	04
6	IV	Demonstrate use of different carpentry tools. Student will also prepare the report with sketch, specifications and applications of carpentry tools demonstrated.	04
7	IV	Prepare two wooden joints as per given drawings.	08
8	V	Demonstrate use of different pipe fitting tools. Student will also prepare the report with sketch, specifications and applications of pipe fitting tools demonstrated.	02
9	V	Prepare pipe fitting jobs as per drawings-two jobs.	04
10	VI	Demonstrate use of different welding transformers and consumables. Also demonstrate arc welding, gas cutting, soldering and brazing operations. Student will also prepare the report with sketch, specifications and applications of fitting tools demonstrated.	04
11	VI	Prepare jobs using arc welding, gas cutting, spot welding, brazing and soldering process- three jobs.	08
12	I to VI	**PROBLEM BASED LEARNING:** Group of 6 students will take rejected workpieces in workshop practice (at least two in each fitting, carpentry, tin smithy, pipe fitting and welding). Group will draw the workpieces , will identify type of defects and will discuss the reasons of such defects. Outcome of discussion has to be written in logbook and report.	02
13	I to VI	**SCHOOL WITHIN SCHOOL:** i: Each student will demonstrate and explain at least one tool (to be assigned by teacher) to all batch colleagues. ii: Each student will share his/her student activities outcome. He/she will also share the experience for the student activities he/she has carried out.	02

NOTES:

       a: It is compulsory to follow safety norms of workshop.

       b: Workshop log-book is compulsory. Record of activities performed by student in each period is also compulsory and must be duly certified by concerned instructor and teacher in routine log book.

       c: Keep your all tools duly resharpened/ready.

d: It is compulsory to submit reports, student activities and workshop logbook. Students activities are compulsory to perform.

e: For 40 marks Practical marks ESE, students are to be examined for competencies achieved. Students are to be asked to prepare job/s.

7.   SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of student activities.

S. No.	STUDENT ACTIVITY
1	Prepare student reports as asked in experiments.
2	Visit the nearer timber merchant. Collect the information on types and appearance of wood being sold by them.
3	Visit the nearer plywood merchant. Collect the information on type and thickness being sold by them.
4	Visit nearer fabricator. Collect the information on welding electrodes, transformers and accessories being used by them.
5	Down load movies showing correct practices for fitting, carpentry and welding.
6	List at least two questions for each of following. Material of centre punch. Use of rough file. Metal joining by welding and adhesives. Shearing machine. Wooden joints.

8.   SUGGESTED LEARNING RESOURCES

A.   List of Books:

Sr.No.	Title of Books	Author	Publication
1	Mechanical workshop practice.	K.C. John	PHI.
2	Workshop familiarization.	E.Wilkinson	Pitman engineering craft series.
3	Workshop Technology-I.	Hazra and Chaudhary	Media promoters & Publisher private limited.
4	Workshop Technology-I.	W.A. J. Chapman	Taylor & Francis.
5	Comprehensive Workshop Technology (Manufacturing Processes).	S.K. Garg	Laxmi publications.
6	I.T.B. Handbook.	-	Engineering industry Training Board.
7	Workshop practice manual.	K.Venkata Reddy	B.S.Publications.

B.   List of Major Equipments/ Instruments

FITTING:
(i):   Bench vices 50/100/150 mm.
(ii):   Hand vice, Machine vice
(iii):   Marking table.
(iv):   Surface plate.
(v):   Angle plate.
(vi):   Universal scribing block.
(vii):   Scriber.
(viii):   Marking gauge.
(ix):   Fitting tables.

(x):   Tri square.
(xi):   Right angle.
(xii):   Combination set.
(xiii):   V block with clamps.
(xiv):   C clamps.
(xv):   Set of needle files.
(xvi):   Ball pane Hammer - 750 Gms.
(xvii):   Pair of outside spring caliper- 250 mm.
(xviii):   Pair of Inside spring caliper 150 mm.
(xix):   Vernier caliper.
(xx):   Micrometer outside & inside
(xxi):   Bevel protractor
(xxii):   Odd leg caliper
(xxiii):   Files (smooth & rough)-round, flat, safe edge, square, knife edge, triangular, half round.
(xxiv):   One pair of divider.
(xxv):   Hacksaw frame with blade 12" * 300 mm.
(xxvi):   Centre punch.
(xxvii):   Dot punch.
(xxviii):   Prick punch.
(xxix):   Letter punch-Number punch.
(xxx):   Flat chisel 20 mm.
(xxxi):   Set of sorted twist drills, taps and dies (with holders/wrench).
(xxxii):   Set of spanners-Fix, Ring, box, Allen and adjustable.
(xxxiii):   Set of screw drivers-sorted.
(xxxiv):   Scraping tool.
(xxxv):   Set of pliers.
(xxxvi):   Filler and radius gauge

TIN SMITHY:

(i):   Tin cutter.
(ii):   Shearing machine
(iii):   Set of sorted hammers and pallets.
(iv):   Set of stakes.
(v):   Set of sorted scissors/snips.
(vi):   Tin smithy tables.
(vii):   Tin smithy vices.
(viii):   Marking table.
(ix):   Surface plate.
(x):   Angle plate.
(xi):   Marking gauge.
(xii):   Tri square.
(xiii):   Right angle.
(xiv):   Tong
(xv):   Square block
(xvi):   Set of chisels.
(xvii):   Scriber.
(xviii):   Punches-sorted including drift.
(xix):   Rivets-sorted.
(xx):   Sheet bending machine.
(xxi):   Trammels.
(xxii):   Wire gauge.
(xxiii):   Hand groover
(xxiv):   Anvil and swage block
(xxv):   Hollow mandrel
(xxvi):   Flatters and cone
(xxvii):   Set of Gouges
(xxviii):   Teflon sheet
(xxix):   Hollow punch set
(xxx):   Snip cutter round and flat

CARPENTRY:

(i):   Carpentry tables.
(ii):   Carpentry vices.
(iii):   Bar cramp.
(iv):   Plane machine-small ("Randha machine").
(v):   Wood and metal Jack planes- 45 mm.
(vi):   Set of sorted wooden jack planes.
(vii):   Smoothing plane.
(viii):   Rebate plane.
(ix):   Cross cut saw.
(x):   Compass saw.
(xi):   Set of sorted saws.
(xii):   Round hole saw
(xiii):   Tenon saw 350 mm.
(xiv):   Set of chisels-Firmer, Dovetail, Paring, Mortise.
(xv):   Adze tool
(xvi):   Auger bit.
(xvii):   Hand drill with set of sorted drill bits.
(xviii):   Gimlet.
(xix):   Small precision brace.
(xx):   Mallet.
(xxi):   Wood rasp file.
(xxii):   Claw hammer.
(xxiii):   Pincer.
(xxiv):   Marking gage 150 mm.
(xxv):   Steel rule 24"
(xxvi):   Measuring Tape 300mm
(xxvii):   C clamps.
(xxviii):   Tri square.
(xxix):   Right angle.
(xxx):   Compass and divider.
(xxxi):   Set of chisels.
(xxxii):   Ball pane Hammer - 750 Gms.
(xxxiii):   Hardwares- nails, screws,etc.
(xxxiv):   Set of screw drivers.
(xxxv):   Wood work punches
(xxxvi):   Set of Gouges

PIPE FITTING:

(i):   Various samples of pipe fittings-like joints, elbows, tees, unions, bend, nipples, couplers, reducers, four way etc. of Metal and PVC.
(ii):   Water taps,plug, farule
(iii):   Pipe bending machine manual/hydraulic
(iv):   Pipe vice
(v):   Pipe wrenches.
(vi):   Pipe spanners.
(vii):   Set of spanners-Fix, Ring, box, Allen and adjustable.
(viii):   Set of screw drivers-sorted.
(ix):   Set of chisels.
(x):   Hammers.
(xi):   Teflon taps, cotton thread
(xii):   Set of dies and holders.
(xiii):   Hacksaw, pipe cutter.
(xiv):   Adhesive for PVC pipe fittings.

METAL JOINING:

(i):	Arc welding transformers.
(ii):	Spot welding machine with necessary accessories, tools and consumables.
(iii):	Welding cables.
(iv):	Electrodes.
(v):	Electrode holders.
(vi):	Ground clamps.
(vii):	Chipping hammer.
(viii):	Wire brush.
(ix):	Oxygen-acetylene cylinders with pressure regulators-torch-hoses, trolley and accessories.
(x):	Filler rods.
(xi):	Solder filler material.
(xii):	Flux for soldering.
(xiii):	Soldering iron.
(xiv):	Brazing/welding torch.
(xv):	Try Square
(xvi):	Hammers, tongs, chisels and anvil
(xvii):	Screw Wrench
(xviii):	Tip Cleaner
(xix):	Swage block.
(xx):	Personal Protective Equipment like safety gloves, face shield /screen

C.   List of Software/Learning Websites:

- http://www.abmtools.com/downloads/Woodworking%20Carpentry%20Tools.pdf
- http://www.weldingtechnology.org
- http://www.newagepublishers.com/samplechapter/001469.pdf
- http://www.youtube.com/watch?v=TeBX6cKKHWY
- http://www.youtube.com/watch?v=QHF0sNHnttw&feature=related
- http://www.youtube.com/watch?v=Kv1zo9CAxt4&feature=relmfu
- http://www.piehtoolco.com
- http://sourcing.indiamart.com/engineering/articles/materials-used-hand-tools/

9   COURSE CURRICULUM DEVELOPMENT COMMITTEE

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