SYLLABUS FOR

INTEGRATED MASTER OF SCIENCE IN ELECTRONICS, COMPUTERAND INSTRUMENTATION [M.Sc.(ECI)]

A Five-year Degree Course

SAURASHTRA UNIVERSITY
RAJKOT

(Effective from June2018)

DepartmentofElectronics
SaurashtraUniversityCampus
Rajkot-360005
PhoneNo.0281-2579006/7

www.saurashtrauniversity.edu

SEMESTER V	**(24 Credits)**
Paper 17: Basic concepts of control system	**(4 Credits)**
Paper 18: Fundamental of Computer Hardware	**(4 Credits)**
Paper 19: Advance Instrumentation	**(4 Credits)**
Paper 20: Microprocessor and Microcontroller	**(4 Credits)**
Practicals	**(8 Credits)**

SEMESTER VI	**(24 Credits)**
Paper 21: Fiber Optics	**(4 Credits)**
Paper 22: Advance concepts of Control System	**(4 Credits)**
Paper 23: Basic programmable controllers	**(4 Credits)**
Paper 24: Computer Aided Designing	**(4 Credits)**
Practicals	**(8 Credits)**

SEMESTER V

Paper 17:Basic Concepts of Control system

Credit :4
Total marks: 100 (70 external+ 30 internal)
Total hours required:60 Hrs.

Unit 1: Introduction to Control Systems and the Laplace Transform

Introduction, Examples of Control Systems, Closed-Loop Control Versus Open-Loop Control, Design of Control Systems.

Review of Complex Variables and Complex Functions, Laplace Transformation, Laplace Transform Theorems, Inverse Laplace Transformation, Partial-Fraction Expansion with MATLAB, Solving Linear, Time-Invariant, Differential Equations, Example Problems and Solutions

Unit 2: Mathematical Modeling of Dynamic Systems

Introduction, Transfer Function and Impulse-Response Function, Block Diagrams, Modeling in State Space, State-Space Representation of Dynamic Systems, Mechanical Systems, Electrical Systems, Liquid-Level Systems, Thermal Systems, Linearization of Nonlinear Mathematical Models, Example Problems and Solutions

Unit 3: Transient-Response Analysis

Introduction, First-Order Systems, Second-Order Systems, Transient-Response Analysis with MATLAB, An Example Problem Solved with MATLAB, Example Problems and Solutions, Problems

Unit 4: Basic Control Actions and Response of Control Systems

Introduction, Basic control actions, Effects of integral and derivative control actions on system performance, Higher order systems, Routh's stability criterion, Pneumatic controllers, Hydraulic controllers, Electronic controllers, Phase lead and phase lag in sinusoidal response, Steady state errors in unity feedback control systems, Example problems and solutions

Recommended-Book:

1. "Modern Control Engineering (3rd Edition)" by Katsuhiko Ogata. Publication: Prentice-Hall India.

Reference-Book:

1. "Control System Engineering" by Bhattacharya, Pearson Education.
2. "Control Systems: Principles and Design" by Madan Gopal, TMH.
3. "Automatic Control Systems" by Kuo, PHI Publication.
4. "Control Engineering: Theory and Practice" by Bandopadhaya, PHI.
5. "Control System Design" by Goodwin, Salgado, PHI Publication

Paper 18:fundamental ofcomputerhardware

Credit :4
Total marks:100 (70 external+ 30 internal)
Total hours required:60Hrs.

Unit 1: TheVisiblePCandmicroprocessor
TheVisiblePC
HowthePC Works:Input, Processing, Output, Storage, TheArt ofthePCTechnician
EssentialToolsoftheTradeandESDAvoidance:ToolsoftheTrade,AvoidingElectrostatic Discharge, Results ofElectrostaticDischarge, Anti-staticTools
RecognizetheMajorComponentsofaPC:CPU,RAM,Motherboard,Case,PowerSupply, FloppyDrive, Hard Drive, and CD-ROM Drive
Connectors:DBConnectors,DINConnectors,CentronicsConnectors,RJConnectors,BNC Connectors, Audio Connectors, USBConnectors,FireWireConnectors
AllKinds ofConnectors: Sound Cards, Video Cards, Network Cards, Keyboard, Mouse, Modem, Printer, Joystick
Microprocessors
CPUCoreComponents:TheManintheBox,ExternalDataBus,Registers,Clock,Backtothe External DataBus
Memory: MemoryStorageOptions, RAM: Random Access Memory,Address Bus
ModernCPUs:Manufacturers,CPUPackages,ThePentiumCPU:TheEarlyYears,Pentium Pro,Later Pentium-ClassCPUs,PentiumII,PentiumIII,EarlyAMDAthlonCPUs,AMD "Thunderbird"Athlon CPUs, AMD Duron,IntelPentium 4, AMD Athlon XP
SpecialtyProcessors:Intel Xeon Processors, 64-Bit Processing, MobileProcessors
InstallingCPUs:WhyReplaceaCPU?,DeterminingtheRightCPU,BuyingaCPU,Preparing toInstall,InsertingaSlot1/SlotACPU,InsertingaPGA-TypeCPU,TestingYourNewCPU, TheArt ofCooling,Know YourCPUs, Overclocking
Unit2: RAM, BIOSandCMOS
RAM
DRAM: OrganizingDRAM, You AreaByteVictim!
RAMSticks,PartI:DIPPs,30-PinSIPPs,30-PinSIMMs,SIMMSticksandParity,Access Speed
RAM Sticks, PartII: 72-Pin SIMMs,Banking, PartI-FillingtheBus, DIMM
ImprovementsinDRAMTechnology:EDO,SDRAM,PC100/133Standards,ECC,Double Pumping, RDRAM, DDR SDRAM, Banking Part II-Dual-Channel, Architecture, Double- Sided SIMMs/DIMMs
InstallingRAM:DoYouNeedRAM?,GettingtheRightRAM,InstallingSIMMs,Installing DIMMsand RIMMs,InstallingSO DIMMs inLaptops, TheRAM Count
TroubleshootingRAM:TestingRAM, MRAM
BIOSandCMOS
The Function of BIOS: Talking of the Keyboard, BIOS and Its Relation to Memory Addressing,All HardwareNeedsBIOS
CMOS Setup Utilities: Updating CMOS: The Setup Program, A Quick Tour Through a Typical CMOS Setup Program, And theRest oftheCMOS Settings, Modern CMOS
BIOSand DeviceDrivers: Option ROM, DeviceDrivers,BIOS, BIOS Everywhere!
Power-OnSelf-Test(POST):BeforeandDuringtheVideoTest:TheBeepCodes,TextErrors, POST Cards, theBoot Process,Boot Configuration

Unit3:ExpansionBusand motherboard

Expansion Bus

Structure andFunction oftheExpansion Bus: PC Bus, 16-BitISA
System Resources, I/O Addresses, Interrupt Requests, Direct MemoryAccess (DMA), MemoryAddresses
Modern Expansion Bus: FalseStarts, PCI
Installing ExpansionCards: Step1: Knowledge, Step2: Physical Installation, Step 3: AssigningResources to theCard, Step 4: DeviceDrivers, Step 5: Verify
TroubleshootingExpansion Cards: DeviceManager
PCI-Xand PCI-Express

Motherboards

HowMotherboards Work
Types ofMotherboards:AT Motherboards, TheNeed foraNew Form Factor, EnterATX Chipset
Varieties: Functions, Features, and Expandability
UpgradingandInstallingMotherboards:ChoosingtheMotherboardandCase,Installingthe Motherboard, Wires, Wires, Wires
TroubleshootingMotherboards: Symptoms, Techniques, Options

Unit4:PowerSupplies andfloppydrives

PowerSupplies

UnderstandingElectricity
PoweringthePC: SecuringAC, SupplyingDC, Cooling
TroubleshootingPower:WhenPowerSuppliesDie,FusesandFire,ItGlows!,Server Systems and theEPS12V Standard, ActivePFC

Floppy Drives

FloppyDriveBasics:Formatting, Types ofDisks,DriveSize
InstallingFloppyDrives:InsertingRibbonCables,DeterminingDriveLetters,Connectors, Power, CMOS
FloppyDrive Maintenance and Troubleshooting:Repairing FloppyDrives,OtherCMOS Options, Radial Misalignment, USBFloppyDrives, USBFlash MemoryDrives

Recommended-Book:

1. “PCHardware”byMichaelMeyers, Scott Jernigan.TMH Edition.

ReferenceBook:

1. “Troubleshooting, Maintaining and RepairingPCs”
   Stephen J.Bigelow,
   TMH
2. “PCUpgrade and MaintenanceGuide”,
   Minasi,
   BPBpublication.
3. “Upgradingand RepairingPCs”
   Scott Mueller,
   PHI
4. “HardwareBible”
   W.L.Rosch,
   TechmediaPublication.

PAPER 19:ADVANCEINSTRUMENTATION

Credit: 04
Total marks:100(70External+30 Internal)
TotalHours required: 60Hrs.

Unit1: WAVEANALYZERS, HARMONIC DISTORTION AND MEASURING INSTRUMENTS

INTRODUCTION – Basicwaveanalyzer– Frequencyselective wave analyzer–spectrumanalyzer– Heterodynewave analyzer–harmonicdistortion analyzer– spectrum analyzer– digitalFourieranalyzer, practical FFT spectrum analysis usingawaveform processingsoftware (ss-36), Outputpowermeter– Field strength meter– strobosane– phasemeter– vector impedancemeter (directreading)– Q meter– LCRBridge– RX meters –AutomaticBridges – transistortesting– megger– analogPH meter

Unit 2: Bridges andrecorders

Wheastone'sbridge– Kelvin's bridge– practicalKelvin's Doublebridge–bridgecontrolled circuits – digital readout bridges –capacitance comparison bridge– inductance comparison bridge– Maxwell's bridge– Hay's bridge– Schering's bridge– Wier'sbridgewagher'searth connection – resonance bridge– types of defeaters – precautions to betaken when using abridgeStripchart recorder– Galvanometertyperecorder– Null type recorder circular chart recorder– X-Y recorder– recording– digital daterecordingobjective andrequirements of recordingdata– recorderspecification– potentiometric recorder– digitalmemorywaveform recorder– application ofstrip chart recorder

Unit3:Transducers andsignal conditioning

Electrical transducer– resistiveposition transducer– strainganger– resistancethermometer– thermistor– inductivetransducer–differential output transducer–LVDT – pressureinductivetransducer– capacitive transducer–Loadcell – piezoelectrictransducer– photoelectrictransducer– photo –voltaic cell – semiconductorphoto diode– thephoto transistor– temperaturetransducers – frequencygeneratingtransducers – Reluctance pulse pick-ups – Flowmeasurement – mechanic flow meter– magneticflowmeter– turbine flow meter– measurement ofthickness using Beth GougeOperational amplifier– basicinstrumentation amplifier– Application of instrumentation amplifiers – chopped and modulated DCamplifier– modulators

Unit 4: Measurementsetup andmeasurementof power

Measurementofmicrowave frequencies – resonantco-axial lines – cavitywave meters –RF/UHF field strengthmeter– measurement ofsensitivity– measurement of selectivity– intermodulation method ofmeasuringnon-lineardistortion – measuringfrequencyresponsein audio amplifier– modulation – measuringfrequencymodulation – measuringfrequency deviation with a radio receiver– measuring amplitudemodulation usingCRO, Requirements ofdummylocal – Bolometer– bolometermethod for power measurement–Bolometer element – measurementof powerbymeansof abolometer bridge– unbalancedBolometerBridge– slybalancing Bolometer bridge-measurement of largeamount ofRFpower– measurement ofpoweronatransmission line– standingwave ratio measurement– measurement ofstandingwaveratio usingdirectcomparison.

RecommendedBook

1. Electronicinstrumentation
   By:H.S.Kalsi, TatamecrowHill

ReferenceBook

1. Electronicinstrumentation and measurement
   By:Anand,PHI
2. Instrumentation, measurement and analysis
   By:Nikrs BCand ChaudharyK.K., TMN

Paper 20: Microprocessor and Microcontroller

Credit :4
Total marks:100 (70 external+ 30 internal)
Total hours required:60Hrs.

Unit 1:

8085 Microprocessor block diagram and instruction set

Functional Description – Interrupts – Serial Input and Output – Pin Description – Data transfer group – Arithmetic group – Branch group – Logic group – Stack operations, I/O and Machine control instructions

Unit 2:

The AVR Microcontroller: History and Features

Microcontrollers and Embedded Processors – Overview of the AVR Family

AVR Architecture and Assembly Language Programming

The General Purpose Registers In The AVR – The AVR Data Memory – Using Instructions With The Data Memory – AVR Status Register – AVR Data Format And Directives – Introduction To AVR Assembly Programming – Assembling An AVR Program – The program counter and program ROM space in the AVR – RISC architecture in the AVR – Viewing Registers and Memory with AVR studio IDE

Unit 3:

AVR Programming in C

Data types and time delays in C – I/O programming in C – Logic operations in C – Data conversation programs in C – Data serialization in C Memory allocation in C

AVR Hardware connection, Hex file, and Flash Loaders

ATmega32 pin connection – AVR fuse bits – Explaining the Hex file for AVR – AVR programming and trainer board

AVR Timer programming in C

Programming timer 0, 1, and 2 – Counter programming – Programming timer in C

AVR Interrupt programming in C

AVR interrupts – Programming timer interrupts – Programming external hardware interrupts – Interrupt priority in the AVR – Interrupt programming in C

AVR serial port programming in C

Basics of serial communication – Atmega32 connection to RS232 – AVR serial port programming in C – AVR serial port programming in C using interrupts

Unit 4:

LCD and Key-Board Interfacing

LCD interfacing – Key-Board interfacing

ADC, DAC and sensor interfacing

ADC characteristics – ADC programming in the AVR – Sensor interfacing in signal conditioning – DAC interfacing

Relay, Optoisolator and Stepper motor interfacing with AVR

Relay and Optoisolator – Stepper motor interfacing

Recommended Books:

1. 0000 – 8085 Introduction to Microprocessors for Engineers and Scientists
   P. K. Ghosh and P. R. Sridhar
   PHI publication
2. The AVR Microcontroller and Embedded System Using Assembly and C
   Muhammad Ali Mazidi
   SarmadNaimi
   SepehrNaimi
   Pearson Publication

Reference Books:

1. "Microprocessor Architecture, Programming and Application with 8085"
   R S Gaonker.
   Whiley Easter ltd. (Unit 3, 4)
2. "Microprocessors: Theory and Application – Intel and Motorola"
   Rafiquzzaman,
   PHI.
3. AVR Programming
   Elliot Williams
   Make publication
4. Programming and customizing the AVR microcontroller
   Dhananjay V. Gadre
   McGrow Hill Publication

SEMESTER VI

PAPER-21: FIBER OPTICS

Credit: 04
Total Marks: 100 (70 External+30 Internal)
Total Hours required: 60 Hrs.

UNIT 1

Overview of Optical Communication Systems

This Unit provides an overview of the fiber optical system, and the lightning review of optics will cover the basics of and overview of the distinctive characteristics of the propagation of light in conducting and dielectric waveguides.

UNIT 2

Fiber Material and Fabrication

This unit covers propagation in multimode and single-mode fibers, coupling into and out of fibers, fiber material and various fabrication methods.

Coupling into and out of fibers: Fiber to Fiber Joints, Fiber Splicing, Optical Fiber Connectors**, Fiber material and fabrication:** Various types of Fiber Materials, Various methods of Fiber Fabrication

UNIT 3

Optical Source and Detectors

This Unit covers the physics and technology of light emission and amplification in semiconductors, light-emitting diodes, semiconductor lasers (including both edge-emitting and surface-emitting lasers). Also, covers the physics and technology of the detection and demodulation of light, including photodiodes and APDs.

Optical Source: Review of Semiconducting Physics, Energy Bands, Intrinsic and Extrinsic Material, The pn Junctions, Band-gaps, Light-Emitting Diodes, Modulation capability, Transient response, Semiconductor Losses, **LASER Diodes:** Structure and Threshold conditions, Temperature Effects, Source Linearity and Reliability and Quantum Efficiency, **Optical Detectors**: PIN photo detector, Avalanche photodiode, Noise consideration, Response time, Depletion layer photocurrent, Avalanche multiplication noise, materials used in APDs.

UNIT 4

Optical Fiber Measurements

This Unit covers the various measurement techniques which covers the measurement of Attenuation as well as loss occurred in fiber.

Attenuation Measurement: Cutback method, Optical Time Domain Reflectometer, Fiber fault location, Time Domain Dispersion Measurements, Frequency Domain Measurements. **Refractive Index Profile Measurement:**End reflection technique, Transmitted near field scanning method, Refracted near filed technique, Interferometer of optical source characteristics, Response time, Distortions.

Recommended Book

l. Optical Fiber Communications by Gerd Keiser, McGraw-Hill Publication.
2. Optical Fiber Communications: Principles and Practice by John M. Senior, Pearson Education Publication

Reference Book:

1. Fiber Optic Communication by D. C. Agarwal, S. Chand Publication
2. Fiber Optics and Optoelectronics by R. P. Khare, Oxford Publication.
3. Fiber Optics through Experiments by Shenoy, Khijwania, Ghatak and Pal, Viva Publication.

Paper 22:AdvanceConcepts ofControl Systems

Credit:4
Total marks:100 (70 external+ 30 internal)
Total hours required:60Hrs.

Unit1:Root-Locus Analysis &Design

Introduction,Root-Locusplots,Summaryofgeneralrulesforconstructingrootloci,Root-LocusplotswithMatLab.Specialcases,Root-Locusanalysisofcontrol systems,Root-Lociforsystems with transparentlag, Root-Contourplots, Exampleproblems and solutions

Control Systems Design bythe Root-Locus Method: Introduction, Preliminary design considerations,Lead compensation,Lagcompensation, Exampleproblems and solutions

Unit 2: FrequencyResponseAnalysis &Design

Introduction, Bode diagrams, Plotting bode diagrams with MatLab, Polar plots, Drawing NyquistplotswithMatLab,Log-MagnitudeversusPhaseplots,Nyquiststabilitycriterion, Stability Analysis, Relative Stability, Closed loop frequency response, Experimental determination oftransferfunctions, Exampleproblems and solutions

Unit 3: Control Systems Design byFrequencyResponse

Introduction,LeadCompensation,lagCompensation,Lag-LeadCompensation,Concluding Comments, Exampleproblems and solutions

Unit4:PIDControls andIntroductionto RobustControl

Introduction,TuningrulesforPIDcontrollers,ModificationsofPIDcontrolschemes,Two-Degrees-of-Freedomcontrol,Designconsiderationsforrobustcontrol,Exampleproblemsand solutions

Recommended-Book:

1."ModernControlEngineering(3rdEdition)"
KatsuhikoOgata.
Publication: Prentice-HallIndia.

Reference-Book:

1."IndustrialInstrumentation andControl"
Singh,
TMH
2. "Control Systems: Theory and Application"
Ghosh,
PearsonEducation.
3. "Industrial Electronics and Control:"
BishwanathPaul,
PHI.

Paper 23: Basic Programmable controllers

Credit:04
Total marks:100(70 external+30 Internal)
Total Hours required: 60 Hrs.

Unit 1: Ladder diagram fundamentals, the programmable logic controller and fundamental PLC programming.

Basic components and their symbols – fundamentals of ladder diagrams – machine control terminology. A brief history – PLC configurations – system block diagram – update – solve the ladder update – update – solve the ladder. Physical components versus program components – Example problem (lighting control) – internal relays – disagreement circuit – majority circuit – oscillator – Holding contacts—Always ON and always OFF contacts-- ladder diagram having more than one rung.

Unit 2: Advance programming techniques, mnemonic programming code, wiring techniques.

Ladder program execution sequence – Flip flaps – R-S Flip flop – one shot – D flip-flop – T-flip-flop – J-K flip-flop – counters - sequencers – timers – master control relays and control zones. AND ladder rung – entering normally closed contacts – OR ladder rung – simple branches – complex branches.PLCpower connection – input wiring – input having a single common – isolated inputs – output wiring – relay outputs –solid state outputs.

Unit 3:**Analog I/O, discrete position sensors and encoders, transducer, and advanced sensors.**

Analog input – Analog output, Analog data handling – analog input potential problems. Sensor output classification – connecting discrete sensor to PLC inputs – proximity sensors – inductive proximity sensors-- capacitive proximity sensors-- ultrasonic proximity sensors – optical proximity sensors. Temperature – liquid level – force – pressure/vacuum – flow – inclination – acceleration – angle position sensors – linear displacements.

Unit 4:**Closedloop and PID control, motor control and system integrity and safety.**

Simple closed loop systems – problems with simple closed loop systems – closed loop systems using proportional, integral and derivative (PID), Derivative function, integral function – The PID in programmable logic controller – tuning the PID – The "adjust and observe" tuning method – The Ziegler – Nichols tuning method – auto tuning PID systems.Ac motor starter – Ac motor overload protection – specifying a motor starter – DC motor controller – variable speed Ac motor drive. System integrity – Equipment temperature considerations – Fail safe wiring and programming –safety interlocks.

Recommended Book:

1. Programmable logic controllers: programming methods and applications
   John R .Hackworth and Frederick D.Hackworth
   pearson

Reference Book:

1. Programmable logic controllers
   W.Bolton
   Newnes
2. PLC Programming for industrial automation
   Kevin collins
   Liskeard,cornwall

Paper 24: Computer Aided Designing

Credit: 04
Total Marks: 100 (70 External+30 Internal)
Total Hours required: 60 Hrs.

Unit 1: Introduction to NX 10.0, Drawing sketches For Solid Models:

Introduction to NX 10.0 – System Requirements – Getting Started with NX – Important terms and Definitions – Understanding the Functions of the Mouse buttons – Quick access toolbar – Ribbon – Status bar – Hot keys – Color scheme – Dialog boxes in NX – Selecting objects – Deselecting objects – Selecting objects using the quick pick dialog box

Introduction – Starting NX – Starting a New document in NX – Invoking different NX environments – Creating three fixed datum planes (XC-YC, YC-ZC, XC-ZC) – Displaying the WCS (Work coordinate System) – Creating Sketches: Creating Sketches in the modeling environment, Creating Sketches in the Sketching environment – Sketching tools: Drawing Sketches using the Profile tool, Using Help lines to locate points, Drawing individuals lines, Drawing Arcs, Drawing Circles, Drawing Rectangles, Placing Points, Drawing Ellipses or Elliptical Arcs, Drawing Conics, Drawing Studio Splines, Filleting Sketches entities – The Drawing Display Tools: Fitting entities in the current display, Zooming an Area, Panning Drawings, Fitting View to selection, Restoring the original orientation of the Sketching Plane – Setting selection filters in the Sketch in Task environment – Selecting Objects – Deselecting objects – Using Snap Points options While Sketching – Deleting Sketched entities – Exiting the Sketch environment

Unit 2: Adding Geometric and Dimensional Constraints to Sketches, Editing, Extruding and Revolving Sketches, and Working with Datum Planes, Coordinate Systems, and Datum Axes:

Constraining Sketches – Concept of constrained Sketches: Under-Constrain, Fully-constrain, Over-constrain – Degree of Freedom Arrows – Dimensioning Sketches: Locking the Automatically applied dimensions, Applying dimensions by using the rapid dimension tool, Applying linear dimensions, Applying Angular dimensions, Applying perimeter dimensions, Editing the dimension value and other parameters, Animating a fully-constrained Sketches – Measuring the distance value between objects in a sketch: Measuring the distance between two objects in a sketch, Measuring the projected distance between two objects, measuring the screen distance between two objects – measuring the length of an Arc or a Line – Measuring the angle between entities: Measuring the Angle value using the by object option, Measuring the Angle value using the by 3 points option, Measuring the Angle value using the by Screen point option – Geometric constraints: Applying additional constraints individually, Applying symmetry constrain, Applying Automatic constraints to a Sketch, Controlling inferred constraints settings, Showing all constraints in a sketch, Showing/ Removing constraints, Converting a sketch entity or dimension into a reference entity or reference dimension

Editing Sketches: Trimming Sketched Entities, Extending Sketched Entities, Creating a Corner between Sketched Entities, Moving Sketched Entities by using the move curve tool, Offsetting Sketched Entities by using Offset Move Curve, Modifying Entities by using the Resize curve tool, Modifying chamfer in Sketched entities by using resize chamfer curve tool, Deleting Sketched entities by using delete curve tool, Offsetting Sketched entities, Mirroring Sketched entities, Creating a linear sketch pattern, Creating a Circular sketch pattern, Creating a general sketch pattern, Transforming sketched entities, Editing sketched entities by dragging – Exiting the sketch environment – Changing the view of the sketch – Creating base features by extruding: Extrude dialog box options – Creating solid revolved bodies – Copying, moving and rotating objects – Hiding entities – Showing hidden entities – Hiding all entities using a single tool – Rotating the view of a model in 3D space – Setting display modes

Additional Sketching and Reference Planes – Types of Datum Planes: Creating Three Fixed (Principle) Datum Planes, Creating Relative Datum Planes – Creating Datum Coordinate Systems –

Creating Fixed and Relative Datum Axes – Other Extrusion Options: Specifying the Boolean Operation, Specifying Other Extrusion Termination Options – Projecting External Elements

Unit 3: Advanced Modeling Tools – I, Advanced Modeling Tools – II:

Advanced Modeling Tools – Creating Holes by using the Hole Tool: Creating General Holes, Creating Drill Size Hole, Creating Screw Clearance Hole, Creating Threaded Hole, Creating Hole Series – Creating Grooves: Creating Rectangular Grooves, Creating Ball End Grooves, Creating U Grooves – Creating Slots: Creating Rectangular Slots, Creating Ball-End Slots, Creating U-Slots, Creating T-Slots, Creating Dove-Tail Slots – Creating Ribs – Creating Chamfers: Creating a Chamfer Feature Using the Symmetric Method, Creating a Chamfer Feature Using the Asymmetric Method, Creating a Chamfer Feature Using the Offset and Angle Method – Creating an Edge Blend Advanced Modeling Tools – Pattern Feature Tool: Creating a Linear Pattern, Creating a Circular pattern, Creating a Polygon Pattern, Creating a Spiral Pattern, Creating a Pattern Along a Curve, Creating a General Pattern, Creating a Reference Pattern, Creating a Helix Pattern, Creating a Fill Pattern – Mirror Feature Tool – Mirror Face Tool – Mirror Geometry Tool – Sweeping Sketches Along the Guide Curves – Creating Swept Features – Creating Tubes or Cables – Creating Threads: Creating Symbolic Threads, Creating Detailed Threads – Creating Shell Features: Shelling the Entire Solid Body

Unit 4: Editing Features and Advanced Modeling Tools – III, Assembly Modeling – I, Assembly Modelling – II:

Editing Features: Editing a Hole Feature, Editing the Positioning of a Groove Feature, Editing the Positioning of a Slot Feature, Editing the Parameters of Features, Editing the Parameters of Features with Rollback, Editing Sketches of the Sketched-based Features – Reordering Features – Advanced Modeling Tools: Creating Boss Features, Creating Pocket Features, Creating Pad Features, Creating Drafts

The Assembly Environment – Invoking the Assembly Environment: Invoking the Assembly Environment Using the new Dialog Box, Invoking the Assembly Environment in the Current Part File, Types of Assembly Design Approaches – Creating Bottom-up Assemblies: Placing Components in the Assembly Environment, Changing the Reference Set of a Component, Applying Assembly Constraints to Components, Points to remember while Assembling Components, Creating a Pattern Component in an Assembly, Replacing a Component in an Assembly, Moving a Component in an Assembly, Mirroring a Component in an Assembly, Modifying a Component in the Assembly File The Top-Down Assembly Design Approach: Creating Components using the Top-Down Assembly Design Approach – Creating Subassemblies – Editing Assembly Constraints – Checking the Interference between the Components of an Assembly: Checking Interference using the simple interference tool, Checking Interference between the Assembly Components, Checking Interference and Clearance and Analyzing cross-sections of components using the View-Section Tool – Creating Exploded Views of an Assembly: Exploding Views automatically, Exploding Views Manually

Recommended Book:

1. NX-10.0: For Engineers and Designers, 9th Edition by
   Prof. Sham Tickoo, Purdue University Calumet, USA
   Published by DreamTech Press

Reference Books:

1. Siemens Nx 10 Design Fundamentals
   JaecheolKoh
   Onsia
2. Parametric modelling with NX 9
   Randi Shih
   SDC Ppublication