

**BACHELOR OF TECHNOLOGY
(INSTRUMENTATION AND CONTROL ENGINEERING)
FIFTH SEMESTER EXAMINATION**

Code No.	Paper ID	Paper	L	T/P	Credits	Status
THEORY PAPERS						
ETHS 301		Communication Skills for Professionals	2	0	1	
ETIC 303		Industrial Instrumentation	3	1	4	M
ETEC 305		Microprocessors and Microcontrollers	3	1	4	M
ETEC 309		Digital System Design	3	1	4	
ETIC 309		Object Oriented Programming using JAVA	3	0	3	
ETMS 311		Industrial Management	3	0	3	
PRACTICAL/VIVA VOCE						
ETHS-351		Communication Skills for Professionals Lab	0	2	1	
ETIC-353		Industrial Instrumentation Lab	0	2	1	M
ETEC-355		Microprocessors and Microcontrollers Lab	0	2	1	
ETEC-351		Digital System Design Lab	0	2	1	
ETIC-357		Object Oriented Programming using JAVA Lab	0	2	1	
ETIC-359		Industrial training / In-house Instrumentation Workshop#*	0	0	1	
TOTAL			17	13	25	

NUES

M: Mandatory for the award of degree.

*Viva-Voce for evaluation of Industrial Training / In-house Workshop will be conducted in this semester.

**BACHELOR OF TECHNOLOGY
(INSTRUMENTATION AND CONTROL ENGINEERING)
SIXTH SEMESTER EXAMINATION**

Code No.	Paper ID	Paper	L	T/P	Credits	Status
THEORY PAPERS						
ETIC-302		Pneumatic and Hydraulic Instrumentation	3	1	4	M
ETIC-304		Process Control	3	1	4	M
ETEC-306		Digital Signal Processing	3	1	4	
ETIC-308		Analytical Instrumentation	3	1	4	
ETIC-310		Modern Control Systems	3	1	4	M
ETEC-310		Data Communication and Networks	3	1	4	
PRACTICAL/VIVA VOCE						
ETIC-352		Pneumatic and Hydraulic Instrumentation Lab	0	2	1	M
ETIC-354		Process Control Lab	0	2	1	M
ETEC-356		*Digital Signal Processing Lab.	0	2	1	
ETIC-358		Modern Control Systems Lab	0	2	1	M
ETEC-358		Data Communication and Networks Lab	0	2	1	
TOTAL			18	16	29	

M: Mandatory for award of degree

#NUES (Non University Examination System)

Note: Minimum of 4-6 weeks of industrial training related to ICE will be held after 6th semester; however, viva-voce will be conducted in 7th Semester (ETIC 459).

Imp:- Elective Paper will be floated in 7th Semester, if one-third of the total students opt for the same. It is advised that the decision about the elective subject for 7th Semester is done before the 15th April every year before end of 6th semester.

***A few lab experiments must be performed using any circuit simulation software e.g. PSPICE/MATLAB/ETAP/Scilab/LabVIEW**

COMMUNICATION SKILLS FOR PROFESSIONALS

Paper Code: ETHS-301

Paper: Communication Skills for Professionals

L	T/P	C
2	0	1

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 75

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: To develop communication competence in prospective engineers so that they are able to communicate information as well as their thoughts and ideas with clarity and precision. This course will also equip them with the basic skills required for a variety of practical applications of communication such as applying for a job, writing reports and proposals. Further, it will make them aware of the new developments in communication that have become part of business organisations today.

UNIT I

Organizational Communication: Meaning, importance and function of communication, Process of communication, Communication Cycle - message, sender, encoding, channel, receiver, decoding, feedback, Characteristics, Media and Types of communication, Formal and informal channels of communication, 7 C's of communication, Barriers to communication, Ethics of communication (plagiarism, language sensitivity)

Soft Skills: Personality Development, Self Analysis through SWOT, Johari Window, Interpersonal skills -Time management, Team building, Leadership skills. Emotional Intelligence. Self Development and Assessment- Self assessment, Awareness, Perception and Attitudes, Values and belief, Personal goal setting, Career planning, Self esteem.

[T1,T2][No. of Hrs. 08]

UNIT II

Introduction to Phonetics: IPA system (as in Oxford Advanced Learner's Dictionary), Speech Mechanism, The Description of Speech Sounds, Phoneme, Diphthong, Syllable, Stress, Intonation, Prosodic Features; Pronunciation; Phonetic Transcription - Conversion of words to phonetic symbols and from phonetic symbols to words. British & American English (basic difference in vocabulary, spelling, pronunciation, structure)

Non-Verbal Language: Importance, characteristics, types – Paralanguage (voice, tone, volume, speed, pitch, effective pause), Body Language (posture, gesture, eye contact, facial expressions), Proxemics, Chronemics, Appearance, Symbols.

[T1,T2][No. of Hrs. 08]

UNIT III

Letters at the Workplace – letter writing (hard copy and soft copy): request, sales, enquiry, order, complaint. Job Application -- resume and cover letter

Meeting Documentation-- notice, memo, circular, agenda and minutes of meeting.

Report Writing - Significance, purpose, characteristics, types of reports, planning, organizing and writing a report, structure of formal report. Writing an abstract, summary, Basics of formatting and style sheet (*IEEE Editorial Style Manual*), development of thesis argument, data collection, inside citations, bibliography; Preparing a written report for presentation and submission. Writing a paper for conference presentation/journal submission.

[T1,T2][No. of Hrs. 08]

UNIT IV

Listening and Speaking Skills: Importance, purpose and types of listening, process of listening, difference between hearing and listening, Barriers to effective listening, Traits of a good listener, Tips for effective listening. Analytical thinking; Speech, Rhetoric, Polemics; Audience analysis. Telephone Skills - making and receiving calls, leaving a message, asking and giving information, etiquettes.

Presentations: Mode, mean and purpose of presentation, organizing the contents, nuances of delivery, voice and body language in effective presentation, time dimension.

Group Discussion: Purpose, types of GDs, strategies for GDs, body language and guidelines for group discussion.

Interview Skills: Purpose, types of interviews, preparing for the interview, attending the interview, interview process, employers expectations, general etiquettes.

[T1,T2][No. of Hrs. 07]

Text Books:

- [T1] Anna Dept. Of English. Mindscapes: English for Technologists & Engineers PB. New Delhi: Orient Blackswan.
- [T2] Farhathullah, T. M. Communication Skills for Technical Students. Orient Blackswan, 2002.

References Books:

- [R1] Masters, Ann and Harold R. Wallace. Personal Development for Life and Work, 10th Edition. Cengage Learning India, 2012.
- [R2] Institute of Electrical and Electronics Engineers. IEEE Editorial Style Manual. IEEE, n.d. Web. 9 Sept. 2009.
- [R3] Sethi and Dhamija. A Course in Phonetics and Spoken English. PHI Learning, 1999.
- [R4] Khera, Shiv. You Can Win. New York: Macmillan, 2003.

INDUSTRIAL INSTRUMENTATION**Paper Code: ETIC-303****Paper: Industrial Instrumentation**

L	T/P	C
3	1	4

INSTRUCTIONS TO PAPER SETTERS:**MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: To familiarize the students with the measurement schemes, used for monitoring various analytical and non electrical parameters encountered in industrial applications.

UNIT-I

Temperature Measurements: Importance, advantage and limitation of different instruments ,Seeback effect, peltier effect used for temperature measurement, thermocouples, Advantage and limitation of- Vapour filled, gas filled, Liquid filled, mercury in glass, Bimetallic, Pressure spring thermometer, pyrometers, thermistors, IC based metering, Low temperature and high temperature measurement schemes.

Level Measurements: Importance, advantage and limitation of different instruments, visual level indicators, float type, Purge method of measuring level, Buoyancy method, Resistance and capacitance probes for level measurement, limit switches, level measurement in pressurized vessels, solid level measurement techniques, modern techniques for level measurements and their applications.

[T1][T2][No. of Hours 11]**UNIT -II**

Pressure Measurements: Principle of measurement of absolute/gauge/ Vacuum, Different type of manometers, Pressure switches, pirani gauge.

Flow Measurements: Mechanical flow meter, Interferential type, Rotating vane, propeller type, orifice plate, venturi tube, flow nozzle, pivot tube, variable area flow meters, rotameters, Electromagnetic and ultrasonic flow meters, mass flow meters, and turbine flow meters, selection of flow meters and typical application scheme for very low flow and highly viscous fluid.

Force and Torque Measurement: Various measuring methods, Mechanical weighing systems, Ballistic Weighing, Hydraulic and pneumatic system, Torque Measurement, Transmission Dynamometers, Combined Force and Moment Measurement.

[T1][T2][No. of Hours 11]**UNIT-III**

Density Measurement: Displacement and float type densitometry, hydrometer, hydrostatic densitometry, miscellaneous densitometry, oscillating densitometer, radiation densitometer, vibrating densitometer & gas densitometer.

Displacement, Linear Velocity Measurement: Gauge blocks, surface plates, use of comparators, optical methods, displacement transducer and typical applications.

[T1][T2][No. of Hours 10]**UNIT – IV**

Moisture and Humidity Measurement: Wet analysis and Dry analysis based methods, Principle Moisture sensing devices- electrical conductivity/capacitance methods/ impedance sensors/radio frequency/ microwave/Infrared absorption meters, vibrating quartz crystal moisture sensors, principle of operational instrument for measurement of humidity, modern techniques for measurement of humidity.

Vibration and Noise Measurements: Importance and harmful effects, limiting/permissible value under various types of industrial environments, modern measurement techniques.

[T1][T2][No. of Hours 12]**Text Books:**

[T1] K. Krishnaswamy, S. Vijaychitra, “Industrial Instrumentation”, New Age International Publishers, 2nd Edition, 2010

[T2] A.K.Ghosh, “Introduction to Measurements and Instrumentation”, 4th Edition, PHI

Reference Books:

- [R1] S.K.Singh, "Industrial Instruments", PHI.
- [R2] W. D. Cooper, "Modern Electronics Instrumentation & Measurement Techniques", PHI.
- [R3] T. G. Beckwith, "Mechanical Measurements", 6th Edition, Addison Wesley Pub.
- [R4] C.R.Alavala, "Principles of Industrial Instrumentation and Control Systems" Cengage Learning.

MICROPROCESSORS AND MICROCONTROLLERS

Paper Code: ETEC-305

Paper: Microprocessors and Microcontrollers

L	T/P	C
3	1	4

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 75

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks

Objective: The objective of the paper is to facilitate the student with the knowledge of microprocessor systems and microcontroller.

UNIT- I

Introduction to Microprocessor Systems: Architecture and PIN diagram of 8085, Timing Diagram, memory organization, Addressing modes, Interrupts. Assembly Language Programming.

[T1][No. of hrs. 10]

UNIT- II

8086 Microprocessor: 8086 Architecture, difference between 8085 and 8086 architecture, generation of physical address, PIN diagram of 8086, Minimum Mode and Maximum mode, Bus cycle, Memory Organization, Memory Interfacing, Addressing Modes, Assembler Directives, Instruction set of 8086, Assembly Language Programming, Hardware and Software Interrupts.

[T2][No. of hrs. :12]

UNIT- III

Interfacing of 8086 with 8255, 8254/ 8253, 8251, 8259: Introduction, Generation of I/O Ports, Programmable Peripheral Interface (PPI)-Intel 8255, Sample-and-Hold Circuit and Multiplexer, Keyboard and Display Interface, Keyboard and Display Controller (8279), Programmable Interval timers (Intel 8253/8254), USART (8251), PIC (8259), DAC, ADC, LCD, Stepper Motor.

[T1][No. of hrs. :12]

UNIT-IV

Overview of Microcontroller 8051: Introduction to 8051 Micro-controller, Architecture, Memory organization, Special function registers, Port Operation, Memory Interfacing, I/O Interfacing, Programming 8051 resources, interrupts, Programmer's model of 8051, Operand types, Operand addressing, Data transfer instructions, Arithmetic instructions, Logic instructions, Control transfer instructions, Timer & Counter Programming, Interrupt Programming.

[T3][No. of hrs. 11]

Text Books:

[T1] Muhammad Ali Mazidi, "Microprocessors and Microcontrollers", Pearson, 2006

[T2] Douglas V Hall, "Microprocessors and Interfacing, Programming and Hardware" Tata McGraw Hill, 2006.

[T3] Ramesh Gaonkar, "MicroProcessor Architecture, Programming and Applications with the 8085", PHI

References Books:

[R1] Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. MCKinlay "The 8051 Microcontroller and Embedded Systems", 2nd Edition, Pearson Education 2008.

[R2] Kenneth J. Ayala, "The 8086 Microprocessor: Programming & Interfacing The PC", Delmar Publishers, 2007.

[R3] A K Ray, K M Bhurchandi, "Advanced Microprocessors and Peripherals", Tata McGraw Hill, 2007.

DIGITAL SYSTEM DESIGN**Paper Code: ETEC-309****Paper: Digital System Design**

L	T/P	C
3	1	4

INSTRUCTIONS TO PAPER SETTERS:**MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks

Objective: To enhance the knowledge and skill of the students in digital system design with emphasis on Hardware Description Language (VHDL HDL)

UNIT I

Introduction to VHDL, design units, data objects, signal drivers, inertial and transport delays, delta delay, VHDL data types, concurrent and sequential statements. Subprograms – Functions, Procedures, attributes, generio, generate, package, IEEE standard logic library, file I/O, test bench, component declaration, instantiation, configuration.

[T1][No. of Hrs.: 12]**UNIT II**

Combinational logic circuit design and VHDL implementation of following circuits –first adder, Subtractor, decoder, encoder, multiplexer, ALU, barrel shifter, 4X4 key board encoder, multiplier, divider, Hamming code encoder and correction circuits.

[T1][No. of Hrs.: 10]**UNIT III**

Synchronous sequential circuits design – finite state machines, Mealy and Moore, state assignments, design and VHDL implementation of FSMs, Linear feedback shift register (Pseudorandom and CRC).

[T2][No. of Hrs.: 10]**UNIT IV**

Asynchronous sequential circuit design – primitive flow table, concept of race, critical race and hazards, design issues like metastability, synchronizers, clock skew and timing considerations
Introduction to place & route process, Introduction to ROM, PLA, PAL, Architecture of CPLD (Xilinx/Altera).

[T2][No. of Hrs.: 12]**Text Books:**

[T1] Douglas Perry ,”VHDL” 4th Edition, TMH

[T2] Stephen Brown, Zvonko Vranesic, “Fundamentals of Digital Logic with VHDL design”, TMH.

Reference Books:

[R1] Charles. H.Roth ,“Digital System Design using VHDL”, PWS (1998)

[R2] John F. Wakerley ,“Digital Design Principles And Practices” ,Pearson Education

[R3] Navabi Z , “VHDL-Analysis & Modelling of Digital Systems”,McGraw Hill.

[R4] [William I. Fletcher](#), “An Engineering Approach To Digital Design”, Prentice Hall

[R5] Bhasker, “A VHDL Primmer”, Prentice Hall 1995.

OBJECT ORIENTED PROGRAMMING USING JAVA

Paper Code: ETIC-309		L	T/P	C
Paper: Object Oriented Programming using JAVA	3	0	3	

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 75

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks

Objective: This course introduces the fundamental programming concepts and techniques in Java and is intended for all who plan to use computer programming in their studies and careers.

UNIT I

Java fundamentals: Features of Java, OOPs concepts, Java virtual machine, Reflection byte codes, Byte code interpretation, Data types, variable, arrays, expressions, operators, and control structures.

Introducing java classes: Abstract classes, Static classes, Inner classes, Packages, Wrapper classes, Interfaces, This, Super, Access control objects and methods: defining a class, adding variables and methods, creating objects, constructors, class inheritance.

Arrays and String: Creating an array, one and two dimensional arrays, string array and methods, Classes: String and String Buffer classes.

[T1, T2, T3][No. of Hrs. 12]

UNIT II

Exception handling: Exception as objects, Exception hierarchy, uncaught exceptions, built in exception, creating your own exceptions, Try, final, Throw, throws

IO package: Input streams, Output streams, Object serialization, Deserialization, Sample programs on IO files, Filter and pipe streams

Multi threading: Thread Life cycle, Multi threading advantages and issues, Simple thread program, Java thread model: priorities, synchronization, messaging, thread classes, Run able interface, and inter thread Communication, suspending, resuming and stopping threads.

[T1,T2,T3][No. of Hrs. 12]

UNIT III

GUI: Introduction to AWT programming, Layout and component managers and menus, handling Image, animation, sound and video.

Event handling: Different Mechanism, the Delegation Event Model, Event Classes, Event Listener Interfaces.

Applet class: Applet life-cycle, passing parameters embedding in HTML, Swing components – JApplet, JButton, JFrame, etc., Sample swing programs, servlets.

[T1,T2,T3][No. of Hrs. 12]

UNIT IV

Networking: Basics, networking classes and interfaces, using java.net package, doing TCP/IP and Data-gram Programming.

Database Connectivity: JDBC architecture, connectivity and working with connection interface, Working with statements, Creating and executing SQL statements, working with Result Set.

[T1,T2,T3][No. of Hrs. 12]

Text Books:

- [T1] Patrick Naughton and Herbertz Schildt, “Java-2 The Complete Reference”, 1999, TMH
- [T2] Rick Dranell, “HTML 4 unleashed”, Techmedia Publication, 2004.
- [T3] Shelley Powers, “Dynamic Web Publishing”, 2nd Ed., Techmedia, 1998.

Reference Books:

- [R1] E. Balaguruswamy, “Programming with Java: A Primer”, TMH, 1998.
- [R2] Horstmann, “Computing Concepts with Java 2 Essentials”, John Wiley, 2004.
- [R3] Decker & Hirshfield, “Programming Java: A introduction to programming using JAVA”, Vikas Publication, 2000.
- [R4] Tmy Gaddies, “Starting out with Java”, Wiley Dreamtech, 2005.
- [R5] Holzner, “HTML Blackbook”, Wiley Dreamtech, 2005.

INDUSTRIAL MANAGEMENT**Paper Code: ETMS-311****Paper: Industrial Management**

L	T/P	C
3	0	3

INSTRUCTIONS TO PAPER SETTERS:**MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: The course provides a broad introduction to some aspects of business management and running of business organization.

UNIT I**Industrial relations-** Definition and main aspects. Industrial disputes and strikes. Collective bargaining.**Labour Legislation-** Labour management cooperation/worker's participation in management. Factory legislation. International Labour Organization.**[T1,T2][No. of Hrs. 10]****UNIT II****Trade Unionism-** Definition, Origin, Objectives of Trade Unions. Methods of Trade unions. Size and finance of Indian Trade unions-size, frequency distribution, factors responsible for the small size. Finance-sources of income, ways of improving finance.**[T1,T2][No. of Hrs. 10]****UNIT III****Work Study-**Method study and time study. Foundations of work study. Main components of method study. Time study standards. Involvement of worker's unions. Work Sampling. Application of work study to office work.**[T1,T2][No. of Hrs. 10]****UNIT IV****Quality Management-** What is Quality? Control Charts. Quality is everybody's job. Taguchi Philosophy. Service Quality. What is Total Quality Management (TQM)? Roadmap for TQM. Criticism of TQM. Six Sigma.**[T1,T2][No. of Hrs. 10]****Text Books:**

[T1] Sinha, P.R.N., Sinha I.B. and Shekhar S.M.(2013), Industrial Relations, Trade Unions and Labour Legislation. Pearson Education

[T2] Chary, S.N. (2012), Production and Operations Management. Tata McGraw Hill Education.

Reference Books:

[R1] Srivastava, S.C. (2012), Industrial Relations and Labour Laws, Vikas Publishing

[R2] Shankar R (2012), Industrial Engineering and Management. Galgotia Publications

[R3] Telsang, M. (2006), Industrial Engineering and Production Management. S.Chand

[R4] Thukaram, Rao (2004), M.E. Industrial Management. Himalaya Publishing House

COMMUNICATION SKILLS FOR PROFESSIONALS LAB

Paper Code: ETHS-351	L	T/P	C
Paper: Communication Skills for Professionals Lab	0	2	1

Objective: To develop communication competence in prospective engineers so that they are able to communicate information as well as their thoughts and ideas with clarity and precision. These activities will enhance students' communication skills with a focus on improving their oral communication both in formal and informal situations. They will develop confidence in facing interviews and participating in group discussions which have become an integral part of placement procedures of most business organisations today.

Lab Activities to be conducted:

- Listening and Comprehension Activities** – Listening to selected lectures, seminars, news (BBC, CNN, etc.). Writing a brief summary or answering questions on the material listened to.
- Reading Activities** -- Reading different types of texts for different purposes with focus on the sound structure and intonation patterns of English. Emphasis on correct pronunciation.
- Conversation Activities**-- Effective Conversation Skills; Formal/Informal Conversation; Addressing higher officials, colleagues, subordinates, a public gathering; Participating in a video conference.
- Making an Oral Presentation**–Planning and preparing a model presentation; Organizing the presentation to suit the audience and context; Connecting with the audience during presentation; Projecting a positive image while speaking; Emphasis on effective body language.
- Making a Power Point Presentation** -- Structure and format; Covering elements of an effective presentation; Body language dynamics.
- Making a Speech** -- Basics of public speaking; Preparing for a speech; Features of a good speech; Speaking with a microphone. Famous speeches may be played as model speeches for learning the art of public speaking. Some suggested speeches: Barack Obama, John F Kennedy, Nelson Mandela, Mahatma Gandhi, Jawahar Lal Nehru, Atal Bihari Vajpayee, Subhash Chandra Bose, Winston Churchill, Martin Luther King Jr.
- Participating in a Group Discussion** -- Structure and dynamics of a GD; Techniques of effective participation in group discussion; Preparing for group discussion; Accepting others' views / ideas; Arguing against others' views or ideas, etc.
- Participating in Mock Interviews** -- Job Interviews: purpose and process; How to prepare for an interview; Language and style to be used in an interview; Types of interview questions and how to answer them.

Suggested Lab Activities:

- Interview through telephone/video-conferencing
- Extempore, Story Telling, Poetry Recitation
- Mock Situations and Role Play; Enacting a short skit
- Debate (Developing an Argument), News Reading and Anchoring.
-

Reference Books:

- Patnaik, Priyadarshi. *Group Discussion and Interview Skills: With VCD*. Cambridge University Press India (Foundation Books), 2012 edition.
- Kaul, Asha. *Business Communication*. PHI Learning: 2009.
- Hartman and Lemay. *Presentation Success: A Step-by-Step Approach*. Thomson Learning, 2000.

Note: The Communication Skills Lab should be equipped with computers, microphones, an internet connection, overhead projector, screen, sound system, audio/video recording facilities, and seating arrangement for GDs and mock interviews. The student activities may be recorded and students may replay them to analyse and improve their pronunciation, tone, expressions, body language, etc.

Traditional language lab softwares are not mandatory and may be used by students to practice and enhance their language competence. Such softwares are usually elementary in nature and are mostly based on British/American English (pronunciation, accent and expression). They should preferably be in Indian English.

INDUSTRIAL INSTRUMENTATION LAB**Paper Code: ETIC-353****Paper: Industrial Instrumentation Lab**

L	T/P	C
0	2	1

List of Experiments:

1. Measurement of pH, conductivity and turbidity.
2. Measurement of flow using orifice/electromagnetic/positive displacement/turbine/ rotameter flow meters.
3. Measurement of vibration on test bench.
4. Study and operation of a typical Pneumatic/Hydraulic control scheme.
5. Measurement of low pressure using Pirani gauge.
6. Introduction and application of LabVIEW for Industrial applications.
7. Measurement of Temperature (Thermistro/RTD/Thermocouple) using LabVIEW.
8. Measurement of speed using LabVIEW.
9. Measurement of Level using LabVIEW.
10. Measurement of flow (turbine flow meter) using LabVIEW.
11. Measurement of Pressure using LabVIEW.

NOTE:- At least 8 Experiments out of the list must be done in the semester.

MICROPROCESSORS AND MICROCONTROLLERS LAB

Paper Code: ETEC-355	L	T/P	C
Paper: Microprocessors and Microcontrollers Lab	0	2	1

List of Experiments:

1. Write a program to add and subtract two 16-bit numbers with/ without carry using 8086.
2. Write a program to multiply two 8 bit numbers by repetitive addition method using 8086.
3. Write a Program to generate Fibonacci series.
4. Write a Program to generate Factorial of a number.
5. Write a Program to read 16 bit Data from a port and display the same in another port.
6. Write a Program to generate a square wave using 8254.
7. Write a Program to generate a square wave of 10 kHz using Timer 1 in mode 1(using 8051).
8. Write a Program to transfer data from external ROM to internal (using 8051).
9. Design a Minor project using 8086 Micro processor (Ex: Traffic light controller/temperature controller etc)
10. Design a Minor project using 8051 Micro controller

NOTE: - At least 8 Experiments out of the list must be done in the semester.

DIGITAL SYSTEM DESIGN LAB**Paper Code: ETEC-351****Paper: Digital System Design Lab**

L	T/P	C
0	2	1

List of Experiments:

1. Design all gates using VHDL.
2. Write VHDL programs for the following circuits, check the wave forms and the hardware generated
 - i) half adder
 - ii) full adder
3. Write VHDL programs for the following circuits, check the wave forms and the hardware generated
 - i) multiplexer
 - ii) demultiplexer
4. Write VHDL programs for the following circuits, check the wave forms and the hardware generated
 - i) decoder
 - ii) encoder
5. Write a VHDL program for a comparator and check the wave forms and the hardware generated
6. Write a VHDL program for a code converter and check the wave forms and the hardware generated
7. Write a VHDL program for a FLIP-FLOP and check the wave forms and the hardware generated
8. Write a VHDL program for a counter and check the wave forms and the hardware generated
9. Write VHDL programs for the following circuits, check the wave forms and the hardware generated
 - i) ALU
 - ii) shift register

NOTE: - At least 8 Experiments out of the list must be done in the semester.

OBJECT ORIENTED PROGRAMMING USING JAVA LAB

Paper Code: ETIC-357	L	T/P	C
Paper: Object Oriented Programming Using Java Lab	0	2	1

List of Experiments:

To define a class describe its constructor, overload the constructor and instantiate its object.

1. Create a java program to implement stack and queue concept.
2. Write a java package to show dynamic polymorphism and interfaces.
3. Write a java program to show multithreaded producer and consumer application.
4. Create a customized exception and also make use of all the 5 exception keywords.
5. Convert the content of a given file into the uppercase content of the same file.
6. Develop an analog clock using applet.
7. Develop a scientific calculator using swings.
8. Create an editor like MS-word using swings.
9. Create a servlet that uses Cookies to store the number of times a user has visited your servlet.
10. Create a simple java bean having bound and constrained properties.

NOTE:- At least 8 Experiments out of the list must be done in the semester.

PNEUMATIC AND HYDRAULIC INSTRUMENTATION

Paper Code: ETIC-302

L T/P C

Paper: Pneumatic and Hydraulic Instrumentation

3 1 4

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 75

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from question no. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: The objective of the paper is to facilitate the students with the working and applications of a large class of pneumatic and hydraulic instruments used in various plants and industries.

UNIT - I

Introduction: Basic requirement for Pneumatic System, Servicing compressed air: Air compressors, air treatment stages, pressure regulation (FRL unit) Introduction to hydraulic system, comparison of pneumatic & hydraulic system.

[T1, T2] [No. of Hrs. 11]

UNIT - II

Pneumatic & hydraulic Actuators, cylinders valve positioner, piston & motor actuators, electro pneumatic actuators, cylinder lubrication, cylinder with sensors, hydraulic actuators, control valves types of control valves.

[T1, T2] [No. of Hrs. 11]

UNIT - III

Basic pneumatic circuits, Timing & sequence diagram: Cylinder sequencing hydraulic & pneumatic Accessories pneumatic telemetry systems: Pneumatic temperature & pressure transmitters their working and applications, electrical control in pneumatic circuit.

[T1, T2] [No. of Hrs. 11]

UNIT - IV

Pneumatic & Hydraulic Controllers (P,PI,PID), P&ID diagrams, converters : I/P,P/I, Pneumatic Relay, Pneumatic Sensors, Flapper nozzle assembly. Maintenance & troubleshooting of pneumatic & hydraulic systems. Introduction to Mechatronic Systems & their applications.

[T1, T2] [No. of Hrs. 11]

Text Books:

[T1] C. D. Johnson, "Process Control Instrumentation Technology", PHI, 2002

[T2] Andrew Parr, "Pneumatic & Hydraulic", PHI, 1999.

Reference Books:

[R1] D. Considine, "Process Industrial Instruments & Control Handbook", McGraw Hill, 1993.

[R2] B. G Liptak, "Instrument Engineers Handbook", Chilton Book Co.

[R3] S. R. Majumdar, "Pneumatic system", Tata McGraw-Hill Education

PROCESS CONTROL**Paper Code: ETIC-304****L T/P C****Paper: Process Control****3 1 4****INSTRUCTIONS TO PAPER SETTERS:
MARKS: 75****MAXIMUM**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from question no. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: To give students comprehension about the [architectures](#), [mechanisms](#) and [algorithms](#) for maintaining the output of a specific [process](#) within a desired range. To give students knowledge about various tuning methods of feedback controllers and multiloop controllers.

UNIT - I

Design Aspects of a process control system: Design Elements of a control system. Control aspects of a complete chemical plant, Development of a Mathematical model, Modelling considerations for control purposes, Dynamic Behavior of First order system, second order system and higher –order systems, introduction to Feedback control, Dynamic Behaviour of feedback-controlled processes, stability Analysis of feedback systems
[T1, T2][No. of Hours 11]

UNIT - II

Design of Feedback controllers: Design problems of controllers, Selection of type of feedback controller, time–Integral performance criterion, Process Reaction Curve and frequency response characteristic, Ziegler-Nichol Rule, effect of dead time, dead time compensator and inverse response compensator
[T1, T2][No. of Hours 11]

UNIT - III

Study of multiple loops controller: Cascade Control System, Selective control system, Split Range Control, Feed forward and Ratio control, Adaptive and Inferential control systems.
[T1, T2] [No. Of Hours 11]

UNIT – IV

Interaction & De-coupling of control loop: Interaction of control loops, relative gain array and selection of the loops. Design of non-interaction control loop, Multivariable model, Predictive control, Simple and multivariable dynamic matrix control loop.
[T1, T2][No. of Hours 11]

Text Books:

- [T1] B. Wayne Bequette, “Process Control Modeling Design and Simulation”, PHI, 2003
[T2] G. Stephanopoulos, “Chemical Process Control”, PHI, 1997.

Reference Books:

- [R1] B.G Liptak, “Instrumentation Engineers Handbook”, BH Publication, 1999
[R2] D.R. Coughanour, “Process system and analysis and control”, TMH
[R3] W.H. Ray, “Advanced Process Control”, Tata McGraw Hill

DIGITAL SIGNAL PROCESSING**Paper Code: ETEC-306****Paper: Digital Signal Processing**

L	T/P	C
3	1	4

INSTRUCTIONS TO PAPER SETTER:**MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks

Objectives: The aim of this course is to provide in depth knowledge of various digital signal processing techniques and design of digital filters, learn the concept of DFT FFT algorithms, and design of digital filters using different approximations, DSP processor and architecture. The prerequisites of this subject are basic knowledge of signal and systems.

UNIT-I

Frequency Domain Sampling: The Discrete Fourier Transform, Properties of the DFT, Linear filtering methods based of the DFT. [T1]

Efficient computation of the DFT: Principal Of FFT, Fast Fourier Transform Algorithms, Applications of FFT Algorithms, A linear filtering approach to computation of the DFT.
Application of DFT, Design of Notch filter

[T2,T1][No. of Hours: 11]**UNIT-II**

Design & Structure of IIR filters from Analog filters: Impulse Invariance; Bilinear transformation and its use in design of Butterworth and Chebyshev IIR Filters; Frequency transformation in Digital Domain, Direct, Cascade, Parallel & transposed structure [T1]

Design & structure of FIR filters: Symmetric and anti-symmetric FIR filters; Design of Linear Phase FIR filters using windows, Frequency Sampling Method of FIR design, Direct, Cascade, Frequency Sampling, transposed structure

[T2][No. of Hours: 11]**UNIT-III**

Implementation of Discrete Time Systems:

Lattice structures, Lattice and Lattice-Ladder Structures, Schur - Cohn stability Test for IIR filters; Discrete Hilbert Transform.

Linear predictive Coding:

Lattice filter design, Levenson Darwin Technique, Schur Algorithm

[T1,T2][No. of Hours: 10]**UNIT-IV**

Quantization Errors In Digital Signal Processing: Representation of numbers, Quantization of filter coefficients, Round-off Effects in digital filters.

Multirate Digital Signal Processing: Decimation, Interpolation, Sampling rate conversion by a rational factor; Frequency domain characterization of Interpolator and Decimator; Polyphase decomposition.

[T2][No. of Hours: 10]**Text Books:**

[T1] Oppenheim & Schafer, Digital Signal Processing, PHI-latest edition.

[T2] Proakis and Manolakis, Digital Signal Processing, PHI Publication

Reference Books:

[R1] S. K. Mitra, Digital Signal Processing, TMH edition 2006

[R2] Johny. R. Johnson, Introduction to Digital Signal Processing, PHI-latest edition

[R3] R.Babu ,Digital Signal Processing , Scitech Publication.

ANALYTICAL INSTRUMENTATION**Paper Code: ETIC-308****L T/P C****Paper: Analytical Instrumentation****3 1****4****INSTRUCTIONS TO PAPER SETTERS:****MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from question no. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: The objective of the paper is to facilitate the students with a large class of instruments used to analyze materials and to establish the composition.

UNIT- I

Fundamentals of Analytical Instruments: Elements of an analytical system, signal conditioning in analytical, performance requirements of analytical instruments, validation

Gas Chromatography: Theory of Chromatography, Construction and working of gas chromatography, gas-solid chromatography, Liquid Chromatography: types of liquid chromatography, high pressure liquid chromatography.

[T1, T2] [No. of Hrs. 11]**UNIT- II**

Mass Spectrometer: Introduction, types of mass spectrometers, components of mass spectrometers, Resolution, applications, gas chromatograph-mass spectrometer (GC-MS), liquid chromatograph-mass spectrometer.

Spectrometer: Raman spectrometer, photoacoustic and photothermal spectrometer, NMR spectrometer, ESR Spectrometer, Electron and ion spectrometer, X-ray spectrometer

[T1, T2] [No. of Hrs. 11]**UNIT- III**

Calorimeters and Spectrophotometers: Visible-Ultraviolet spectrophotometers, infrared photometers, Atomic absorption spectrophotometers, flame photometers.

pH meters: principle, electrodes for pH measurements, types of pH meters, Ion Analyzers, Industrial Gas Analyzers, Blood Gas Analyzers.

[T1, T2] [No. of Hrs. 11]**UNIT- IV :**

Environmental Pollution Monitoring Instruments: Air pollution monitoring instruments: Carbon Monoxide, Sulphur Dioxide, Nitrogen Oxides, Hydrocarbons, Water pollution monitoring instruments.

[T1, T2] [No. of Hrs. 11]**Text Books:**

[T1] R.S.Khandpur, "Handbook of Analytical Instruments", (18th reprint), Tata McGraw Hill Pub, New Delhi (2000).

[T2] D Patranbis, "Principles of Industrial Instrumentation", Tata McGraw Hill Pub., New Delhi (1991)

Reference Books:

[R1] E B Jones, "Instrument Technology" vol. II, Butterworths Scientific Publication, London (1985)

[R2] Gillan McMohon "Analytical Instrumentation: A Guide to Laboratory, Portable and Miniaturized Instruments", Wiley-Interscience Publisher, 2008

MODERN CONTROL SYSTEMS**Paper Code: ETIC-310****Paper: Modern Control Systems**

L	T/P	C
3	1	4

INSTRUCTIONS TO PAPER SETTERS:**MAXIMUM MARKS-75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Q. No.1 rest of the paper shall consist of four units as per the syllabus, every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Objective: To impart knowledge of state space, discrete systems, non-linear systems and adaptive control.

UNIT-I**State Space Analysis**

Introduction, state space representation of continuous LTI systems, transfer function and state variables, transfer matrix, EIGEN values and EIGEN vectors, Solution of State equations, controllability and observability, canonical forms (CCF, OCF, DCF, JCF).

[T1,T2] [No. of Hrs.10]**UNIT-II****Discrete System**

Introduction to discrete time systems, sampling process, Z-transform and inverse Z-transforms and hold circuits, presentation by difference equation and its solution, pulse transfer function, transient and steady state responses, Dead beat response, steady state error, Representation of discrete systems in state variable form and its solution, stability of digital control system, digital equivalent of conventional controller/compensator.

[T1,T2] [No. of Hrs.12]**UNIT – III****Non-Linear System**

Introduction, Non-linear system behaviour and different types of non-linearities, Describing function analysis, assumptions and definitions, DF of common non-linearities, Phase Plane Analysis, singular points, construction of phase portrait, phase plane analysis of linear/non-linear systems, existence of limit cycles, jump phenomenon, stability analysis.

[T1,T2] [No. of Hrs.10]**UNIT – IV****Lyapunov Theory and Adaptive Control**

Lyapunov direct method, positive definite functions and Lyapunov functions, existence of Lyapunov functions, Lyapunov analysis of LTI systems, variable gradient method, Krasvoskii method, performance analysis, Popov's stability criteria.

Introduction to basic approaches to adaptive control - Model reference adaptive control systems, self tuning regulators, Applications of adaptive control.

[T1,T2] [No. of Hrs.10]**Text Books:**

- [T1] Dorf-State Space Analysis, Modern Control System, Pearson 4th edition, 2002
 [T2] M. Gopal-Digital Control and State Variable Methods, TMH 4th Edition.

Reference Books:

- [R1] J. J. Stoline, Nonlinear Control System.
 [R2] Brian D.O.Adnerson & John B. Moore, Optimal Control
 [R3] R.C. Sukla – Control Systems, Dhanpat Rai & Co. (P) Ltd.
 [R4] Shastri & Badson, Adaptive Control, PHI
 [R5] S. Das Gupta, Control System Theory, Khanna Publications.

DATA COMMUNICATION AND NETWORKS**Paper Code: ETEC-310****Paper: Data Communication and Networks**

L	T/P	C
3	1	4

INSTRUCTIONS TO PAPER SETTERS:**MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from question no. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks

Objective: *To understand the basics of data communication and networking protocols.***UNIT I**

Data Communication: Introduction of Data Communication: Networks, Protocols and standards, Standards organizations, Line configurations, Topology, Transmission mode, Categories of networks, Network Models and Architecture ,Detailed Functions of the OSI layers. Multiplexing: TDM, FDM, WDM, Spread Spectrum Techniques, Transmission media: Guided and Unguided media, Transmission impairment, Performance issues.

[T1][R1][R4][No of Hours: 10]**UNIT II**

Error detection and correction: Types of errors detection, Vertical Redundancy Check (VRC), Longitudinal Redundancy Check (LRC), Cyclic Redundancy Check (CRC), Check sum, Error correction Mechanism. Data link control: Line discipline, Flow control, Error control. Data link protocols: Asynchronous protocols, Synchronous protocols, Character oriented protocols, Bit oriented protocols, Link access procedures, HDLC.

[T1][T2][R4][No of Hours: 12]**UNIT III**

Multiple Access Control: Channel assignment techniques, ALOHA, Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA ,Controlled Access (Polling, Token Passing), Channelization: TDMA, CDMA, FDMA 802.x Standards: 802.11 and 802.15(Adhoc Networks) SONET / SDH: Synchronous transport signals ,Physical configuration , SONET layers , Applications. Switching: Circuit switching, Packet switching, Message switching. Frame relay: Introduction as legacy networks. ATM: Design goals, ATM architecture, ATM layers, ATM applications , Quality of Service, ATM over X(SDH/SONET).

[T1][T2][R2][R4][No of Hours: 12]**UNIT IV**

Networking and internetworking devices: Repeaters , Bridges , Gateways and Other devices, Unicast and Multicast Routing, Virtual LANs Network layers: Addressing (IPV4, IPV6), Subnetting, Supernetting, Internetworking - Other protocols and network layers. TCP / IP protocol suite: Overview of TCP/IP.

[T1][R1][R3][No of Hours: 10]**Text Books:**

- [T1] Behrouz A.Forouzan, 'Data Communication and Networking', 5th Edition, Tata McGraw Hill, 2013
 [T2] Andrew Tannenbaum. S. 'Computer Networks', Pearson Education, 4th Edition, 2003

Reference Books:

- [R1] William Stallings, 'Data and Computer Communication', 8th Edition, Pearson Education, 2003
 [R2] Introduction to Data communications and Networking. Tomasi, Pearson Education

PNEUMATIC AND HYDRAULIC INSTRUMENTATION LAB

Paper Code: ETIC-352	L	T/P	C
Paper: Pneumatic and Hydraulic Instrumentation Lab	0	2	1

List of Experiments:

1. Operating single acting cylinder and double acting cylinder using 3/2 push button valve.
2. Operating double acting cylinder using 5/2 pilot operated valve.
3. Operating double acting hydraulic cylinder using hydraulic 4/3 and 4/2 valve.
4. Operating single and double acting cylinder using special purpose valve – Time delay valve, Quick exhaust
 - i) valve, Twin pressure valve, Check valve etc.
5. Write a program for sequencing of two cylinders using pneumatic components only.
6. Write a program for sequencing of two cylinders using electro pneumatic components.
7. Sequencing of multiple double acting piston cylinder arrangement using electro-pneumatic components.
8. PLC programming- Operate single acting cylinder and double acting cylinder using push button and direction
 - i) Control valve. Use push buttons in the AND, OR and Latching conditions.
9. Write a PLC program for to and fro motion of single acting cylinder and double acting cylinder automatically.
10. Write a PLC program for sequencing of three cylinders in following sequence
 1. A+B+C-A+B+C+ A- B+C+ A+B+C+
 2. A+ B-C- A+B+C- A+B+C+
 3. A+B+C- A+B-C- A- B-C-

NOTE:- At least 8 Experiments out of the list must be done in the semester.

PROCESS CONTROL LAB**Paper Code: ETIC-354****Paper: Process Control Lab**

L	T/P	C
0	2	1

List of Experiments:

1. To implement SILO Control using PLC.
2. To control the PH of reaction Vessel using PLC.
3. To Control the operation of Bottling plant using PLC.
4. To control a chemical process using PLC.
5. To control the operation of Washing Machine using PLC.
6. To implement cascade control using Process Control Trainer.
7. To study the operation of PID Control using Process control Trainer.
8. To implement feed forward control using Process Control Trainer.
9. To implement ON-OFF control using Process Control Trainer.
10. To study the characteristics of Control Valve using Process Control Trainer.

NOTE:- At least 8 Experiments out of the list must be done in the semester.

DIGITAL SIGNAL PROCESSING LAB**Paper Code: ETEC-356****Paper: Digital Signal Processing Lab**

L	T/P	C
0	2	1

List of Experiments:**Software Experiments:**

1. Generation of basic signals sine, cosine, ramp, step, impulse and exponential in continuous and discrete domains using user defined functions.
2. Write a MATLAB program to find convolution (linear/circular) and correlation of two discrete signals.
3. Perform linear convolution using circular convolution and vice versa.
4. Write a MATLAB program to
 - a. Find 8 point DFT, its magnitude and phase plot and inverse DFT.
 - b. Find 16 point DFT, its magnitude and phase plot and inverse DFT.
5. Perform the following properties of DFT-
 - a. Circular shift of a sequence.
 - b. Circular fold of a sequence.
6. Write a MATLAB Program to design FIR Low pass filter using
 - a. Rectangular window
 - b. Hanning window
 - c. Hamming window
 - d. Bartlett window
7. Write a MATLAB program to
 - a. Implement a Low pass / High pass / Band pass / Band stop IIR Filter using Butterworth Approximation.
 - b. Implement a Low pass / High pass / Band pass / Band stop IIR Filter using Chebyshev Approximation.

Hardware Experiments using Texas Instruments Kits-DSK 6713:

8. Introduction to Code composer Studio.
9. Write a program to generate a sine wave and see the output on CRO
10. Write a Program to Generate ECHO to give audio file.
11. Write a program to demonstrate Band Stop filter by FIR.

Additional Experiments:

12. Write a program to generate a cos wave and see the output on CRO
13. Write a program to blink the LED
14. Write a program to display a string on LCD.

NOTE:- At least 8 Experiments out of the list must be done in the semester.

MODERN CONTROL SYSTEMS LAB**Paper Code: ETIC-358****Paper: Modern Control Systems Lab**

L	T/P	C
0	2	1

List of Experiments:

1. Study of open loop and closed loop time/ frequency responses of first/second order LTI system
2. Conversion of transfer functions to state model of LTI system and vice versa
3. Determine State Space Model of a given system and determine its controllability and observability.
4. Analysis of Zero order hold and first order hold circuits.
5. Conversion of transfer functions to state model of discrete time system.
6. To determine state transition matrix of a given system.
7. Study of saturation and dead zone non-linearity using describing function technique of a relay control system.
8. To draw phase trajectory of a given non-linear system.
9. Experiments based on PLC applications e.g. Lift control models, pick and place module etc.
10. Study of operation of a stepper motor interface with microprocessor.

NOTE:- At least 8 Experiments out of the list must be done in the semester.

DATA COMMUNICATION AND NETWORKS LAB**Paper Code: ETEC-358****L T/P C****Paper: Data Communication and Networks Lab****0 2 1****List of Experiments:**

1. Introduction to Computer Network laboratory
Introduction to Discrete Event Simulation
Discrete Event Simulation Tools - ns2/ns3, Omnet++
2. Using Free Open Source Software tools for network simulation – I Preliminary usage of the tool ns3
Simulate telnet and ftp between N sources - N sinks (N = 1, 2, 3). Evaluate the effect of increasing data rate on congestion.
3. Using Free Open Source Software tools for network simulation - II
Advanced usage of the tool ns3
Simulating the effect of queuing disciplines on network performance - Random Early Detection/Weighted RED / Adaptive RED (This can be used as a lead up to DiffServ / IntServ later).
4. Using Free Open Source Software tools for network simulation - III
Advanced usage of the tool ns3 Simulate http, ftp and DBMS access in networks
5. Using Free Open Source Software tools for network simulation - IV
Advanced usage of the tool ns3
Effect of VLAN on network performance - multiple VLANs and single router.
6. Using Free Open Source Software tools for network simulation - IV
Advanced usage of the tool ns3
Effect of VLAN on network performance - multiple VLANs with separate multiple routers.
7. Using Free Open Source Software tools for network simulation - V
Advanced usage of the tool ns3
Simulating the effect of DiffServ / IntServ in routers on throughput enhancement.
8. Using Free Open Source Software tools for network simulation - VI
Advanced usage of the tool ns3
Simulating the performance of wireless networks
9. Case Study I : Evaluating the effect of Network Components on Network Performance
To Design and Implement LAN With Various Topologies and To Evaluate Network Performance Parameters for DBMS etc)
10. Case Study II : Evaluating the effect of Network Components on Network Performance
To Design and Implement LAN Using Switch/Hub/Router and Interconnecting Devices For Two Different LANs and To Evaluate Network Performance Parameters.
11. Mini project - one experiment to be styled as a project of duration 4 weeks (the last month)

NOTE:- At least 8 Experiments out of the list must be done in the semester.

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