Dr. V. P. Shetkari Shikshan Mandal’s

**Padmabhooshan Vasantraodada Patil**

 **Institute of Technology**,

Budhgaon – 416304.

 STUDENTS INFORMARTION MANUAL

(TY PART-I)



 **Department of Electronics & Telecommunication**

**Engineering**

 Name of Student: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Roll Number: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Exam Number: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Academic Year: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Mobile Number: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

E-mail ID: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Academic Year: 2022-23

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 **Vision of the Institute**

To become a leading institute in providing high quality technical and engineering education to the aspirants and serve the industry and society through excellent educational programmers, creativity and research.

 **Mission of the Institute**

* To meet the short and long term engineering man power needs for social, techno-economical development of region and nation, through teaching, research, consultancy and service.
* To contribute advancing of knowledge and wisdom in science and technology for the human welfare.
* To cultivate skills, lifestyle and habits of lifelong learning to adopt knowledge based global civilization.
* To create highest standards of education with noble values of ethics, morality, integrity and humanity.

 **Quality Policy**

* Institution quality policy is based on the following principles
* To develop and maintain, state of art education practices.
* To give every possible facility to students, faculties & Staff so that they can deliver the best.
* To provide secular, disciplined, caring environment for all learners.
* To be the forefront of the education to satisfy the local, national & global needs.

**Institute Information**

 Dr. V. P. S. S. M.’s Padmabhooshan Vasantraodada Patil Institute of Technology, Budhgaon is one of the esteemed technical institutes in western Maharashtra was established in the year 1983 which is affiliated to Shivaji University, Kolhapur, D.T.E. Govt. of Maharashtra and is approved by A.I.C.T.E., New Delhi.

The institute offers:

* Ten Under Graduate (U.G.) programmes leading to Bachelor’s degree in Engineering (B. Tech.)
* Five Post Graduate (P.G) programmes leading to Master degree in Technology (M.Tech.)

**Undergraduate Programme**

|  |  |
| --- | --- |
| **Branch** | **Intake** |
| Mechanical Engineering  | 60 |
| Civil Engineering | 120 |
| Electrical and Computer Engineering | 60 |
| Electronics & Telecommunication Engineering  | 60 |
| Electronics and Computer Engineering | 60 |
| Computer Science and Engineering (Artificial Intelligence and Data Science) | 60 |
| Computer Science and Engineering | 60 |
| Instrumentation and Control Engineering | 30 |
| Mechatronics | 60 |
| Chemical Engineering | 60 |

**Post Graduate Programme**

|  |  |
| --- | --- |
| **Branch** | **Intake** |
| Electronics & Telecommunication Engineering | 12 |
| Civil(Structure ) Engineering | 18 |
| Electrical Engineering | 24 |
| Mechanical(Design) Engineering | 12 |
| Mechanical(Heat Power) Engineering | 12 |

**Department of Electronics & Telecommunication Engineering**

The Department of Electronics & Telecommunication was established in the year 1985 with a sanctioned intake of 30 increased to 60 in the academic year 1999-2000. The department has a good intermingle of experienced, young & dynamic faculty which works as a team to strengthen the department. The department has produced about 1000 graduates so far out of which about 70% are having good positions in the reputed organizations.

 **Vision of the Department**

To prepare students for understanding of recent technology in the field of Electronics and Telecommunication and facilitate them to acquire necessary skills to serve industry and society.

**Mission of the Department**

* To provide necessary infrastructure and academic support to the aspirants.
* To motivate the students for higher education and upgradation of skills.
* To provide quality education to introduce recent advances in the field of Electronics and Telecommunication Engineering.

 **Programme Educational Objectives (PEO’s)**

* To imbibe skills necessary to engage in lifelong learning for successful career in Industry & Higher education.
* To enable student to analyze and solve Electronics and Telecommunication Engineering problems by applying basic concepts of mathematics, science, and modern engineering techniques.
* To train the students to innovate, design and develop systems with advanced knowledge of digital, analog electronics and programming concepts.
* To prepare students with professional ethics, soft skills, social response-bilities and develop leadership qualities and work in multidisciplinary environments.

**Program Educational Objectives (PEOs)**

1. Inculcate the habit of lifelong learning for successful career in Industry & Higher Education.
2. Prepare Graduates to analyze and solve Electronics and Telecommunication Engineering problems by applying basic principles of mathematics, science, and modern engineering tools.
3. Apply skills for researchand innovation using state-of-the-art technologies for continuous improvement.
4. Prepare graduates to be sensitive to ethical, societal and environmental issues while engaging in their professional duties, and develop leadership qualities in multidisciplinary environments.

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**Program outcomes (POs)**

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| **a** | **PO1** | **Engineering knowledge:**Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problem. |
| **b** | **PO2** | **Problem analysis:**Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences. |
| **c** | **PO3** | **Design and development of solutions:**Design solution for complex engineering problems and design system components or processes that meet the specified needs with appropriate considerations for public health and safety and the cultural, societal and environmental considerations.  |
| **e** | **PO4** | **Conduct investigation of complex problems:** Use research based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusion. |
| **k** | **PO5** | **Modern tool usage:** Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with understanding of limitations. |
| **c** | **PO6** | **The engineer and society:** Apply reasoning, informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and consequent responsibilities relevant to the professional engineering practice. |
| **h** | **PO7** | **Environment and sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development. |
| **f** | **PO8** | **Ethics:**Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. |
| **d** | **PO9** | **Individual and Teamwork:** Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings. |
| **g** | **PO10** | **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions. |
| **j** | **PO11** | **Project management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and multidisciplinary environment. |
| **i** | **PO12** | **Lifelong learning:** Recognize the need for, and have the preparations and ability to engage in independent and lifelong learning in the broadest context of technological change. |
| **l** | **PSO1** | An ability to develop ideas and project which will cater the professional and competitive needs in electronics and telecommunication engineering. |
|  | **PSO2** | Graduates will be able to use techniques and skills to design, analyze and simulate electronics and telecommunication components and systems for societal needs. |

**Short Term Goals**

* Arranging expert/guest lecturers for the students.
* Arranging training programmers/workshops for the students.
* Arranging aptitude tests, workshops, project competition, quiz contests for students.
* Maintain team spirit in the department

**Long Term Goals**

* Strengthening the Training & Placement activities.
* Increasing the interaction of the department with outside world.
* Develop the research culture in the department.

**Students Role**

As our society/ nation grows & becomes technologically more strong / complex, it needs more trained Engineers. Students can contribute to this professional growth by playing an effective & disciplined role during their studies.

**Responsibilities**

1. Punctuality, 100% Attendance & Active participation in All Academic Activities
2. Self Discipline & good relations with other students, teaching & support staff.
3. Positive attitude, motivation and technical thinking.
4. Participation in Co-Curricular & Extra-Curricular activities.
5. Always carrying Identity Card & following the College Dress Code.
6. Pursuing all-round personality development with good generic skills.

7. Following the Code-of-Conduct by the Department, Institute & University.

 **Code-of-Conduct**

1. Coming late to Lectures/Practical’s, common off, leave without permission is serious offence.
2. Roaming in the campus during academic work or disturbing the campus activities through shouting/ misconduct is not permitted.
3. Use of personal unauthorized electronic gadgets in department premises is objectionable.
4. Attendance less than 75% will lead to semester defaulter & make you ineligible for Exams.
5. Any form of violence, ragging, use of tobacco, alcohol or drugs on campus are serious offences punishable with rustication from the institute &/ legal action.



Notes -

**Activity Record**

**(Counseling, Co/Extra Curricular, Leave)**

**Counseling Staff Name**

|  |  |  |
| --- | --- | --- |
| **Date** | **Topic** | **Suggestion** |
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**Co/Extra Curricular Activities**

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| --- | --- | --- | --- |
| **Date** | **Activity Name** | **Participation level** | **Outcome** |
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**Leave Record**

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| **Sr. No.** | **From** | **To** | **Reason** | **Permitting Staff** | **Remark** |
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**Laboratory and Classroom Instructions**

**Laboratory Instructions**

# Handle all electronics Devices /equipments carefully

# Follow safety procedures & avoid damage to self and equipment

# Inform to respective faculty before beginning your experiment

# Help to conserve energy, Switch off the equipments tubes & fans before leaving the laboratory

# Inform the lab assistant or lab in-charge when any fault arises during the performance of an experiment

# Report any not working equipment to the lab instructor; don’t open/ remove the cover/ attempt to repair any equipment.

* Do not move the instruments from one laboratory to another, without permission.

**Classroom Instructions**

* Maintain silence in class rooms.
* Don’t write anything on seating bench and walls of classroom.
* Keep your mobiles switched off.
* Attend classes regularly and be punctual for your classes.
* Your reason of absence should be timely informed to your class teacher with written application.
* Help to conserve energy, Switch off fans and tubes before leaving the classroom.
* Keep Classroom Clean.

**Curriculum Structure**



**TIMETABLE**

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Sr. No.** | **Time** | **MONDAY** | **TUESDAY** | **WEDNESDAY** | **THURSDAY** | **FRIDAY** | **SATURDAY** |
| **1** | **10.00 am TO 11.00 am** | EMF (DOS) | DSP (AGP) | T1- Mi.Pr. (CMP)T2- Mi.Pr. (DOS)T3- DSP (RSM)T4- AC (/SSS) | CS (SVP) | DSP (AGP) |  |
| **2** | **11.00 am TO 12.00 noon** | CS (SVP) | AC (/RPO) | DSP (AGP) | EMF (DOS) |
| **12.00 TO 12.45 pm LUNCH BREAK** |
| **3** | **12.45 pm TO 01.45 pm** | T1- DSP (AGP)T2- AC (SVP)T3- Mi.Pr. (RSM)T4- Mi.Pr. (DOS) | DSD (BPK) | AC (/RPO) | T1- AC (/RPO)T2- Mi.Pr. (CMP)T3- Mi.Pr. (DOS)T4- DSP (AGP) | DSD (BPK) |  |
| **4** | **01.45 pm TO 02.45 pm** | CS (SVP) | EMF (DOS) | T2- DSD (BPK)(T)T3- AC (/SSS)(T) |
| **02.45 pm TO 03.00 pm TEA BREAK** |
| **5** | **03.00 pm TO 04.00 pm** | AC (/RPO) | T1- Mi.Pr. (DOS)T2- DSP (AGP)T3- AC (/SSS)T4- Mi.Pr. (RSM) | DSD (BPK) | T1- DSP (AGP)(T)T3- DSD (BPK)(T)T4- CS (SVP)(T) | T1- DSD (RSM)(T)T2- CS (SVP)(T)T4- EMF (DOS)(T) |  |
| **6** | **04.00 pm TO 05.00 pm** | T1- EMF (DOS)(T)T2- DSP (AGP)(T)T3- CS (SVP)(T)T4- AC (/SSS)(T) | T1- AC (/SSS)(T)T2- EMF (DOS)(T)T3- DSP (RSM)(T)T4- DSD (BPK)(T) | T1- CS (SVP)(T)T3- EMF (DOS)(T)T4- DSP (AGP)(T) | T2- AC (SVP)(T) |

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**BTETC501 Electromagnetic Field Theory 4 Credits**

***Course Objectives:***

1. Learners can be able to explore their knowledge in the area of EM Waves and its analysis.

2. To learn basic coordinate system, significance of divergence, gradient, curl and its applications to EM Waves.

3. To understand the boundary conditions for different materials/surfaces.

 4. To get insight on finding solution for non-regular geometrical bodies using Finite Element Method, Method of Moments, Finite Difference Time Domain.

5. To get the basics of microwave, transmission lines and antenna parameters.

6. Students get acquainted with different physical laws and theorems and provide basic platform for upcoming communication technologies

***Course Outcomes:***

1. Understand characteristics and wave propagation on high frequency transmission lines

2. Carryout impedance transformation on TL

 3. Use sections of transmission line sections for realizing circuit elements

4. Characterize uniform plane wave

5. Calculate reflection and transmission of waves at media interface

6. Analyze wave propagation on metallic waveguides in modal form

7. Understand principle of radiation and radiation characteristics of an antenna

UNIT – 1 Mathematical Fundamentals and Static Electric Fields: 07 Hours

Introduction, Vector Analysis, Coordinate systems and Transformations, Line, surface and volume integrals, Divergence Theorem, Stoke's theorem, Columb's Law, Electric Field, Electric flux density, Gauss's Law with Application, Electrostatic Potential and Equipotential Surfaces, Boundary conditions for Electrostatic fields, Capacitance and Capacitors, Electrostatic Energy and Energy Density.

UNIT – 2 Steady Electric Currents and Static Magnetic Fields: 07 Hours

Current Density and Ohm's Law, Electromotive force and Kirchhoff's Voltage Law, Continuity Equation and Kirchhoff‟s Current Law, Power Dissipation and Joule's Law, Biot-Savart Law and its Application, Ampere's Circuital Law and its Application, Magnetic Flux Density, Magnetic Scalar and Vector Potentials, Boundary Condition Magnetic Fields, Inductance and Inductor, Energy stored in Magnetic Field.

UNIT – 3 Time Varying Field &Maxwell's Equations: 07 Hours

Introduction, Faraday's Law of electromagnetic Induction, Maxwell's Equation, Boundary Conditions for Electromagnetic fields, Time Harmonic Fields

UNIT – 4 Transmission Lines: 07 Hours

Equations of Voltage and Current on TX line, Propagation constant and characteristic impedance, and reflection coefficient and VSWR, Impedance Transformation on Loss-less and Low loss Transmission line, Power transfer on TX line, Smith Chart, Admittance Smith Chart, Applications of transmission lines: Impedance Matching, use transmission line sections as circuit elements.

UNIT – 5 Electromagnetic Waves: 07 Hours

Maxwell Equations in phasor form, Wave Equation, Uniform Plane wave in Homogeneous, free space, dielectric, conducting medium. Polarization: Linear, circular & Elliptical polarization, unpolarized wave. Reflection of plane waves, Normal incidence, oblique incidence, Electromagnetic Power and Poynting theorem and vector.

*Text Books /Reference Books:*

*1. R.K. Shevgaonkar, Electromagnetic Waves, Tata McGraw Hill India,2005*

*2. E.C. Jordan & K.G. Balmain, Electromagnetic waves & Radiating Systems, Prentice Hall, India*

*3. Narayana Rao, N: Engineering Electromagnetics, 3rd ed., Prentice Hall,1997.*

*4. David Cheng, “Electromagnetics”, PrenticeHall.*

*5. Sadiku, "Elements of Electromagnetics",Oxford.*

*6. Krauss, "Electromagnetics", McGraw Hill, New York, 4th edition.*

*7. W. H. Hayt, "Engineering Electromagnetics", McGraw Hill, New Delhi,1999.*

*8. Edminister, Schaum series, "Electromagnetics", McGraw Hill, New York, 1993, 2nd edition.*

*9. Sarvate, "Electromagnetism", WileyEastern.*

**BTETC502 Digital Signal Processing 4 Credits**

***Course Objectives:***

1. To introduce students with transforms for analysis of discrete time signals and systems.

2. To understand the digital signal processing, sampling and aliasing.

 3. To use and understand implementation of digital filters.

4. To understand concept of sampling rate conversion and DSP processor architecture

***Course Outcomes:***

1. Understand use of different transforms and analyze the discrete time signals and systems.

2. Realize the use of LTI filters for filtering different real-world signals.

3. Capable of calibrating and resolving different frequencies existing in any signal.

4. Design and implement multistage sampling rate converter.

5. Design of different types of digital filters for various applications.

UNIT – 1 DSP Preliminaries: 07 Hours

Discrete time signals: Sequences; representation of signals on orthogonal basis; Sampling and reconstruction of signals, Basic elements of DSP and its requirements, advantages of Digital over Analog signal processing.

UNIT – 2 Discrete Fourier Transform: 07 Hours

DTFT, Definition, Frequency domain sampling, DFT, Properties of DFT, circular convolution, linear convolution, Computation of linear convolution using circular convolution, FFT, decimation in time and decimation in frequency using Radix-2 FFT algorithm

UNIT – 3 Z transform: 07 Hours

Need for transform, relation between Laplace transform and Z transform, between Fourier transform and Z transform, Properties of ROC and properties of Z transform, Relation between pole locations and time domain behavior, causality and stability considerations for LTI systems, Inverse Z transform, Power series method, partial fraction expansion method, Solution of difference equations.

UNIT – 4 IIR Filter Design: 07 Hours

Concept of analog filter design (required for digital filter design), Design of IIR filters from analog filters, IIR filter design by impulse invariance method, Bilinear transformation method. Characteristics of Butterworth filters, Chebyshev filters, Butterworth filter design, IIR filter realization using direct form, cascade form and parallel form, Lowpass, High pass, Bandpass and Bandstop filters design using spectral transformation (Design of all filters using Low pass filter)

UNIT – 5 FIR Filter Design and introduction to MDSP: 07 Hours

Ideal filter requirements, Gibbs phenomenon, windowing techniques, characteristics and comparison of different window functions, Design of linear phase FIR filter using windows and frequency sampling method. FIR filters realization using direct form, cascade form and lattice form. Introduction to Multirate signal processing: Concept of Multirate DSP, Introduction to Up sampler, Down sampler and two channel filter banks, Application of Multirate signal processing in communication, Music processing, Image processing and Radar signal processing.

***TEXT/REFERENCE BOOKS:***

*1. S. K. Mitra, Digital Signal Processing: A computer-based approach,TMH*

*2. A.V. Oppenheim and Schafer, Discrete Time Signal Processing, Prentice Hall,1989. 3. John G. Proakis and D.G. Manolakis, Digital Signal Processing: Principles, Algorithms and Applications, Prentice Hall,1997.*

 *4. L. R. Rabiner and B. Gold, Theory and Application of Digital Signal Processing, Prentice Hall,1992.*

*5. J. R. Johnson, Introduction to Digital Signal Processing, Prentice Hall,1992.*

*6. D. J. DeFatta, J. G. Lucas and W. S. Hodgkiss, Digital Signal Processing, John Wiley& Sons, 1988.*

**NOTES**

BTETC503 Analog Communication 4 Credits

***Course Objectives:***

1. To introduce the concepts of analog communication systems.

2. To equip students with various issues related to analog communication such as modulation, demodulation, transmitters and receivers and noise performance.

3. To understand the concepts of modulation and demodulation techniques of angle modulation (frequency and phase)

***Course Outcomes:***

1. Understand and identify the fundamental concepts and various components of analog communication systems.

2. Understand the concepts of modulation and demodulationtechniques.

3. Design circuits to generate modulated and demodulated wave.

4. Equip students with various issues related to analog communication such as modulation, demodulation, transmitters and receivers and noiseperformance.

5. Understand the concepts of modulation and demodulation techniques of angle modulation (frequency and phase).

6. Explain signal to noise ratio, noise figure and noise temperature for single and cascaded stages in a communication system.

7. Develop the ability to compare and contrast the strengths and weaknesses of various communication systems.

UNIT – 1 Introduction to Communication System 07 Hours

Block schematic of communication system, Simplex and duplex systems, Modes of communication: Broadcast and point to point communication, Necessity of modulation, Classification of modulation, sampling theorem and pulse analog modulation, multiplexing: TDM, FDM.

UNIT – 2 Amplitude Modulation 07 Hours

Introduction, Mathematical analysis and expression for AM, Modulation index, Frequency spectrum and bandwidth of AM, Power calculations, Generation of AM using nonlinear property, Low and high level modulation, Balance Modulator. Types of AM: DSB-FC, DSB-SC, SSB-SC, ISB and VSB, their generation methods and comparison.

UNIT – 3 Angle Modulation 07 Hours

Introduction, Mathematical analysis of FM and PM, Modulation index for FM and PM, Frequency spectrum and bandwidth of FM, Narrow band and wide band FM, Direct and indirect methods of FM generation, Pre emphasis and de-emphasis, Comparison of AM, FM and PM.

 UNIT – 4 Radio Receivers and Demodulators 07 Hours

Introduction, Performances characteristic of receivers: Sensitivity, Selectivity, Fidelity, Image frequency and IFRR, Tracking and Double spotting, TRF, Super heterodyne receivers, RF amplifier, Local oscillator and mixer, IF amplifier, AGC.

UNIT – 5 AM and FM Detectors and noise 07 Hours

AM Detectors: Envelop detector and practical diode detector. FM Detectors: Slope detector, phase discriminator and ratio detector. Noise: Introduction, Sources of noise, Classification of noise, Noise calculations (thermal noise), SNR, Noise figure, Noise Factor, Noise Temperature.

 *TEXT/REFERENCE BOOKS:*

*1. Kennedy, "Electronics Communications Systems", McGraw-Hill New Delhi-1997, 4th Edition.*

*2. Anokh Singh, "Principles of communication engineering"S.Chand*

*3. Roddy&Coolen, "Electronic communication"PHI*

 *4. Taub & Schilling "Principles of communication systems" Tata Mc GrawHill*

*5. Beasley & Miller, "Modern Electronic Communication", Prentice-Hall India-2006, 8th Edition.*

*6. Wayne Tomasi, "Electronic Communication Systems", Pearson Education-2005, 5th Edition.*

*7. R. G. Gupta, "Audio & Video Systems" Tata McGraw-Hill NewDelhi-2008.*

**NOTES**

BTETPE504C Digital System Design 4 Credits

***Course Objectives:***

1. The concept and theory of digital Electronics are needed in almost all electronics and telecommunication engineering fields and in many other engineering and scientific disciplines as well.

2. The main objective of this course is to lay the foundation for further studies in areas such as communication, VLSI, computer, microprocessor etc. One of the most important reasons for the unprecedented growth of digital electronics is the advent of integrated circuit.

3. This course will explore the basic concepts of digital electronics.

***Course Outcomes:***

1. Design and analyze combinational logic circuits

 2. Design & analyze modular combinational circuits with MUX/DEMUX, Decoder, Encoder

3. Design & analyze synchronous sequential logic circuits

4. Use HDL & appropriate EDA tools for digital logic design and simulation.

UNIT – 1 Introduction to VHDL: 07 Hours

Introduction to VHDL, design units, data objects, signal drivers, inertial and transport delays, delta delay, and VHDL data types, concurrent and sequential statements.

UNIT –2 Subprograms: 07 Hours

Subprograms – Functions, Procedures, attributes, generio, generate, package, IEEE standard logic library, file I/O, test bench, component declaration, instantiation, configuration.

UNIT – 3 Combinational logic circuit design and VHDL implementation: 07 Hours

Combinational logic circuit design and VHDL implementation of following circuits – first adder, Subtractor, decoder, encoder, multiplexer, ALU, barrel shifter, multiplier, divider

UNIT – 4 Synchronous sequential circuits design: 07 Hours

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).

UNIT – 5 Asynchronous sequential circuit designs: 07 Hours

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

*TEXT/REFERENCE BOOKS:*

*1. R.P. Jain, “Modern digital Electronics”, Tata McGraw Hill, 4th edition,2009.*

*2. Douglas Perry, “VHDL”, Tata McGraw Hill, 4th edition,2002.*

*3. W.H. Gothmann, “Digital Electronics- An introduction to theory and practice”, PHI,2nd edition, 2006.*

*4. D.V. Hall, “ Digital Circuits and Systems” , Tata McGraw Hill,1989*

 *5. Charles Roth, “Digital System Design using VHDL”, Tata McGraw Hill 2nd edition 2012.*

*6. Bhasker J, “VHDL Primer” Prentice-Hall of India Pvt. Ltd 3rdEdition*

BTETOE505A Control System Engineering 4 Credits

***Course Objectives:***

1. To introduce the elements of control system and their modeling using various Techniques.

2. To introduce methods for analyzing the time response, the frequency response and the stability of systems.

3. To introduce the concept of root locus, Bode plots, Nyquist plots.

4. To introduce the state variable analysis method.

5. To introduce concepts of PID controllers and digital and control systems. 6. To introduce concepts programmable logic controller.

***Course Outcomes:***

1. Understand the modeling of linear-time-invariant systems using transfer function and statespace representations.

2. Understand the concept of stability and its assessment for linear-time invariant systems.

3. Design simple feedback controllers.

UNIT – 1 Introduction to control problem: 07 Hours

Industrial Control examples, Mathematical models of physical systems, Control hardware and their models, Transfer function models of linear time-invariant systems. Feedback Control: Open-Loop and Closed-loop systems. Benefits of Feedback, Block diagram reduction techniques, Signal flow graph analysis.

UNIT – 2 Time Response Analysis and Stability Analysis: 07 Hours

Standard test signals, Time response of first and second order systems for standard test inputs. Application of initial and final value theorem, Design specifications for second-order systems based on thetime-response. Concept of Stability, Routh-Hurwitz Criteria, Relative Stability analysis, Root-Locus technique. Construction of Root-loci, Dominant Poles, Application of Root Locus Diagram.

UNIT – 3 Frequency-response analysis: 07 Hours

Relationship between time and frequency response, Polar plots, Bode plots. Nyquist stability criterion, Relative stability using Nyquist criterion – gain and phase margin. Closed-loop frequency response.

UNIT – 4 Introduction to Controller Design: 07 Hours

Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems, Application of Proportional, Integral and Derivative Controllers, Designing of Lag and Lead Compensator using Root Locus and BodePlot.

UNIT – 5 State variable Analysis: 07 Hours

Concepts of state variables, State space model. Diagonalization of State Matrix, Solution of state equations, Eigenvalues and Stability Analysis, Concept of controllability and observability, Poleplacement by state feedback, Discrete-time systems, Difference Equations, State-space models of linear discrete-time systems. Stability of linear discrete- timesystems.

*TEXT/REFERENCE BOOKS:*

*1. N. J. Nagrath and M. Gopal, “Control System Engineering”, New Age International Publishers, 5th Edition,2009.*

*2. Benjamin C. Kuo, “Automatic control systems”, Prentice Hall of India, 7thEdition,1995.*

*3. M. Gopal, “Control System – Principles and Design”, Tata McGraw Hill, 4th Edition, 2012.*

*4. Schaum‟sOutlineSeries,“FeedbackandControlSystems”TataMcGraw-Hill,2007.*

*5. John J. D‟Azzo& Constantine H. Houpis, “Linear Control System Analysis andDesign”, Tata McGraw-Hill, Inc.,1995.*

*6. Richard C. Dorf and Robert H. Bishop, “Modern Control Systems”, Addison – Wesley, 1999.*