

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: Environment Conservation & Hazard Management
(Code: 3300003)

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

1. RATIONALE

For a country to progress, sustainable development is one of the key factors. Environment conservation and hazard management is of much importance to every citizen of India. The country has suffered a lot due to various natural disasters. Considerable amount of energy is being wasted. Energy saved is energy produced. Environmental pollution is on the rise due to rampant industrial mismanagement and indiscipline. Renewable energy is one of the answers to the energy crisis and also to reduce environmental pollution. Therefore this course has been designed to develop a general awareness of these and related issues so that the every student will start acting as a responsible citizen to make the country and the world a better place to live in.

2. 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. **Take care of issues related to environment conservation and disaster management while working as diploma engineer.**

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
4	0	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 Ecology and environment	1.1 Enhance knowledge about engineering aspects of Environment 1.2 Correlate the facts of ecology and environment A 1.3 assess the effect of pollution 1.4 List the causes of environmental pollution 1.5 State the major causes of air, water and noise pollution 1.6 Describe how industrial waste contaminates the land 1.7 Describe the effects of radiation on vegetables, animals	1.1 Importance of environment and scope 1.2 Engineering and environment issues 1.3 The natural system, Biotic and a-Biotic components and processes of natural system 1.4 Eco system, food chain and webs and other biological Systems, 1.5 Causes of environmental pollution 1.6 Pollution due to solid waste 1.7 water pollution, air pollution, the Noise as pollution, 1.8 Pollution of land due to industrial and chemical waste 1.9 Radiation and its effects on vegetables and animals
Unit– II Sustainable Development	2.1 Explain the concept of sustainable development 2.2 Justify the need for renewable energy 2.3 Describe the growth of renewable energy in India 2.4 Explain the concepts of waste management and methods of recycling	2.1 Concept of sustainable development, 2.2 Natural resources, a-biotic and biotic resources 2.3 Principles of conservation of energy and management 2.4 Need of Renewable energy 2.5 Growth of renewable energy in India and the world 2.6 Concept of waste management and recycling
Unit – III Wind Power	3.1 Describe the growth of wind power in India 3.2 State the differences between VAWTs and HAWTs 3.3 Explain the differences between drag and lift type wind turbines 3.4 Describe the working of large wind turbines 3.5 List the types of aerodynamic control of large wind turbines 3.6 Name the generators used in large wind turbines	3.1 Growth of wind power in India 3.2 Types of wind turbines – Vertical axis wind turbines (VAWT) and horizontal axis wind turbines (HAWT) 3.3 Types of HAWTs – drag and lift types 3.4 Working of large wind turbines 3.5 Aerodynamic control of large and small wind turbines 3.6 Types of electrical generators used in small and large wind turbines
Unit – IV Solar Power	4.1 Describe the salient features of solar thermal and PV systems 4.2 Describe a solar cooker and solar water heater 4.3 Describe the working of solar PV system 4.4 State the salient features of polycrystalline, monocrystalline and thin film PV systems	4.1 Features of solar thermal and PV systems 4.2 Types of solar cookers and solar water heaters 4.3 Solar PV systems and its components and their working 4.4 Types of solar PV cells 4.5 Solar PV and solar water heaters, rating and costing
Unit – V Biomass energy	5.1 State the different types of biomass energy sources 5.2 Describe about the energy content in biomass 5.3 Describe the working of simple biogas plant	5.1 Types of Biomass Energy Sources 5.2 Energy content in biomass of different types 5.3 Types of Biomass conversion processes 5.4 Biogas production

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – VI Seismic Engineering and disaster management	6.1 Explain the principles of seismic Engineering in design of structure 6.2 State the appropriate actions to be taken during disasters	6.1 Introduction of seismic engineering and its application civil engineering designs 6.2 Features of disasters such as Floods, Earthquakes, Fires, Epidemics, Gas/radioactive leaks etc. 6.3 Management and mitigation of above disasters

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

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1.	Ecology and Environment	8	4	4	0	8
2.	Sustainable Development	10	4	5	1	10
3.	Wind Power	10	4	6	4	14
4.	Solar Power	10	4	6	4	14
5.	Biomass energy	8	4	4	2	10
6.	Seismic Engineering and disaster	10	6	6	2	14
	Total	56	26	31	13	70

Legends:

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

6. SUGGESTED LIST OF EXPERIMENTS/PRACTICAL EXERCISES

Nil

7. SUGGESTED LIST OF STUDENT ACTIVITIES

- i. Prepare paper on various sustainable development
- ii. Make a report after gathering information the values of water, noise pollution and air pollution in your city/town and compare the values in other cities and towns in India with respect to environmentally acceptable levels
- iii. Prepare a paper on air and water pollution in an industry/institute
- iv. Undertake some small mini projects in any one of the renewable energies
- v. Visit an energy park and submit project on various sources of energy
- vi. Prepare powerpoint on clean and green technologies
- vii. Prepare a list of do's and don'ts applicable during disasters
- viii. Submit a report on garbage disposal system in your city/town.

8. SUGGESTED LEARNING RESOURCES

A. List of Books

S. No.	Title of Book	Author	Publication/Year
1	Renewable Energy Technologies	Solanki, Chetan Singh	PHI Learning, New Delhi, 2010
2	Ecology and Control of the Natural Environment	Izrael, Y.A.	Kluwer Academic Publisher
3	Environment Engineering and Disaster Management	Sharma, Sanjay K.	Luxmi Publications, New Delhi
4	Environmental Noise Pollution and Its Control	Chhatwal, G.R.; Katyal, T.; Katyal,	Anmol Publications, New Delhi
5	Wind Power Plants and Project Development	Earnest, Joshua & Wizelius, Tore	PHI Learning, New Delhi, 2011
6	Renewable Energy Sources and Emerging Technologies	Kothari, D.P. Singal, K.C., Ranjan, Rakesh	PHI Learning, New Delhi, 2009
7	Environmental Studies	Anandita Basak	Pearson
8	Environmental Science and Engineering	Alka Debi	University Press
9	Coping With Natural Hazards, Indian Context	K. S. Valadia	Orient Longman
10	Engineering and Environment	Edward S. Rubin	Mc Graw Hill Publ.

B. List of Major Equipment/ Instrument

- i. Digital sound level meters (to check noise pollution)
- ii. Digital air quality meter (to measure air pollution)
- iii. Digital handheld anemometer (to measure wind speeds)
- iv. Digital hand held pyranometer (to measure solar radiation levels)

C. List of Software/Learning Websites

- i. http://www1.eere.energy.gov/wind/wind_animation.html
- ii. http://www.nrel.gov/learning/re_solar.html
- iii. http://www.nrel.gov/learning/re_biomass.html
- iv. <http://www.mnre.gov.in/schemes/grid-connected/solar-thermal-2/>
- v. <http://www.mnre.gov.in/schemes/grid-connected/biomass-powercogen/>

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- Prof. H.L.Purohit , HOD, Civil Engg. Dept. L.E.College. Morbi
- Shri. P.A.Pandya, LCE, Civil Engg. Dept, G.P , Himatnagar

Co-ordinator and Faculty Members from NITTTR Bhopal

- Dr. J.P.Tegar, Professor Dept of Civil and Environmental Engg, NITTTR, Bhopal.
- Dr. Joshua Earnest, Professor and Head, Dept. of Electrical & Electronics Engg, NITTTR, Bhopal

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
COURSE CURRICULUM

Course Title: Basic Instrumentation
(Code: 3311701)

Diploma Programmes in which this course is offered	Semester in which offered
Instrumentation & Control Engineering	First Semester

1. RATIONALE

Any student of diploma in instrumentation engineering will be required to select various instrumentation devices when he reaches the industry. As most of the devices are electrical and electronics based products, the student is required to develop a basic understanding of the concepts and related terms of electricity, electronics, magnetism & electromagnetism and it is in this backdrop that this course has been designed.

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. **Select and use the various instrumentation devices.**

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		
L	T	P	C	ESE	PA	ESE	PA	200
4	0	4	8	70	30	40	60	

Legends: L-Lecture; T – Tutorial/Teacher Guided Student Activity; P - Practical; C – Credit;

ESE - End Semester Examination; PA - Progressive Assessment.

4. COURSE DETAILS

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – I Basics of instrumentation	1a. Classify instruments used in the instrumentation industry 1b. Explain the basic terms related to instrumentation and control	1.1 Scope of Instrumentation in industries 1.2 Significance of Instrumentation & control. 1.3 Evolution of Instrumentation a Brief journey from manual control to automation b Simple block diagram of Instrumentation system c Basic terms related to instrumentation & control viz. process variable, system, control variable, error, input, output, feedback 1.4 a Definitions of characteristics of instruments & Measurement System Static: accuracy, sensitivity, resolution, precision, drift, dead

Unit	Major Learning Outcomes	Topics and Sub-topics
		<p>zone, repeatability & reproducibility and Dynamic : Fidelity, speed of response, lag</p> <p>b Classification of Instruments based on Function, output, operation, nature of signals etc.</p>
Unit– II Basic electricity	2.1 Explain the basic terms related to electrical engineering 2.2 Classify electrical measuring instruments	2.1 Terms related to basic electricity-Definitions of EMF, Current, Potential Difference, Power, Energy and Efficiency. 2.2 Definition: Resistance, resistivity & conductivity and their units 2.3 Factors affecting resistance 2.4 Ohm's law, Kirchoff's Laws of current & voltage, Measurement of unknown resistance by Wheastone bridge (without derivation) 2.5 Terms related to A.C. (alternating current): Cycle, frequency, time period, Amplitude, average & RMS value. 2.6 Classification of electrical measuring instruments
Unit– III Magnetism & electromagnetism	3.1 Explain the different laws related to electricity and magnetism 3.2 Describe the working of NO and NC types of relays	3.1 Definition of magnetism, Types of magnets (Only examples) 3.2 Terms related to magnetism- Poles, magnetic lines of force, flux density, Reluctance, permeability, B-H curve, Hysteresis 3.3 Working principle of electromagnet, solenoid 3.4 Relays, Types- N.O. & N.C. 3.5 Self & Mutual induction, Statements of Faraday's first & second Laws of electromagnetic induction, Statements of Fleming's rules.
Unit– IV Basic electronics	4.1 Describe the working of half and full wave rectifiers 4.2 Select appropriate types of electronic filters 4.3 Explain the working of opamps and terms related to it.	4.1 Symbols, Terminal identification & List applications of various semiconductor devices- Diodes, Transistors, SCR, DIAC, TRIAC, UJT, GTO, IGBT 4.2 Simple block diagram of power supply 4.3 Introduction to single phase Rectifier- Half & Full wave (without derivation) 4.4 Introduction to filter circuit, List types of Filters 4.5 Introduction to voltage regulator, List types of regulators 4.6 Simple Block diagram, advantages & comparison of SMPS & UPS 4.7 OPAMP IC 741: Symbol, PIN diagram, Application (only List) Terms- Voltage gain, bandwidth, input impedance, output impedance
Unit– V Essential parameters for instrumentation	5.1 Compare the different types of of flow measurements 5.2 Describe the method of temperature and level measurements	5.1 Introduction to various process parameters: Definitions of Terms- Pressure, Flow, Level, temperature 5.2 List various pressure sensing elements 5.3 List various techniques for flow measurements 5.4 List various techniques for level measurements 5.5 List various techniques for temperature measurements
Unit– VI Introduction to latest innovation in advanced industrial instrumentation	6.1 Explain the block diagram of DCS, PLC and industrial application of controllers	6.1 Simple block diagram of DCS (Introductory) 6.2 Simple block diagram of PLC (Primary level) 6.3 Introduction to industrial application of controllers (only List)

5. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
1.	Introduction to basics of instrumentation	10	2	6	2	14
2.	Basic electricity	12	4	6	2	14
3.	Magnetism & electromagnetism	10	2	6	2	14
4.	Basic electronics	10	2	6	2	14
5.	Introduction to essential parameters for instrumentation	07	2	4	1	07
6.	Introduction to latest innovation in advanced industrial instrumentation	07	2	5	0	07
Total		56	25	23	08	70

Legends

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

6. SUGGESTED LIST OF EXERCISES/PRACTICAL/EXPERIMENTS

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

S.No.	Unit No.	Practical Exercises/ Experiment
1		Study various laboratory equipments viz. power supply, CRO, Function generator, Multimeter etc.
2		Use Multimeter for measuring voltage, current & resistance.
3		Use CRO for measuring voltage, current & frequency.
4	II	Verify Ohm's law.
5	II	Verify Kirchhoff's current law.
6	II	Verify Kirchhoff's Voltage law.
7	II	Measure unknown resistance using Wheatstone bridge.
8	II	Measure resistance value of series combination of resistors.
9	II	Measure resistance value of parallel combination of resistors.
10	II	Obtain various parameters related to given A.C. waveform.
11	III	Demonstrate the working of electromagnet.
12	III	Demonstrate the working of solenoid.
13	III	Study relay & its operation.
14	IV	Select Diode, Transistor, SCR, DIAC, TRIAC, UJT from the given components & identify their terminals.
15	IV	Assemble half wave rectifier & measure output voltage waveform on CRO.
16	IV	Assemble Full wave rectifier & measure output voltage waveform on CRO.
17	IV	Connect filter circuit at the output of rectifier & measure output voltage waveform on CRO.
18	V	Study and use Pressure sensing elements,
19	V	Study and use Flow measuring instruments
20	V	Study and use level measuring instruments.
21	V	Study and use temperature measuring instruments.

S.No.	Unit No.	Practical Exercises/ Experiment
22	VI	Study block diagram of DCS.
23	VI	Study block diagram of PLC.
24	VI	Study applications of controllers.

NOTE: At least 16 experiments/practical exercises have to be performed form the above

7. SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

Students are required to prepare and submit a laboratory report on instruction/demonstration given by instructor and workshop activities done by students as a part of term work.

8. SUGGESTED LEARNING RESOURCES

A. List of Books

Sr	Author	Title of Books	Publication
1.	Murthy D. V. S.	Transducers and Instrumentation	PHI Learning 2011
2.	Ernest Doebelin	Measurement Systems	Mcgraw hill Publishers
3.	Helfrick & Cooper	Modern Electronic Instrumentation & Measurement Techniques	PHI Learning
4.	Robert L. Boylestad, Louis Nashelsky	Electronic Devices and Circuit Theory	PHI Learning
5.	Patranabis	Sensors and Transducers	PHI Learning
6.	A.K. sawhney	A Course In Electrical And Electronic Measurements And Instrumentation	Dhanpat Rai & Sons.
7.	Bell, D.A.	Electronic Instrumentation and Measurements	PHI Learning 2011
8.	Carr, Joseph J.	Elements of Electronic Instrumentation and Measurements	Pearson Education, 2010
9.	S. K. Singh	Industrial Instrumentation & Control	Mcgraw hill Publishers
10.	R. K. jain	Electronic Instrumentation	Tata Mcgrawhill
11.	Kalsi, H.S.	Measurement Systems	Mcgraw hill Publishers 2011

B. List of Major Equipment/ Instrument:

Multimeter, Megger, Clamp-on meter, CRO, soldering iron, desoldering pump, pliers, cutters, L-end key, spanner(ring/open/box/adjustable),stripper, screw driver, pointer remover, tube bender, tube cutter, flaring tools etc.

C. List of Software/Learning Websites

- i. http://www.instrumentationworld.com/instrumentation_tutorial.htm
- ii. http://www.pc-education.mcmaster.ca/Instrumentation/go_inst.htm

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. M. K. Parikh**, HOD IC dept, Government Polytechnic, Ahmedabad
- **Prof. R. R. Manchiganti**, HOD IC dept, Government Polytechnic, Gandhinagar

- **Shri. A. K. Bilkhiya**, Lecturer IC dept, Government Polytechnic, Gandhinagar
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- **Shri. M. M. Shah**, Lecturer IC Dept, Government Polytechnic, Palanpur
- **Shri. S. K. Raval**, Lecturer IC Dept, Government Polytechnic, Ahmedabad
- **Shri. H. P. Patel**, Lecturer IC Dept, Government Polytechnic, Ahmedabad
- **Shri. J. A. sutariya**, Lecturer IC Dept, Government Polytechnic, Ahmedabad
- **Shri. M. B. Vanara**, Lecturer IC Dept, Government Polytechnic, Ahmedabad
- **Shri. N. J. Dehalvi**, Lecturer IC Dept, Government Polytechnic, Gandhinagar
- **Shri. Manan A. Modi**, Lecturer IC Dept, Government Polytechnic, Palanpur
- **Prof. Hirenkala Vachhani** I/C HOD IC dept, Christ Polytechnic Institute, Rajkot
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Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. Joshua Earnest**, Professor and Head, Dept. of Electrical & Electronics Engg, NITTTR, Bhopal.
- **Prof. A.S. Walkey**, Associate Professor, Dept. of Electrical & Electronics Engg, NITTTR, Bhopal.

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
COURSE CURRICULUM

Course Title: Instrumentation Workshop
(Code: 3311702)

Diploma Programmes in which this course is offered	Semester in which offered
Instrumentation & Control Engineering	First Semester

1. RATIONALE

When the students reach the industries, they will be able to identify the various instrumentation devices, measure the current, voltage and power, solder and desolder the components, identify and remedy the electrical faults, test the instrumentation loop and recognize the use of instrumentation tools. They will also be able to select right impediments and tools for the right work.

2. LIST OF 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. **Select and use the appropriate instrumentation devices for the specific applications.**

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		
L	T	P	C	ESE	PA	ESE	PA	100
0	0	4	4	00	00	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 CONTENTS

Unit	Major Learning Outcomes	Topics and Sub-topics
Instrumentation workshop	1.1 Identify different instrumentation related devices 1.2 Solder and de-solder the devices in the circuits	1.1 Electronic components identification: Resistor, Capacitor, Inductor, transformer, fuse, diodes, Transistor. 1.2 Soldering: Techniques to solder and desolder the electronic components on PCB. 1.3 Measurement: measurement of electrical parameters (V,I,R,P) with proper instruments. 1.4 Wiring: Loop wiring , panel wiring and electrical wiring 1.5 Troubleshooting: Testing instrumentation loop, instrumentation panel

5. SPECIFICATION TABLE (for theory)

There is no theory paper and hence specification table for theory is not applicable

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 for guidance for exercises/practical/experiments

S.No.	Unit	Exercises/Practical
1		Measure inner & outer diameter using vernier calipers & compare it with standards.
2		Measure thickness of the metallic sheet with micrometer & compare it with standards.
3		Identify different electronic components viz. Resistor, Capacitor, Inductor, transformer, fuse, diode, transistor.
4		Identify various resistors viz. carbon composition, carbon film, cracked carbon, metal oxide film, wire-wound, variable resistors
5		Measure value of given resistor & compare it with theoretical value obtained using colour code.
6		Identify various capacitors viz paper , silvered paper, mica, silvered mica, ceramic plastic foil, electrolytic
7		Identify various inductors viz fixed and variable inductors.
8		Identify various chokes viz A.F. & R.F.
9		Identify Piezo electric crystal & study it's application
10		Measure voltage, current & power using suitable instrument.
11		Connect 3 phase power supply (star , delta) to suitable load.
12		Identify terminals of diodes and transistors
13		Identify & Test fuses & transformers
14	I	Solder and de-solder electronic components on PCB as well solder earth connection.
15	I	Wire instrumentation signals, low/ high power supply and connect appropriate earth to it.
16	I	Wire instrument panel with various accessories as per instrument hook-up diagram.
17	I	Measure voltage, current and power for single and three phase Supply.
18	I	Wire the MCB, ELCB to supply electrical power to instrument panel.
19	I	Wire the MCB, ELCB, contactor, starter to supply electrical power to motor drive panel as per given wiring diagram for one application.
20	I	Prepare specifications for instrumentation tools, wires, cables, switches, electronic components for a given application.
21	I	Wire electrical circuit diagram using IEEE standard symbols for one instrument panel application.
22	I	Wire instrumentation loop as per given diagram using ISA standard symbols for one instrument panel application controlling single loop.
23	I	Identify open circuit, short circuit faults.
24	I	Test assembled instrument loop wiring for various parameters and faults.
25		Troubleshoot instrument panel wiring for various parameters and faults.
26		Identify tools, equipments & components required for installation of process control instruments.
27		Dismantle & assemble valve to identify it's components as per sketch .
28		Dismantle, assemble & calibrate pressure guage.
29		Dismantle & assemble recorder to identify it's components.
30		Install any one instrument using screw type connection.
31		Install any one instrument using flange type connection.
32		Install any one transmitter as per sketch with bill of materials.
33		Test pressure/flow/level/temperature switch.
34		Test proximity & limit switch.

Note: At least 24 exercises/practical from the above should be performed.

7. SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

Students are required to prepare and submit a laboratory report on instruction/demonstration given by instructor and workshop activities done by students as a part of term work.

8. SUGGESTED LEARNING RESOURCES

A. List of Books

S. No.	Author	Title of Books	Publication/Year
1	Murthy, D. V. S.	Transducers and Instrumentation	PHI Learning 2011
2	Kalsi, H.S.	Measurement Systems	Mcgraw hill Publishers 2011
3	Bell, D.A.	Electronic Instrumentation and Measurements	PHI Learning 2010
4	Carr , Joseph J.	Elements of Electronic Instrumentation and Measurements	Pearson Education, 2010

B. List of Major Equipment/ Instrument:

Multimeter, Megger, Clamp-on meter, CRO, soldering iron, de-soldering pump, pliers, cutters, L-end key, spanner(ring/open/box/adjustable),stripper, screw driver, pointer remover, tube bender, tube cutter, flaring tools etc.

C. List of Software/Learning Websites

- I. http://www.instrumentationworld.com/instrumentation_tutorial.htm
- II. http://www.pc-education.mcmaster.ca/Instrumentation/go_inst.htm

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

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- Shri Ashvin M. Patel, Lecturer IC, Government Polytechnic, Palanpur
- Shri H. P. Patel, Lecturer IC, Government Polytechnic, Ahmedabad
- Shri M B Vanara, Lecturer IC, Government Polytechnic, Ahmedabad
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GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
COURSE CURRICULUM

Course Title: Principles of Chemical Engineering
(Code: 3311703)

Diploma Programmes in which this course is offered	Semester in which offered
Instrumentation & Control Engineering	First Semester

1. RATIONALE

The student will understand the principles of chemical engineering and their applications in process industry. The student will be able to understand the use of instrumentation for operations specific to a chemical process environment.

2. LIST OF COMPETENCIES

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

- i. Identify need for different instruments for various Chemical Engineering Processes

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
3	0	0	3	70	30	00	00	

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 Unit Operations	1.1 Define processes 1.2 Compare processes 1.3 Select operations	1.1 Introduction to process & Instrumentation for Chemical Processes 1.2 Definitions, application & comparison : Batch Process, Continuous Process 1.3 Importance & applications of Unit Operations 1.4 Brief Description & Uses of Agitation, Drying, Evaporation, Blending, Crushing, Grinding, Conveying, Filtration, Crystallization, Centrifugation
Unit– II Unit Process	2.1 Identify application of unit process 2.2 List & select unit processes	2.1 Introduction, importance & application of Unit Process 2.2 Brief description & application of Cracking, Reforming, Polymerization, Alkylation, Hydrogenation, Isomerisation, absorption, Adsorption, Extraction
Unit-III Thermodyn amics of Process	3.1 State laws of thermodynamics 3.2 Classify, define & describe heat transfer reaction 3.3 select, define & describe Heat exchanger 3.3 describe Refrigeration & Air-conditioning System	3.1 Laws of Thermodynamics 3.2 Application of Thermodynamic Laws in Processes 3.3 Brief description of Heat Transfer Reaction : Exothermic & Endothermic 3.4 Definition and Types of Heat Exchangers 3.5 Basic Instrumentation for Shell and Tube type Heat Exchanger 3.6 Principle and brief description with schematic diagram of Refrigeration System & Air-conditioning System
Unit– IV Process equipments	4.1 Classify Pumps & Compressors 4.2 describe pumps, compressor, belt & belt conveyers	4.1 Classification of Pumps & Compressors 4.2 Brief description of Pumps : Centrifugal, Reciprocating 4.3 Brief description of Compressors : Rotary, Reciprocating 4.4 Brief description of belt conveyers & bucket elevators
Unit– V Principles of Electroche mical Analysis:	5.1 Define electrochemistry 5.2 Understand activity series of metals 5.3 Define redox reactions 5.4 Describe electrochemi	5. 5.1 Electrochemistry- definition a Activity Series of Metals b Redox Reactions 5.2 Electrochemical Cell Potentiometric titration Types of Battery (only List) 5.3 pH measurement: a Logarithmic nature of pH b Measurement electrode: c List types of electrodes

Unit	Major Learning Outcomes	Topics and Sub-topics
	cal cell 5.5 Define potentiometric titration 5.6 List types of batteries 5.7 Classify, define & describe heat transfer reaction	d Functional layers of the glass membranes

5. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks (Duration – 2.5 Hours)			
			R Level	U Level	A Level	Total
1.	Unit Operations	08	4	4	6	14
2.	Unit Process	06	4	6	4	14
3.	Thermodynamics of Process	10	6	6	2	14
4.	Process equipments	06	7	7	0	14
5.	Principles of Electrochemical Analysis	12	2	6	6	14
	Total	42	23	29	18	70

Legends

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

6. SUGGESTED LIST OF EXPERIMENTS/PRACTICALS

There are no practical/experiments in this course.

7. SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

Visit to one relevant process industry, where most of the above processes are in use is recommended. Students should be asked to study the processes and the type and specifications of the Instruments installed for efficient functioning of those processes.

8. SUGGESTED LEARNING RESOURCES

A. List of Books

S.No.	Author	Title of Books	Publication
1	Bela G. Liptak	Process Measurement and Analysis	Chilton Book company, Radnor, Pennsylvania
2	R.N. Shreeve	Chemical Process Industries	Mcgraw hill Publishers
3	Dryden	Handbook of chemical engg.	

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- **Prof. J. A. Sutariya**, Lecturer IC Dept, Government Polytechnic, Ahmedabad
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- **Prof. J. A. Mishra**, Lecturer IC Dept, Government Polytechnic, Ahmedabad

Coordinator & Faculty members from NITTTR Bhopal :

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- **Dr Anju Rawalley**, Professor Department of Applied Sciences, NITTTR, Bhopal