GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
COURSE CURRICULUM

Course Title: Advance Mathematics (Group-1)
(Code: 3320002)

Diploma Programmes in which this course is offered	Semester in which offered
Biomedical Engineering, Chemical Engineering, Electrical Engineering, Computer Engineering, Electronics & Communication Engineering, Information Technology, Power Electronics	**Second Semester**

1. RATIONALE

The course is classified under Advance Mathematics and students are intended to understand the advance concepts and principles of Mathematics such as calculus, complex numbers and differential equations. This knowledge is required to understand and solve engineering problems.

2. COMPETENCIES

The course content should be taught and implemented with the aim to develop different types of mathematical skills so that students are able to acquire following competencies:

- **Use proper Mathematical tool to understand engineering principles and concepts.**
- **Apply concepts of calculus or suitable mathematical tool to solve given 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.

Note: It is the responsibility of the institute heads that marks for **PA of theory** & **ESE and PA of practical** for each student are entered online into the GTU Portal at the end of each semester within the dates specified by GTU.

4.　　DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – I Complex Number	**1a**.Simplify Complex expressions **1b**.Find Modulus and Amplitude of given expressions **1c**.Use De Moivre's Theorem to simplify mathematical expressions and to find roots	Concept, Modules and Amplitude form, Root of Complex Number, De Moivre's Theorem. Apply concept of complex numbers in simple engineering problems.
Unit– II Function & Limit	2a .Solve the problems using functions 2b .Solve the problem of function using the concept of Limit	**2.1 Function** Concept and Examples **2.2 Limit** Concept of Limit, Standard Formulae and related Examples.
Unit– III Differentiation & it's Applications	**3a**.Differentiate the various function **3b**.Apply the differentiation to Velocity, Acceleration and Maxima & Minima	**3.1 Differentiation**: Definition, Rules of, Sum, Product, Quotient of Functions, Chain Rule, Derivative of Implicit functions and Parametric functions, Logarithmic Differentiation. Successive Differentiation up to second order **3.2 Application:** Velocity, Acceleration, Maxima & Minima.(simple problems)
Unit– IV Integration & its application	4a .Integrate the various function 4b .Apply the Integration for finding Area and Volume	**4.1 Integration**: Concept, Integral of Standard Functions, Working Rules of Integration, Integration by Parts, Integration by Substitution Method, Definite Integral and its properties. **4.2 Application:** Area and Volume.(simple problems)
Unit-V Differential Equations(First Order First Degree)	**1a.**Find the Order and Degree of a Differential Equation. **1b.** Form a Differential Equation for simple Engineering problems **1c.** Solve Differential Equations using Variable Separable, Homogeneous and Integrating Factor methods.	**5.1** Definition, Order and Degree of Differential Equation **5.2** Formation of DE **5.3** Solution of DE of First Degree and First Order by Variable Separable, Homogeneous and Integrating Factor methods.

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
I	Complex Number	3	2	5	3	10
II	Function & Limit	4	3	5	4	12
III	Differentiation & its Application	8	4	8	6	18
IV	Integration & its Application	8	4	8	4	16
V	Differential Equations	5	2	8	4	14
Total		**28**	**15**	**34**	**21**	**70**

Legends: R = Remember; U= Understand; A= Apply and above levels (Bloom's revised taxonomy)

Note: This specification table shall be treated as only general guideline for students and teachers. The actual distribution of marks in the question paper may vary from above table.

6.   SUGGESTED LIST OF EXERCISES/PRACTICALS

The exercises should be properly designed and implemented with an attempt to develop different types of mathematical skills so that students are able to acquire above mentioned competencies.

S. No.	Unit No.	Practical Exercises
1	I	Complex Number, Practice Examples
2		Use software for further understanding of applications
3	II	Practice Examples of Function & Limit
4		Use of Various Method/Techniques
5	III	Differentiation and Related Examples
6		Solve problems related to various methods/techniques of differentiations
7		Identify the Engineering Applications from respective branches and solve the problems
8	IV	Integration & Related Examples.
9		Solve problems Related to Various Methods/Techniques of integration
10		Identify the Engineering Applications from respective branches and solve the problems
11	V	Identify the corresponding Engineering Applications for differential equations from respective branches and solve the problems.

Note: The above Tutor sessions are for guideline only. The remaining Tutorial hours are may be used by teachers appropriately for revision and practice.

7.   SUGGESTED LIST OF 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. Some of these activities may be as below:

1. Applications to solve identified Engineering problems and use of Internet.

2. Learn graphical sofwares:EXCEL,DPLOT,GRAPH etc.

3. Learn MathCAD to use Mathematical Tools and solve the problems of Calculus.

4. Learn MATLAB and use it 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,2012
2	Pandya N R	Advanced Mathematics for Polytechnic	Macmillan Publishers India Ltd.,2012
3	Deshpande S P	Polytechnic Mathematics	Pune Vidyarthi Gruh Prakashan,1984
4	Prakash D S	Polytechnic Mathematics	S Chand,1985

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. D Plot

3. Graph

4 MathCAD

5. MATLAB

You may use other Software like Mathematical and other Graph

Plotting software. Use websites such as 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.

- **Prof. (Smt) R L Wadhwa**, Lect Govt Polytechnic,Ahmedabad

- **Prof. H C Suthar**, BPTI,Bhavnagar

- **Prof. P N Joshi**, Govt Polytechnic,Rajkot

Coordinator and Faculty Member From NITTTR Bhopal

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

- **Dr. Deepak Singh**, Associate Professor, Dept. of Science.

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM

Course Title: Basic of Civil Engineering

(Code: 3320004)

Diploma Programmes in which this course is offered	Semester in which offered
Electrical Engineering ,Mechanical Engineering, Fabrication Technology	Second Semester

1.   RATIONALE:

A mechanical or electrical technician is expected to look after many activities at work place, which may be interdisciplinary, for example if he/she has to mount a heavy machine, he should be able to supervise the preparation of foundation for it, which requires the knowledge of civil engg. Therefore he/she is supposed to be exposed to very basics of civil engineering. This course mainly encompasses the major and general areas of civil engineering, knowledge of which may be required by mechanical and electrical engineers/technicians.

2.   COMPETENCIES:

The course content should be taught and implemented with the aim to develop different types of skills so that students are able to acquire following competencies:

- **To supervise the simple civil engineering tasks related to own branch's integrated tasks.**

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	1	2	3	0	0	20	30	**50**

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

Note: It is the responsibility of the institute heads that marks for **PA of theory** & **ESE and PA of practical** for each student are entered online into the GTU Portal at the end of each semester within the dates specified by GTU.

4.   DETAILED COURSE CONTENTS:

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit –1 **CIVIL ENGG. SURVEYING**	**1a.** Use surveying tools and equipments for field survey, leveling and measurements **1b.** Calculate different levels and angles **1c.** Understand given contour map	1.1 Surveying & leveling (its importance and types) 1.2 Necessity for leveling 1.3 Principals of surveying 1.4 Instrument/ tools used for survey and level 1.5 Various methods of finding the field survey measurements 1.6 Chain and Compass Survey 1.7 Preparations of contour sheets/ plan using survey data. 1.8 Procedure of leveling
Unit – 2 **CIVIL ENGG. DRAWING**	**2a.** Read and Interpret the building drawing **2b**. Plan lay out of a simple building	2.1 Types of building drawings 2.2 Abbreviation, conventions & symbols in civil drawing 2.3 Building byelaws for planning of residential building and industrial building 2.4 Planning of simple residential and industrial building
UNIT –3 **CONSTRUCTION MATERIALS**	3a. Select different types of construction materials as per requirements 3b. Test given construction materials for quality control 3c. Prepare approximate cost estimates	3.1 Common construction materials such as cement, Brick, Stone, Timber, Steel and Concrete. 3.2 Properties of each materials & their acceptable standards 3.3 Quality parameters of materials 3.4 Estimations and costing for simple structure (only the material cost)
Unit –4 **MACHINE FOUNDATIONS**	4a. Assess the typical requirements of foundations for medium sized electrical and Mechanical Machines.	4.1 Criteria for machine foundation 4.2 Provisions for foundation design considerations in machine foundations. 4.3 Factors to be considered while designing machine foundations such as type of soil 4.4 Design foundations for simple machine like lathe, compression press, universal testing machine , electric power hammer etc. BIS CODE of practice for machine foundations I.S.- 2974 - Part –I& II

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

Unit No.	Unit Title	Tutorial Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
I.	Civil engineering Surveying	04				
II.	Civil engineering drawing	04				
III.	Construction materials	02	NOT APPLICABLE			
IV.	Machine foundations	04				
	Total	14				

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's revised taxonomy)

Note: This specification table shall be treated as only general guideline for students and teachers. The actual distribution of marks in the question paper may vary from above table.

6. SUGGESTED LIST OF PRACTICAL/EXERCISES

The experiments should be properly designed and implemented with an attempt to develop different types of skills so that students are able to acquire above mentioned competency. This is the list of minimum experiments to be performed.

Ex. No.	Unit No.	Practical/Exercises	Approx Hours Required
1	I	Practice for linear measurements through ranging, chaining, taping offsetting, recording field book etc.	04
2	I	Practice for working on prismatic compass, dumpy Levels, for taking measurements and , recording length and angles.	04
3	II	Prepare surveying drawings using surveyed data	04
4	III	Test few construction materials such as cement, brick etc in laboratory	04
5	IV	Visit of industry to observe the machine foundation and study of foundation design	04
6	III	Market survey of construction materials and prepare of cost estimation	04
7	IV	Observe and draw machine foundation for some heavy machines.	04
Total			28

7. SUGGESTED LEARNING RESOURCES:

A. List of Books.

Sr.No.	Title of Books	Author
1	Text book on Surveying&leveling	T.P.Kanitkar
2	Text hook on Surveying&leveling	B.C.Punmia
3	Civil Engineering Drawing	Shah Kalel&Patkil
4	Engineering Material	S.C.Rangwala
5	Properties of concrete	A.M.Neville

B.List of Major Equipment/ Instrument.

1.Chain (10m, 20m, 30m, etc.)

2.Measure Tape, Ranging rods

3.Prismatic compass, Surveyor compass

4.Dumpy level, Tilting level

5.Compressive Testing Machine

C. List of Software/Learning Websites: QE PRO for estimation, Autocad for drawings

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. Bhavesh Modi**   Principal ,B V P I T (DS) Umrakh Ta. Bardoli

- **Mr. Krishnaraj A. Khatri**   L C E, B V P I T (DS) Umrakh   Ta. Bardoli

- **Mrs. A. N. Pamnani**   L C E ,B B I T , V V Nagar

- **Mrs. Rina Chokshi**   L C E, P I E T (DS) Limda Vadodara

Co-ordinator and Faculty Members from NITTTR Bhopal

- **Dr. J.P.Tegar**, ProfessorDept of Civil and Environmental Engg,

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
COURSE CURRICULUM

Course Title: Basic Physics (Group-2)
(Code: 3300005)

Diploma Programmes in which this course is offered	Semester in which offered
Electronics & Communication Engineering	**First Semester**
Biomedical Engineering,Computer Engineering,Electrical Engineering,Information Technology,Instrumentation & Control Engineering,Power Electronics Engineering,Printing 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………….

- Select proper measuring instrument on the basis of range, least count & precision required for measurement.
- Analyze properties of material & their use for the selection of material mostly applicable for engineering users..
- Identify good & bad conductors of heat and proper temperature scale for temperature measurement
- Identify, analyze, discriminate and interpret logical sequence of field problems with the study of physics.
- Analyze variation of sound intensity with respect to distance.
- Follow the principles used in the physical properties, its measurement and selections.

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	*Explain Physical Quantities and their units. *Measure given dimensions by using appropriate instruments accurately. *Calculate error in the measurement *Solve numerical based on above outcomes	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	*State Coulomb's law, Ohm's law and Kirchhoff's law *Explain Electric field, potential and potential difference	2.1 Concept of charge, Coulomb's inverse square law, Electric field, intensity, potential and potential difference. 2.2 Electric current, Ohm's law, laws of series and parallel combination of resistance 2.3 D.C. circuits, Kirchhoff's law, heating effect & chemical

Unit	Major Learning Outcomes	Topics and Sub-topics
	*Define intensity, electric current, resistance *Apply laws of series and parallel combination to electrical circuits *Explain heating & chemical effect of current *Solve numerical based on above outcomes	effect of current (Numericals on above topics)
Unit– III	*Define magnetic intensity and flux and state their units *Distinguish between dia, para and ferro magnetic materials *Explain electromagnetic induction and its uses *State lenz's law *State applications of AC	3.1 Magnetic field and its units, magnetic intensity, magnetic lines of force, magnetic flux and their units 3.2 Dia, Para, Ferro magnetic materials 3.3 Electromagnetic Induction, Lenz's law and its Applications, Alternating current and its waveform
Unit– IV	*Define types of materials based on energy bands *Distinguish between intrinsic and extrinsic semiconductors *Explain p-n junction diode and its characteristics *State applications of diodes *state advantages of bridge rectifier over others * Explain types of transistors *Explain characteristics of transistors *Explain transistor operation in CE mode *State relation of current gain * Define nanotechnology and explain applications	4.1 Conductors, Insulators and Semiconductors, Energy bands, intrinsic and extrinsic semiconductors, Temperature dependence of conductivity, Superconductivity 4.2 p-n junction diode and its characteristics, Rectifier circuits - Full wave, half wave and bridge rectifiers (no design) 4.3 semiconductor transistor pnp and npn and their characteristics, transistor operation in CE mode, relation of current gain 4.4 Introduction to nanotechnology
Unit– V	*Explain wave and wave motion with example. *Distinguish between longitudinal and transverse waves *Explain propagation of sound in air. * State properties of light. *Define reflection, refraction polarization and diffraction *Explain physical significance of refractive index * Explain dispersion of light *State Properties of laser *Explain spontaneous and stimulated emission, population inversion and optical pumping *Explain construction and working of He-Ne laser *State applications of lasers. * Explain principle & working of optical fibres	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 stationary wave , node and antinode, definition of resonance with examples, Formula for velocity of sound in air 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 LASER, Properties of laser, spontaneous and stimulated emission, population inversion, optical pumping, construction and working of He-Ne laser, applications of lasers. Fibre Optics, Introduction, Total internal reflection, critical angle, acceptance angle, Structure of optical fibre, Numerical Aperture, Fiber optic materials, Types of optical fibres, Applications in communication systems.

Unit	Major Learning Outcomes	Topics and Sub-topics
	* State applications of optical fibres in communication systems	

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.	Static & Current Electricity	10	05	05	08	18
3.	Electromagnetism & AC Current	08	04	05	03	12
4.	Semiconductors & Nano-technology	10	06	06	05	17
5.	Sound, Laser & Optical Fiber	09	04	06	03	13
	Total	**42**	**22**	**24**	**24**	**70**

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

6.   SUGGESTED LIST OF EXPERIMENTS

The experiments 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.	Experiment
1	1	To Measure linear dimensions by vernier caliper and calculate volume
2	1	To Measure linear dimensions by Micrometer screw
3	2	To calculate resistance using Ohm's law
4	2	To verify law of Resistance in series and parallel
5	2	To find unknown resistance through whetstone bridge
6	3	To determine A.C. frequency with the help of sonometer
7	1,2	To determine errors in electrical measurements
8	5	To determine the divergence of He-Ne laser beam.
9	3	To Measure A.C. Power using resistive load
10	3	Measurement of Energy
11	4	To study p-n junction in forward bias
12	4	To calculate SA/V ratio of simple objects to understand nanotechnology

- Hours distribution for Physics Experiments :

  Minimum 8 experiments should be performed from the above list

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
	Total	28

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 measure diameter and calculate resistance of given set of conductors

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

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

8.   SUGGESTED LEARNING RESOURCES

A. List of Books

S.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

S.No.	Author	Title of Books	Publication
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. Digital Vernier Calipers And Micrometer Screw Guage
2. Whetstone's Bridge
3. He – Ne Laser Instrument
4. Digital Energy Meter
5. Resistance Box
6. Battery Eliminator
7. Digital Millimeters

C. List of Software/Learning Websites

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

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

1. Dr. S. B. Chhag, Lecturer in Physics, Science Deptt, Govt. Polytechnic, Rajkot

2. Ku. B. K. Faldu, Lecturer in Physics, Science Deptt, Govt. Polytechnic, Ahmedabad

3. Shri D. V. Mehta, Lecturer in Physics, Science Deptt, RCTI, Ahmedabad

4. Shri S. B. Singhania, Lecturer in Physics, Science Deptt, Govt. Polytechnic, Ahmedabad

5. Dr. U. N. Trivedi, Lecturer in Physics, Science Deptt, RCTI, Ahmedabad

Coordinator and Faculty Member From NITTTR Bhopal

1. Dr. P. K. Purohit, NITTTR, Bhopal

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	R Level	U Level	A Level	Total
			\[Distribution of Theory Marks\]			
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: D.C. Circuits
(Code: 3320903)

Diploma Programme in which this course is offered	Semester in which offered
Electrical Engineering	Second Semester

1. RATIONALE

Students of electrical engineering diploma need to possess a good understanding of concepts and principles of electrical engineering, which is essential to determine the electrical engineering parameters. Further these concepts need to be assimilated by the students to understand concepts of advanced courses and develop skills that are needed by the industry. This will also be needed to analyze the different applications of electrical & electronics engineering circuits.

2. COMPETENCY

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

- **Solve basic circuit problems using circuit laws and network theorems.**

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	2	6	70	30	20	30	150

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

Note: It is the responsibility of the institute heads that marks for **PA of theory** & **ESE and PA of practical** for each student are entered online into the GTU Portal at the end of each semester within the dates specified by GTU.

4.   COURSE DETAILS

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit –I **Basics of Electrical Engineering**	1a. Define the various electrical parameters 1b. Identify the commonly used materials and components used in electrical engineering 1c. Define the terms work, power and energy 1d. Convert mechanical energy to electrical energy and vice-versa. 1e. State joules law and its applications.	1.1. Charge, Current, Potential, voltage, power, Energy Electrical Resistance and its Unit, Ohms law: applications and limitations Specific Resistance and its unit. Parameters affecting the resistance, Effect of temperature on resistance and temperature co-efficient, potential difference ; EMF 1.2. Conductors, Insulators, semiconductors, capacitors and inductors. 1.3. Definitions of Work, Power and Energy (both electrical and mechanical); Conversion from Mechanical units into Electrical units 1.4. Joules law of heat and problems on Heating
Unit –II **Electrical circuits**	2a. Calculate voltage and current in the given resistive circuits using KCL and KVL. 2b. Calculate voltage and current of resistive circuits using Mesh and nodal analysis method. 2c. Explain the principle of duality	2.1 Concept of Open circuit, Closed circuit, Short circuits 2.2 Definitions of node, branch, loop, mesh. 2.3 Kirchhoff's laws and simple numerical 2.4 Kirchhoff's Voltage and Current law (KVL and KCL) 2.5 Mesh Analysis and Nodal Analysis of Networks 2.6 Principle of Duality 2.7 Series and Parallel circuits with numerical problems.
Unit –III **Network Theorems**	3a. Classify types of electrical circuits 2a. Use Superposition Theorem to calculate the current in any branch of the circuit. 2b. Use Thevenin's Theorem to calculate V_{th}, R_{th} and load current in the given circuit. 2c. Calculate the load current in the given circuit using Norton's Theorem. 2d. Determine the maximum current in the load of the circuit using the Maximum Power Transfer Theorem 3b. State Reciprocity Theorem 3c. Convert star to delta and delta to star transformations.	3.1. Linear & Nonlinear circuit, Active and Passive Network 3.2. Super Position Theorem, Thevenin's Theorem, Norton's Theorem Maximum Power Transfer Theorem, Reciprocity Theorem 3.3. Star delta transformations with numericals

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit –IV Electrostatics & Capacitors	4a. Define the terms related to electrostatics 4b. Explain the working of capacitor 4c. Identify the different types of capacitors and their applications 4d. Calculate the capacitance in electrical circuits 4e. Calculate the energy stored in capacitors	4.1 Electric charge, Laws of electrostatics, Electric field, Electrostatic induction, Electric flux, Flux Density, Electric field Intensity. 4.2 Capacitance – Effects of Dielectrics, dielectric constant units. 4.3 Types of Capacitors, Capacitors in series and parallel. 4.4 Energy stored in a Capacitor, Rise and Decay of current in R-C Circuit and time constant
Unit –V Electromagnetic Induction& Inductors	5a. Define phenomenon of electromagnetic induction 5b. State and apply Faraday's law, Lenz's law, Fleming's right hand rule, Fleming's left hand rule 5c. Differentiate Statically and dynamically induced EMF, self and mutual inductance 5d. Identify the different types of inductor and explain their applications 5e. Calculate the energy stored in magnetic field	5.1 Electromagnetic Induction. 5.2 Faraday's law, Lenz's law, Fleming's right hand rule for Generators, Fleming's left hand rule for Motors. 5.3 Statically and dynamically induced EMF. 5.4 Inductance: Self and Mutual inductance. 5.5 Types of Inductor 5.6 Energy stored in Magnetic field

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
I	Introduction to electrical energy	09	06	06	06	18
II	Electrical circuits	05	03	04	08	15
III	Network Theorems	05	03	04	08	15
IV	Electrostatics & Capacitors	04	05	03	02	10
V	Electromagnetic Induction & Inductors	05	05	05	02	12
	Total	**28**	**22**	**22**	**26**	**70**

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

Note: This specification table shall be treated as only general guideline for students and teachers. The actual distribution of marks in the question paper may vary from above table.

6. SUGGESTED LIST OF PRACTICAL/EXERCISES

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

S. No.	Unit No.	Practical/Exercises	Hours Required
1	I	Measure voltage and current in a given linear electrical circuit.	02
2	II	Calculate temperature co-efficient of a given resistor.	02
3	II	Connect resistances in series to get required effective resistance and verify	02
4	II	Connect resistances in parallel to get required effective resistance and verify	02
5	II	Connect resistances in parallel and series to get required effective resistance and verify	02
6	II	Measure current in a particular branch of the given electrical circuit using Kirchoff's Current Law	02
7	II	Measure voltage drop in a closed loop of the given electrical circuit using Kirchoff's Voltage Law	02
8	III	Measure current in a particular branch of the given electrical circuit having two input sources using Superposition theorem	02
9	III	Verify Thevinin's theorem for a given circuit	04
10	III	Convert star connected resistances to its equivalent delta connected resistances	02
11	III	Convert delta connected resistances to its equivalent Star connected resistances	04
12	IV	Verify equivalent capacitance by connecting given capacitors in Series and Parallel	02
		Total	28

7. SUGGESTED LIST OF STUDENT ACTIVITIES

- Assignments on solving numerical
- Identify and select various measuring instruments as per required range
- Identify and select resistors based on color code
- Identify and select capacitors based on color code
- Calculate RC Time constant for given R-C series circuit

8. SUGGESTED LEARNING RESOURCES

A. List of Books

S.No.	Author	Title of Books	Publication
1	Theraja, B. L.	Electrical Technology Vol-1	S. Chand & Co. Ltd., 2011 or latest edition
2	Gupta, B.R.	Principles of Electrical Engineering	S.K. Kataria,2012 or latest edition
3	Rao, Uma. K.	Basic Electrical Engineering	Pearson Education, India, 2012 or latest edition
4	Ananda Murthy, R. S.	Basic Electrical Engineering	Pearson Education, India,2011 or latest edition
5	Gupta ,J.B.	A Course in Electrical Technology Vol. I	S.K. Kataria & Sons, 2012 or latest edition
6	Singh, Tarlok	Fundamentals of Electrical Engineering	S.K. Kataria & Sons,2012 or latest edition

B. List of Major Equipment/ Components
i.   Ammeter
ii. Voltmeter
iii. Wattmeter
iv. Multimeter
v.   Stop watch
vi. Thermometer
vii. Rheostats
viii. Capacitors
ix. Inductors

C. List of Software/Learning Websites
i.   www.allaboutcircuits.com/vol_1/chpt_1/1.html
ii. http://openbookproject.net/electricCircuits/DC/DC_5.html
iii. www.kpsec.freeuk.com
iv. www.howstuffworks.com/

COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. S.S.Mehta,** Lecturer, Electrical Engg.Dept. , B&B Institute of Technology, Vallabhvidyanagar

- **Prof. B. R. Shrotriya**, Lecturer,Electrical engg.Dept. , Govt. Polytechnic, Junagad

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- **Prof. A.S. Walkey**, Associate Professor, Dept. of Electrical &   Electronics Engg.

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM

Course Title: Electrical Engineering Workshop Practice
(Code: 3320902)

Diploma Programmes in which this course is offered	Semester in which offered
Electrical Engineering	Second Semester

1.   RATIONALE

The diploma electrical engineering students are required to perform tasks such as selection of different types of wires, cables, switches etc. relevant to the current, voltage ratings and applications. Such skills can be developed through the electrical workshop practices which will be useful in industries for using various electrical tools, measuring instruments, safety tools and devices. This course is designed in such a way that practicals performed in this course will develop these basic skills to perform well in the industry.

2.   COMPETENCY

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

- **Connect basic electrical instruments and devices.**

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 Student Activity; **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 Electrical Tools	1a. Use various electrical tools and measuring instruments.	1.1 Pliers, nose plier, cutter, screw driver, tester, test lamp etc. Ammeter, voltmeter, wattmeter, clip on meter, Multimeter, Megger, etc.
Unit– II Cables and Switches	2a. Select different types of wires, cables, light sources and switches.	2.1 Single core cable, multicore cable, single strand wire, multi strand wire, shielded wire, different types of light sources etc.; Toggle switch, Rotary switch, Push button switch, micro switch, MCB, ELCB, etc.
Unit– III Resistors	3a. Select/identify different types of resistors.	3.1 Rheostat, wire wound resistor, Carbon film resistor, Carbon composition resistor, fixed and variable potentiometer etc.
Unit– IV Capacitors	4a. Select /identify different types of capacitors.	4.1 Paper capacitor, electrolytic capacitor, ceramic capacitor, polyester, gang capacitor
Unit–V Earthing and Electrical Safety	5a. Undertaking pipe earthing.	5.1 Earthing, pipe earthing, plate earthing, Electrical safety tools Electrical safety rules , I.E. rules for electrical hazards and accidents

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
I	Electrical wiring tools, measuring instruments					
II	Electrical wires, cables and switches		**Not applicable**			
III	Resistors					
IV	Capacitors					
V	Earthing and electrical safety					

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

Note: This specification table shall be treated as only general guideline for students and teachers. The actual distribution of marks in the question paper may vary from above table.

6.   SUGGESTED LIST OF EXERCISES/PRACTICALS

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

S. No.	Unit No.	Practicals / Exercises	Hours
1	I	Identify various tools used for wiring.	04
2	I	Identify the symbols used in electrical circuit diagrams.	04
3	I	Identify and connect various electrical measuring instruments and measure various electrical parameters like current, voltage, power.	04
4	I	Use common testing instruments used in electrical workshops: 1: Test lamp. 2: line tester. 3: Multimeter. 4: Clamp-on meter. 5; Megger.	04
5	I	Connect different domestic appliances to power supply and measure current drawn by them using 1)Ammeter. 2)Tong tester. 3) Multimeter.	04
6	I	Identify different types of domestic wirings.	04
7	II	Identify and specify different types of wires, cables, cable joints used for different current and voltage ratings.	02
8	II	Identify different types of light sources, open circuit, closed circuit and short circuit.	04
9	III	Identify and specify different types of switches used for different applications as per current and voltage ratings.	02
10	III	Identify and specify different types of sockets and plugs used for different current and voltage ratings.	02
11	III	Know the working of various electrical circuit protective devices (fuse, MCB,)	04
12	I & III	Prepare a meter board for lighting and power installation using MCB, energy meter, fuse unit, DP switch, indicators and bus bars.	04
13	IV & IV	Identify and specify different types of conducting, insulating materials, resistors, capacitors and inductors as per standard color code practice.	04
14	III & IV	Solder various resistors, capacitors and electronic components on PCB.	04
15	V	Conduct mock artificial respiration and first aid exercises to learn about safety procedures of first aid in case of electrical hazards.	04
16	V	Undertake earthing practice (good demonstration)	02
		Total Hours	**56**

7.   SUGGESTED LIST OF STUDENT ACTIVITIES

    i.   Draw various electrical symbols

   ii.   Collect and study of various catalogues for cables ,switches and instruments

  iii.   Study electrical safety I.S. codes

8.   SUGGESTED LEARNING RESOURCES

A. List of Books

S.No.	Author	Title of Books	Publication
1	Mithal, G.K.	Electrical Engineering Materials	Khanna Publication ,2011
2	Gupta, J.B. , & Gupta, Renu	Electrical engineering materials & semiconductor devices	S.K. Kataria & sons, 2012
3	Singh, Surjit	Electrical engineering drawing i &ii	S.K. Kataria & sons, 2012
4	Bhatia, S.L.	Handbook of Electrical Engineering	Khanna Publication ,2012
5	Uppal, S.L. & Garg ,G.C.	Electrical Wiring, Estimating and Costing	Khanna Publication ,2012

B. List of Major Equipment/ Instrument

  i.   Various tools for wiring such as wire stripper, bearing puller, etc.
 ii.   Various electrical measuring instruments such as digital and analogue multimeters, ammeters, voltmeters, wattmeters, frequency meters, phase sequence meters, tong tester, etc.
iii.   Various safety devices for protection of electrical installation, earthing rods, megger, insulation tester, etc..
 iv.   Various safety devices used for first aid and electric fire hazards.
  v.   Soldering kit.
 vi.   Different types of cables, wires, switches, light sources, resistors, capacitors, inductors, insulating and conducting materials, MCBs, ELCBs, etc.
vii.   Various domestic appliances (e.g. fan, heater, electric iron, geyser etc.)
viii. Various electrical power supplying equipments (e.g. transformer, variac, d.c.power supply etc)

C. List of Software/Learning Websites

  i.   http://en.wikipedia.org/wiki/Electrical_wiring
 ii.   http://www.kpsec.freeuk.com/components/switch.htm
iii.   http://home.howstuffworks.com/electrical-tools.htm

9.   COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnic

- **Prof. S.S.Mehta**. Lecturer, Electrical Engg. Dept. B&B Institute of Technology, Vallabhvidyanagar.

- **Prof. A. S. Pandya**. HOD. Electrical Engg. Dept. Govt. Polytechnic, Rajkot.

- **Prof. V. R. Kotdawala**. Lecturer, Electrical Engg. Dept. Govt. Polytechnic, Himmatnagar.

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- **Prof. A.S.Walkey,** Associate Professor, Dept. of Electrical & Electronics Engg.