SPPU B.E./B.Tech ENTC Sem 4 syllabus

Object Oriented Programming

Unit I Foundation of Object Oriented Programming (08 Hrs)
Introduction to procedural, modular, object-oriented and generic programming techniques, Limitations of
procedural programming, Need of object-oriented programming, fundamentals of object-oriented
programming: objects, classes, data members, methods, messages, data encapsulation, data abstraction and
information hiding, inheritance, polymorphism. Inline functions, Function overloading, call by value and
call by reference, return by reference, functions with default arguments, this pointer, illustrative Simple
C++ Programs. Dynamic initialization of variables, memory management operators, Member dereferencing
operators, operator precedence, typecast operators, Scope resolution operators, arrays.

Unit II Classes & Objects (06 Hrs)
Defining class, Defining member functions, static data members, static member functions, private data
members, public member functions, arrays of objects, objects as function arguments.
Constructors and Destructors: types of constructors, handling of multiple constructors, destructors.
(Complex Class & String Class)

Unit III Operator Overloading (06 Hrs)
Fundamentals of Operator Overloading, Restrictions on Operators Overloading, Operator Functions as
Class Members vs. as Friend Functions, Overloading Unary Operators, Overloading Binary Operators,
Overloading of operators using friend functions.

Unit IV Inheritance & Polymorphism (06 Hrs)

Introduction to inheritance, base and derived classes, friend classes, types of inheritance, hybrid
inheritance, member access control, static class, multiple inheritance, ambiguity, virtual base class,
Introduction to polymorphism, pointers to objects, virtual functions, pure virtual functions, abstract base
class, Polymorphic class, virtual destructors, early and late binding, container classes, Contained classes,
Singleton class.

Unit V Templates, Namespaces and Exception handling (06 Hrs)
Templates: Introduction, Function template and class template, function overloading vs. function
templates
Namespaces: Introduction, Rules of namespaces
Exception handling: Introduction, basics of exception handling, exception handling mechanism, throwing
and catching mechanism, specifying exceptions, Multiple Exceptions, Exceptions with arguments C++
streams, stream classes, unformatted I/O, formatted I/O and I/O manipulators.

Unit VI Working with files (06 Hrs)
Introduction, classes for file Stream Operations, opening and closing files, detecting End_Of_File (EOF),
modes f File Opening, file pointers and manipulators, updating file, error handling during file operations.

Text Books:
1. E Balagurusamy, “Programming with C++”, Tata McGraw Hill, 3rd Edition.
2. Herbert Schildt, “The Complete Reference C++”, 4th Edition.
Reference Books:
1. Robert Lafore, “Object Oriented Programming in C++”, Sams Publishing, 4th Edition.
2. Matt Weisfeld, “The Object-Oriented Thought Process”, Pearson Education.

Control Systems

Unit I Introduction to Control Systems & its modelling(06 Hrs)

Basic Elements of Control System, Open loop and Closed loop systems, Differential equations and
Transfer function, Modeling of Electric systems, Translational and rotational mechanical systems, Block
diagram reduction Techniques, Signal flow graph.

Unit II Time domain analysis (06 Hrs)
Time domain analysis: transient response and steady state response, standard test inputs for time domain
analysis, order and type of a system, transient analysis of first and second order systems, time domain
specifications of second order under damped system from its step response, Steady state error and static
error constants.

Unit III Stability analysis (08 Hrs)
Characteristic equation of a system, concept of pole and zero, response of various pole locations in s-plane,
concept of stability absolute stability, relative stability, stability of system from pole locations, Routh Hurwitz stability criterion, Root locus: definition, magnitude and angle conditions, construction of root locus, concept of dominant poles, effect of addition of pole and zero on root locus. Application of root locus for stability
analysis.

Unit IV Frequency domain analysis (08 Hrs)
Frequency response and frequency domain specifications, correlation between time domain and frequency
domain specifications, polar plot, Nyquist stability criterion and construction of Nyquist plot, Bode plot,
determination of frequency domain specifications and stability analysis using Nyquist plot and Bode plot.

Unit V State space representation (06 Hrs)

State space advantages and representation, Transfer function from State space, physical variable form,
phase variable forms: controllable canonical form, observable canonical form, Solution of homogeneous
state equations, state transition matrix and its properties, computation of state transition matrix by Laplace
transform method only.

Unit VI Controllers and Digital Control Systems (06 Hrs)
Concept of Controller, Basic ON-OFF Controller, Concept of Dead Zone, Introduction to P, I, D, PI, PD and PID controller, OFFSET of Controller, Integral Reset, PID Characteristics. Concept of Zeigler-Nicholas method. Concept of Industrial Automation, Need of IoT based Industrial Automation.

Text Books:
1. N. J. Nagrath and M. Gopal, “Control System Engineering”, New Age International Publishers, 5
th Edition.
2. K. Ogata, “Modern Control Engineering”, Prentice Hall India Learning Private Limited; 5th Edition.
Reference Books:
1. Benjamin C. Kuo, “Automatic control systems”, Prentice Hall of India, 7th Edition.
2. M. Gopal, “Control System – Principles and Design”, Tata McGraw Hill, 4th Edition.
3. Schaum‟s Outline Series, “Feedback and Control Systems” Tata McGraw-Hill.
4. John J. D‟Azzo and Constantine H. Houpis, “Linear Control System Analysis and Design”, Tata
McGraw-Hill, Inc.
5. Richard C. Dorf and Robert H. Bishop, “Modern Control Systems”, Addison – Wesley.

Principles of Communication Systems

Unit I Signals & spectra (08 Hrs)
Introduction to Communication System, Analog and Digital messages, regenerative repeaters, Signal
Bandwidth & Power. Size & classification of signal, exponential Fourier series, concept of negative
frequencies. Fourier transform and properties, Frequency shifting, Concept of baseband and bandpass
signals, Signal transmission through LTI system. Signal energy & Energy Spectral density. Signal power &
Power Spectral Density, Input and output PSD, PSD of modulated signal.

Unit II AM transmission & reception for signal tone (08 Hrs)

Need for frequency translation, Amplitude modulation (DSB-C), Double sideband Suppressed carrier
(DSB-SC) modulation, Single sideband modulation (SSB), Vestigial Sideband modulation
(VSB),Spectrum and Bandwidth of AM, DSB-SC, SSB & VSB, Calculation of modulation index for AM
wave, Modulation index for more than one modulating signals, Power and power efficiency, AM reception

Unit III FM transmission & reception for signal tone (08 Hrs)
Phase Modulation (PM) and Frequency Modulation (FM), Relationship between Phase and Frequency
Modulation, Modulation Index, Spectrum of FM (single tone): Feature of Bessel Coefficient, Power of FM
signal, Bandwidth of tone modulated FM signal, modulation index : AM vs. FM, Spectrum of constant
Bandwidth‟ FM, Narrowband and Wideband FM.
FM Modulators and Demodulators: FM generation by Armstrong‟s Indirect method, frequency
multiplication and application to FM, FM demodulator.

Unit IV Pulse Modulation (06 Hrs)
Need of analog to digital conversion, sampling theorem for low pass signal in time domain, and Nyquist
criteria, Types of sampling- natural and flat top. Pulse amplitude modulation & concept of TDM: Channel
bandwidth for PAM, equalization, Signal Recovery through holding.
Pulse Width Modulation (PWM) and
Pulse Position Modulation (PPM): Generation & Detection.

Unit V Digital Representation of Analog Signals (06 Hrs)
Quantization of Signals: Quantization error, Uniform & Non-Uniform types of Quantization, Mid-rise &
Mid-tread Quantizer.
Companding: A-law & μ-law.
Pulse Code Modulation system: Generation & Reconstruction, Differential Pulse code modulation, Delta
Modulation, Adaptive Delta Modulation.

Unit VI Baseband Digital Transmission (06 Hrs)
Line codes: Properties and spectrum.
Digital Multiplexing and hierarchies: T1, AT&T, E1, CCITT, Scrambling & Unscrambling.
Synchronization: Carrier Synchronization, Bit Synchronization and

Frame Synchronization. Intersymbol
Interference, Equalization.

Text Books:

1. Taub, Schilling and Saha, “Principles of Communication Systems”, McGraw-Hill, 4th Edition.
2. B P Lathi, Zhi Ding, “Modern Analog and Digital Communication System”, Oxford University
Press, 4th Edition.

Reference Books:

1. Bernard Sklar and Prabitra Kumar Ray, “Digital Communications Fundamentals and Applications”,
Pearson Education 2nd Edition.

2. Wayne Tomasi, “Electronic Communications System”, Pearson Education, 5
th Edition.
3. A.B Carlson, P B Crully and J C Rutledge, “Communication Systems”, Tata McGraw Hill
Publication, 5th Edition.

4. Simon Haykin, “Communication Systems”,John Wiley & Sons, 4th Edition.

Signals & Systems

204191: Signals & Systems

Credit 03 + 01 = 04

Unit I Introduction to Signals & Systems

Signals: Introduction, Graphical, Functional, Tabular and Sequence representation of Continuous and
Discrete time signals. Basics of Elementary signals: Unit step, Unit ramp, Unit parabolic, Impulse,
Sinusoidal, Real exponential, Complex exponential, Rectangular pulse, Triangular, Signum, Sinc and
Gaussian function.
Operations on signals: time shifting, time reversal, time scaling, amplitude scaling, signal addition,
subtraction, signal multiplication. Communication, control system

and Signal processing examples.

Classification of signals: Deterministic, Random, periodic , Non periodic, Energy , Power, Causal , Non-
Causal, Even and odd signal.

Systems: Introduction, Classification of Systems: Lumped Parameter and Distributed Parameter System,
static and dynamic systems, causal and non-causal systems, Linear and Non- linear systems, time variant
and time invariant systems, stable and unstable systems, invertible and non- invertible systems.

Unit II Time domain representation of LTI System

Input-output relation, definition of impulse response, convolution sum, convolution integral, computation
of convolution integral using graphical method for unit step to unit step, unit step to exponential,
exponential to exponential, unit step to rectangular and rectangular to rectangular only. Computation of
convolution sum. Properties of convolution. System interconnection, system properties in terms of impulse
response, step response in terms of impulse response.

Unit III Fourier Series

Fourier series (FS) representation of periodic Continuous Time (CT) signals, Dirichlet condition for
existence of Fourier series, orthogonality, basis functions, Amplitude and phase response, FS representation of CT signals using trigonometric and exponential Fourier series. Applications of Fourier series, properties of Fourier series and their physical significance, Gibbs phenomenon.

Unit IV Fourier Transform

Fourier Transform (FT) representation of aperiodic CT signals, Dirichlet condition for existence of Fourier
transform, evaluation of magnitude and phase response, FT of standard CT signals, Properties and their
significance, Interplay between time and frequency domain using sinc and rectangular signals, Fourier
Transform for periodic signals.

Unit V Laplace Transform

Definition of Laplace Transform (LT), Limitations of Fourier transform and need of Laplace transform,
ROC, Properties of ROC, Laplace transform of standard periodic and aperiodic functions, properties of
Laplace transform and their significance, Laplace transform evaluation using properties, Inverse Laplace
transform based on partial fraction expansion, stability considerations in S domain, Application of Laplace
transforms to the LTI system analysis.

Unit VI Probability and Random Variables

Probability: Experiment, sample space, event, probability, conditional probability and statistical
independence, Bayes theorem, Uniform and Gaussian probability models.
Random variables: Continuous and Discrete random variables, cumulative distributive function,
Probability density function, properties of CDF and PDF. Statistical averages, mean, moments and
expectations, standard deviation and variance.

Text Books:
1. Simon Haykins and Barry Van Veen, “Signals and Systems”, Wiley India, 2nd Edition.

2. M.J. Roberts “Signal and Systems”, Tata McGraw Hill 2007.
Reference Books:
1. Charles Phillips, “Signals, Systems and Transforms”, Pearson Education, 3 rd Edition.

2. Peyton Peebles, “Probability, Random Variable, Random Processes”, Tata Mc Graw Hill, 4
th Edition.
3. A. Nagoor Kanni “Signals and Systems”, Mc Graw Hill, 2nd Edition.