

**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 Electronics 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 | 100 |
| 2 | 2 | 0 | 4 | 70 | 30 | 0 | 0 | |

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 Assistanship, 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 |
|-------------------------------|---|---|--------------------------|--------------------|----|----------------|----|-------------|
| L | T | P | | Theory Marks | | Tutorial Marks | | |
| 3 | 2 | 0 | 5 | ESE | PA | ESE | PA | 150 |
| | | | | 70 | 30 | 20 | 30 | |

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 Comprehension 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 <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> - Matching items (word and its Meaning) - One word Substitution - Phrases and idioms - Synonyms 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 | <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> Meeting and Parting Introducing and Influencing Requests Agreeing and Disagreeing Inquiries and Information 4.3 Letter: <ul style="list-style-type: none"> 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 taxonomy)

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 <ol style="list-style-type: none"> 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: 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 | 150 |
| 3 | 0 | 2 | 5 | 70 | 30 | 20 | 30 | |

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 |
|------------------|---|--|
| | <ul style="list-style-type: none"> *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 | <p>effect of current</p> <p>(Numericals on above topics)</p> |
| Unit– III | <ul style="list-style-type: none"> *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 | <p>3.1 Magnetic field and its units, magnetic intensity, magnetic lines of force, magnetic flux and their units</p> <p>3.2 Dia, Para, Ferro magnetic materials</p> <p>3.3 Electromagnetic Induction, Lenz's law and its Applications, Alternating current and its waveform</p> |
| Unit– IV | <ul style="list-style-type: none"> *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 | <p>4.1 Conductors, Insulators and Semiconductors, Energy bands, intrinsic and extrinsic semiconductors, Temperature dependence of conductivity, Superconductivity</p> <p>4.2 p-n junction diode and its characteristics, Rectifier circuits - Full wave, half wave and bridge rectifiers (no design)</p> <p>4.3 semiconductor transistor pnp and npn and their characteristics, transistor operation in CE mode, relation of current gain</p> <p>4.4 Introduction to nanotechnology</p> |
| Unit– V | <ul style="list-style-type: none"> *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 | <p>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</p> <p>Properties Of Light, Electromagnetic spectrum, Reflection, refraction, snell's law, diffraction, polarization, interference of light, constructive and destructive interference (Only definitions),</p> <p>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.</p> <p>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.</p> |

| 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 :

- To calculate acoustics of given class room
- To measure diameter and calculate resistance of given set of conductors

Teacher guided self learning activities :

- To prepare a chart of applications of nanotechnology in engineering field
- To prepare models to explain different concepts

Course/topic based seminars :

- 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/physicszone
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: Electronic Components & Practice
(Code: 3311101)

| Diploma Programmes in which this course is offered | Semester in which offered |
|---|---------------------------|
| Electronics & Communication Engineering, Biomedical Engineering | First Semester |
| | |

1. RATIONALE

This course is intended to help the students to get clear idea of fundamentals of electronic components and develop practical skills in using various types of electronic components employed in electronic industries. It will also make the students familiar with the suitability of various electronics components for different applications. More over this course is intended to develop skills of testing components that will be really needed for the project and setting up of many experiments in other basic and applied technology courses. This course will also enable the student to develop the ability to understand datasheets.

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. **Use testing & measuring instruments to test various electronics components and simple 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 | 200 |
| 4 | 0 | 4 | 8 | 70 | 30 | 40 | 60 | |

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 |
|--|--|---|
| 1. Electronic Components | <p>1.1 Differentiate various types of resistors, capacitors and inductors & their usage.</p> <p>1.2 Test various components.</p> | <p>1.1 RESISTORS Concept of resistors, classification of resistors, materials used for resistors, resistors general specification: - maximum power rating, tolerance, temperature co-efficient, .Construction, specification and application of carbon film resistors, standard wire wound resistors, color coding, construction, working, application and characteristic curves of LDR</p> <p>1.2 CAPACITORS Classification of capacitors, materials used for capacitors, capacitors specification:-capacitor working voltage, fixed capacitor- construction, specification and application of disc, ceramic capacitor, aluminum electrolytic capacitor, variable capacitor-application of air gang, PVC gang capacitor, Trimmer capacitor – mica, Coding of capacitors-using numerals, colour band system, directly printed values on capacitors, capacitive reactance</p> <p>1.3 INDUCTORS Faradays laws of electromagnetic induction, self & mutual induced emf inductor specifications- definitions and expressions of: - self inductance, mutual inductance, coefficient of coupling, Q factor, inductive reactance. construction and application of air core, iron core, ferrite core inductor, frequency range inductors- A.F., R.F., I.F., toroidal inductor</p> |
| 2. Cables, Connectors and Fuses (More weightage given to practical) | <p>2.1 Compare various types of cables, connectors and fuses.</p> <p>2.2 Describe applications of various types of cables, connectors and fuses.</p> <p>2.3 Test various cables, connectors and fuses.</p> | <p>2.1 CABLES General specifications of cables- characteristic impedance, current carrying capacity, flexibility. Types of cables - construction and applications of coaxial cable, 600 E telephone cable-PASP, Alpth sheathed cable, FRC cable, twin core cable-twisted & shielded type, optical fiber cable</p> <p>2.2 CONNECTORS General specifications of connectors- contact resistance, breakdown voltage, insulation resistance, Constructional diagram, applications of BNC, D series, Audio, Video, printer, edge, FRC, RJ 45 connectors. constructional diagram and applications of phone plug & jacks</p> <p>2.3 FUSES Glass, ceramic fuse, resettable fuse, shunt fuse- MOV, HRC fuse</p> |
| 3. Switches and Relays (More weightage given to practical) | <p>3.1 Differentiate the various Switches and their usage.</p> <p>3.2 Explain construction, working and applications of various types of relays.</p> | <p>3.1 SWITCHES Switch specifications – voltage rating, contact current rating, contact resistance, characteristics of switch & relay - operating time, release time, bounce time, constructional diagram, application of toggle, rotary, push to on & push to off, rocker</p> <p>3.2 RELAYS Construction, working and application of general purpose relay, NO, NC contact, reed relays, solid state relays, difference between switch & relay</p> |
| 4. PN junction Diode and Rectifiers | <p>4.1 Explain the characteristics of PN junction diode.</p> <p>4.2 Compare various types of</p> | <p>4.1 PN JUNCTION DIODES Review of P-type and N-type semiconductor, characteristics of PN junction diode, forward voltage drop, reversed saturation current, Power dissipation, breakdown voltage</p> <p>4.2 RECTIFIER Need of rectifier, definition, types of rectifier – half wave rectifier</p> |

| Unit | Major Learning Outcomes | Topics and Sub-topics |
|---------------------------------------|---|--|
| | rectifiers. 4.3 Build power supply with a filter. | voltage (no derivation) ,ripple, ripple factor, ripple frequency, PIV of diode used, transformer utilization factor, efficiency of rectifier of three types of rectifier 4.3 FILTERS Need of filters ,types of filters: shunt capacitor , series inductor, LC filter |
| 5. Introduction to Transistors | 5.1 Differentiate various Transistor Construction and configuration | 5.1 Transistor construction ,Types of transistor (NPN & PNP) Transistor operation and amplifying action. 5.2 Transistor Configuration,(CB,CE,CC configuration.) 5.3 Relation between current gain, alpha and beta. |
| 6. Introduction to IC and SMD | 6.1 Compare various IC's and SMD 6.2 Interpret the datasheets | 6.1 IC'S Classification of IC's, monolithic IC, advantages , disadvantages of IC's thick & thin film IC, hybrid IC, linear IC, digital IC , IC packages-SIP, TO 5 ,Flat , DIP, pin Identification, temperature ranges, device identification 6.2 SMD Concept of SMT & SMD, advantages & disadvantages of SMD. SMD resistor ,capacitor, IC, transistor, land pattern of SMD resistor, capacitor, transistor & IC's SMD packages (SOT,PLCC) |

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

| Unit | Unit Title | Teaching Hours | Distribution of Theory Marks | | | |
|------------|----------------------------------|----------------|------------------------------|-----------|-----------|-----------|
| | | | R Level | U Level | A Level | Total |
| I | Electronic components | 16 | 5 | 5 | 10 | 20 |
| II | Cables and connector | 6 | 0 | 2 | 4 | 6 |
| III | Switches and Relays | 6 | 0 | 2 | 4 | 6 |
| IV | PN junction Diode and Rectifiers | 12 | 4 | 6 | 8 | 18 |
| V | Introduction to Transistor | 10 | 4 | 4 | 4 | 12 |
| VI | Introduction to IC and SMD | 08 | 2 | 2 | 4 | 08 |
| | Total | 56 | 15 | 21 | 34 | 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 | ALL | Test AC/DC voltage sources with Digital Multimeter (DMM). |
| 2 | I | Identify, find value and test different types of resistors. |
| 3 | I | Identify, find value and test different types of capacitors. |
| 4 | I | Identify, find value and test different types of Inductors. |
| 5 | I | Make use of resistor, capacitor, inductor in series and parallel connection. |
| 6 | II | Identify different types of cables & test it. Discover their application. |
| 7 | II | Identify different types of connectors & discover their application. |
| 8 | II | Identify different types of fuses & test it. |
| 9 | III | Identify different types of Switches and discover its usage. |
| 10 | III | Identify different types of Relays and discover its usage. |
| 11 | IV | Operate CRO & function Generator so as to become familiar with their external controls. |
| 12 | IV | Measure amplitude & frequencies of different sine waveform using CRO & Function Generator. |
| 13 | IV | Measure amplitude & frequencies of different square waveform using CRO & Function Generator. |
| 14 | IV | Test half wave rectifier and observe waveforms with and without filter. |
| 15 | IV | Test full wave rectifier and observe waveform with and without filter. |
| 16 | IV | Test bridge rectifier and observe waveforms with and without filter. |
| 17 | V | Test various transistor configuration. |
| 18 | VI | Identify various IC packages. |
| 19 | VI | Identify various SMD. |
| 20 | IV | Read and interpret data sheet of various junction diodes and Transistors. |
| 21 | V | Read and interpret data sheet of various IC and SMD components. |

*** Note: Minimum 16 experiments should be performed**

7. SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

Following is the list of proposed student activities like:

- Collect various electronic components & make a show case component wise.
- Collect specifications, pictures of electronic components from internet & present in class room.
- Build DC power supply.
- Visit nearby industry which manufacture any electronic component covered in this course.

8. SUGGESTED LEARNING RESOURCES

A. List of Books

| Sr. no | Title | Author | Publication |
|--------|--|-------------------|---|
| 1 | Electronic Components and Materials | Madhuri Joshi | Shroff Publishers & Distributors Private Ltd. |
| 2 | Electrical & Electronics Engineering Materials Component | S.K. Bhattacharya | Khanna |

| | | | |
|---|--|-------------------|-----------------------|
| 3 | Basic Electronics | Debashis De | Pearson |
| 4 | Electronic Components Handbook | Thomas H. Jones | Reston Publishing Co. |
| 5 | Electronic Components and Materials | Dhir | Tata McGraw Hill |
| 6 | Handbook of components for electronics | Charles A. Harper | Laxmi Enterprise |
| 7 | Electronic Components and Materials | Grover & Jamwal | Dhanpat Rai & Sons |
| 8 | Electrical Engineering Materials | M.L. Gupta | Dhanpat Rai & Sons |
| 9 | Text book of Applied Electronics | R.S. Sedha | S. Chand |

Other Learning Resources

- i. Practical Semiconductor Data Manuals: BPB Publications; New Delhi
- ii. Some electronic engineering magazines.

B. List of Major Equipment/ Instrument

- i. Function Generator
- ii. Multimeter
- iii. Cathode Ray Oscilloscope
- iv. D.C. Power Supplies
- v. Educational Kits

C. List of Software/Learning Websites

- i. <http://www.electronics-tutorials.com/>
- ii. <http://www.efymag.com/>
- iii. <http://www.electronicsforu.com>
- iv. <http://www.kpsec.freeuk.com/symbol.htm>
- v. http://en.wikipedia.org/wiki/Electronic_component
- vi. <http://forum.shaarpmind.com/showthread.php/2159-How-to-Check-Basic-Electronic-Components-Using-a-Multi-Meter>

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. R.D Raghani** HOD, EC Dept., L. E. College, Morbi
- **Shri. M.Y. Kantharia** I/C HOD , EC Dept., BBIT , V V Nagar
- **Smt. G N Acharya** , Lecturer, EC Dept., Govt. Poly., Ahmedabad

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- **Dr. Joshua Earnest**, Professor and Head, Dept. of Electrical and Electronics Engg., NITTTR, Bhopal
- **Prof.(Mrs.) Susan S. Mathew**, Associate Professor, Dept. of Electrical and Electronics Engg., NITTTR, Bhopal

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
COURSE CURRICULUM

Course Title: Basic of Electrical Engineering
(Code: 3320901)

| Diploma Programmes in which this course is offered | Semester in which offered |
|---|---------------------------|
| Electronics & Communication Engineering | First Semester |
| Plastic Engineering, Power Electronics Engineering, | Second Semester |

1. RATIONALE

Use of basic of electrical engineering principles occurs in different occupations. It is therefore necessary for diploma engineering students of almost all the branches to know some of the fundamentals of electrical engineering concepts. Therefore, this course has been designed to take care of this need.

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:

- i. Use different types of electrical test and measuring instruments

3. TEACHING AND EXAMINATION SCHEME

| Teaching Scheme (In Hours) | | | Total Credits (L+T+P) | Examination Scheme | | | | Total Marks |
|-------------------------------|---|---|--------------------------|--------------------|----|-----------------|----|-------------|
| L | T | P | | Theory Marks | | Practical Marks | | |
| | | | | 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 Fundamentals of Electric and Magnetic Circuits | 1.1 Explain concepts of electric and magnetic parameters 1.2 Differentiate electric and magnetic circuits 1.3 Apply Faraday's laws in different circuits 1.4 Differentiate Statically and dynamically induced EMFs | 1.1 Concepts of EMF, Current, Potential Difference, Power and Energy. 1.2 Concepts of M.M.F, magnetic force, permeability, hysteresis loop, reluctance, leakage factor etc. 1.3 Concepts of magnetic and electric circuits Faraday's laws of electromagnetic induction. 1.4 Dynamically induced emf. 1.5 Statically induced emf.-(a) Self induced emf (b) Mutually induced emf. 1.6 Equations of self & mutual inductance. |
| Unit – II A.C. Circuits | 2.1 Explain the various basic parameters of AC fundamentals 2.2 Solve simple numericals related to AC circuits 2.3 Derive the current and voltage relationship in star and delta connections 2.4 Find currents and voltages in series and parallel AC circuits | 2.1 A.C. circuit parameter: Cycle, Frequency, Periodic time, Amplitude, Angular velocity, current, RMS value, Average value, Form Factor & Peak Factor, impedance, phase angle, and power factor. 2.2 Vector representation of emf and current. 2.3 Mathematical representation of an alternating emf and current 2.4 A.C. through pure a) resistors, b) inductors and c) capacitors 2.5 A.C. through R-L series, R-C series, and R-L-C series & parallel circuit 2.6 Power in A. C. Circuits. Concept of power triangle. 2.7 Voltage and Current relationship in Star and Delta connections. |
| Unit– III Transformer | 3.1 Explain the construction and working of a single phase transformer 3.2 Calculate transformer performance parameters 3.3 Describe working principle of auto transformer | 3.1 General construction and principle of transformers. 3.2 Emf equation and transformation ratio of transformers. 3.3 Various losses in transformers and efficiency equation. 3.4 auto transformers. |
| Unit– IV Electrical Machines | 4.1 Describe the construction of a typical single phase motor 4.2 Explain working principle of single phase induction motors 4.3 Explain the working of induction motor starters | 4.1 Construction and Working principle of single phase A.C. motor. 4.2 Various types of single phase motors 4.3 Starting methods for induction motors 4.4 Applications of single phase motors |
| Unit– V Protection | 5.1 Justify the need for protection and the use of MCB, MCCB and ELCB 5.2 List the different types of electrical related personal protective equipment. 5.3 State the need for electrical Earthing. 5.4 Describe the type of Earthing used in domestic and industrial applications. | 5.1 Different protective devices such as fuse, MCB, MCCB and ELCB. 5.2 Electrical related Personal Protective Equipment 5.3 Earthing systems: purpose, material used for Earthing, types of Earthing system |

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

| Unit No. | Unit Title | Teaching Hours | Distribution of Theory Marks (Duration –Hours) | | | |
|----------|--|----------------|---|-----------|-----------|-----------|
| | | | R Level | U Level | A Level | Total |
| 1. | Fundamentals of Electric and Magnetic Circuits | 10 | 8 | 5 | 2 | 15 |
| 2. | A.C. Circuits | 10 | 8 | 5 | 4 | 17 |
| 3. | Transformer | 07 | 5 | 4 | 2 | 11 |
| 4. | Electrical Machines | 08 | 5 | 5 | 4 | 14 |
| 5. | Protection | 07 | 4 | 5 | 4 | 13 |
| | Total | 42 | 30 | 24 | 16 | 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 above mentioned expected competency.

| S. No. | Unit No. | Experiment |
|--------|----------|--|
| 1 | II | Measure voltage, current and power in 1-phase circuit. (with resistive load) |
| 2 | II | Measure voltage, current and power in R-L series circuit. |
| 3 | III | Measure transformation ratio K of 1-phase transformer. |
| 4 | III | Connect single phase transformer and measure input & output quantities. |
| 5 | IV | Make Star & Delta connection in induction motor starters and measure the line and phase values |
| 6 | V | Identify switches, switch fuse and fuse switch units, MCB, MCCB & ELCB. |
| 7 | V | Measure voltage, current and power using analog and digital instruments. |

7. SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

- Interpret the name plate ratings and identify the parts of an induction motor
- Connect the various types of meters to measure the current and voltage of induction motor
- Interpret the name plate ratings and identify the parts of a transformer
- Make star delta connections of transformer
- Study of various electrical Earthing systems
- Study of various safety equipments used for preventing electrical hazards.

8. SUGGESTED LEARNING RESOURCES

A. List of Books

| S.No. | Author | Title of Books | Publication/Year |
|-------|--------------------------------|---|---|
| 1 | Prasad P.V and Sivanagaraju S. | Electrical Engineering: Concepts and Applications | Cengage Learning India, New Delhi, 2012 |
| 2 | Bhattacharya S.K | Electrical Machine | Tata McGraw Hill; New Delhi, 2010 |
| 3 | Thereja B.L. | Electrical Technology | S. Chand & Company Ltd; New Delhi 2010 |

B. List of Major Equipment/ Instrument

- Analog and Digital Ammeter, Voltmeter, Wattmeter, Multimeter, Megger, Clamp on meter

- ii. Single phase Transformer, Auto transformer
- iii. Single phase AC Motors
- iv. Different types of starters

C. List of Software/Learning Websites:

- i. <http://www.animations.physics.unsw.edu.au/jw/AC.html>
- ii. <http://en.wikipedia.org/wiki/Transformer>
- iii. <http://www.alpharubicon.com/altenergy/understandingAC.htm>

9. 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, Junagadh.
- **Prof. A. S. Pandya.** HOD. Electrical Engg.Dept Govt. Polytechnic, Rajkot.
- **Prof. V. R. Kotdawala.** Lecturer, Electrical Engg.Dept Govt. Polytechnic, Himmatnagar.
- **Prof. A.A.Parmar** Lecturer, Electrical Engg.Dept. B&B Institute of Technology, Vallabhvidyanagar.
- **Prof. P.S. Chaudhary.** Lecturer,Electrical Engg.Dept. B&B Institute of Technology, Vallabhvidyanagar.

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- **Prof. A.S.Walkey,** Associate Professor, Dept. of Electrical & Electronics Engg, NITTTR, Bhopal.
- **Prof.(Mrs.)Susan.S.Mathew,** Associate Professor, Dept. of Electrical & Electronics Engg, NITTTR, Bhopal