

University of Engineering & Management, Jaipur

Third Semester							
Theory							
Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1	BS	BM301	Mathematics & Statistics-II	3	0	0	3
2	EC	PEC301	Electronics Devices	3	0	0	3
3	EC	PEC302	Analog Electronics Circuits	3	0	0	3
4	EC	PEC303	Network Theory	3	1	0	3
5	EC	PEC304	Signals and Systems	3	0	0	3
6	HS	GSC303	ESP & SDP-III	2	0	0	2
7	BS	BIO301	Biology for Engineers	2	0	0	1
8		NPT301	(NPTEL)	-	-	-	2
			Total Credits (Theory)				20
## NPTEL courses are based on the respective year's offered course							
Practical							
Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1	EC	EC391	Electronic Devices Lab	0	0	2	1
2	EC	EC392	Analog Electronics Lab	0	0	2	1
2	EC	EC394	Signals & Systems Lab	0	0	2	1
3	ES	OEC381	Data Structure and Algorithm (Sessional)	0	0	2	1
4	ECP	INT-301	Mini PROJECT I	0	0	2	1
			Total Credits (Practical)				5
			Total Credits (Semester)				25

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ECC301	Electronic Devices	3L:0T:0P	3 credits
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Introduction to Semiconductor Physics: Review of Quantum Mechanics, Electrons in periodic Lattices, E-k diagrams. Energy bands in intrinsic and extrinsic silicon; Carrier transport: diffusion current, drift current, mobility and resistivity; sheet resistance, design of resistors

Generation and recombination of carriers; Poisson and continuity equation P-N junction characteristics, I-V characteristics, and small signal switching models; Avalanche breakdown, Zener diode, Schottky diode

Bipolar Junction Transistor, I-V characteristics, Ebers-Moll Model, MOS capacitor, C-V characteristics, MOSFET, I-V characteristics, and small signal models of MOS transistor, LED, photodiode and solar cell;

Integrated circuit fabrication process: oxidation, diffusion, ion implantation, photolithography, etching, chemical vapor deposition, sputtering, twin-tub CMOS process.

Text /Reference Books:

1. G. Streetman, and S. K. Banerjee, "Solid State Electronic Devices," 7th edition, Pearson, 2014.
2. D. Neamen, D. Biswas "Semiconductor Physics and Devices," McGraw-Hill Education
3. S. M. Sze and K. N. Kwok, "Physics of Semiconductor Devices," 3rd edition, John Wiley & Sons, 2006.
4. C.T. Sah, "Fundamentals of solid state electronics," World Scientific Publishing Co. Inc, 1991.
5. Y. Tsividis and M. Colin, "Operation and Modeling of the MOS Transistor," Oxford Univ. Press, 2011.

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Understand the principles of semiconductor Physics
2. Understand and utilize the mathematical models of semiconductor junctions and MOS transistors for circuits and systems.

ECC391:Electronic Devices Lab	(0L:0T:2P)	(1 credit)
Hands-on experiments related to the course contents of ECC301		

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ECC302	Analog circuits	3L:0T:0P	3 credits
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Diode Circuits, Amplifier models: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier. Biasing schemes for BJT and FET amplifiers, bias stability, various configurations (such as CE/CS, CB/CG, CC/CD) and their features, small signal analysis, low frequency transistor models, estimation of voltage gain, input resistance, output resistance etc., design procedure for particular specifications, low frequency analysis of multistage amplifiers.

High frequency transistor models, frequency response of single stage and multistage amplifiers, cascode amplifier. Various classes of operation (Class A, B, AB, C etc.), their power efficiency and linearity issues. Feedback topologies: Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc., calculation with practical circuits, concept of stability, gain margin and phase margin.

Oscillators: Review of the basic concept, Barkhausen criterion, RC oscillators (phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.), non-sinusoidal oscillators. Current mirror: Basic topology and its variants, V-I characteristics, output resistance and minimum sustainable voltage (VON), maximum usable load. Differential amplifier: Basic structure and principle of operation, calculation of differential gain, common mode gain, CMRR and ICMR. OP-AMP design: design of differential amplifier for a given specification, design of gain stages and output stages, compensation.

OP-AMP applications: review of inverting and non-inverting amplifiers, integrator and differentiator, summing amplifier, precision rectifier, Schmitt trigger and its applications. Active filters: Low pass, high pass, band pass and band stop, design guidelines. Digital-to-analog converters (DAC): Weighted resistor, R-2R ladder, resistor string etc. Analog to-digital converters (ADC): Single slope, dual slope, successive approximation, flash etc.

Switched capacitor circuits: Basic concept, practical configurations, application in amplifier, integrator, ADC etc.

Text/Reference Books:

1. J.V. Wait, L.P. Huelsman and GA Korn, Introduction to Operational Amplifier theory and applications, McGraw Hill, 1992.
2. J. Millman and A. Grabel, Microelectronics, 2nd edition, McGraw Hill, 1988.
3. P. Horowitz and W. Hill, The Art of Electronics, 2nd edition, Cambridge University Press, 1989.
4. A.S. Sedra and K.C. Smith, Microelectronic Circuits, Saunder's College11 Publishing, Edition IV
5. Paul R. Gray and Robert G.Meyer, Analysis and Design of Analog Integrated Circuits, John Wiley, 3rd Edition

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Understand the characteristics of diodes and transistors
2. Design and analyze various rectifier and amplifier circuits
3. Design sinusoidal and non-sinusoidal oscillators

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4. Understand the functioning of OP-AMP and design OP-AMP based circuits

5. Design ADC and DAC

ECC392: Analog Circuit Laboratory

[0L:0T:2P]

[1 credit]

Hands-on experiments related to the course contents EC302

ECC303	Network Theory	3L:0T:0P	3 credits
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Node and Mesh Analysis, matrix approach of network containing voltage and current sources, and reactances, source transformation and duality. Network theorems: Superposition, reciprocity, Thevenin's, Norton's, Maximum power Transfer, compensation and Tellegen's theorem as applied to AC circuits. Trigonometric and exponential Fourier series: Discrete spectra and symmetry of waveform, steady state response of a network to non-sinusoidal periodic inputs, power factor, effective values, Fourier transform and continuous spectra, three phase unbalanced circuit and power calculation.

Laplace transforms and properties: Partial fractions, singularity functions, waveform synthesis, analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms evaluation of initial conditions.

Transient behavior, concept of complex frequency, Driving points and transfer functions poles and zeros of immittance function, their properties, sinusoidal response from pole-zero locations, convolution theorem and Two four port network and interconnections, Behaviors of series and parallel resonant circuits, Introduction to band pass, low pass, high pass and band reject filters.

Text/Reference Books

1. Van, Valkenburg.; "Network analysis"; Prentice hall of India, 2000
2. Sudhakar, A., Shyammoan, S. P.; "Circuits and Network"; Tata McGraw-Hill New Delhi, 1994
3. A William Hayt, "Engineering Circuit Analysis" 8th Edition, McGraw-Hill Education

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Understand basics electrical circuits with nodal and mesh analysis.
 2. Appreciate electrical network theorems.
 3. Apply Laplace Transform for steady state and transient analysis.
 4. Determine different network functions.
 5. Appreciate the frequency domain techniques.
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ECC304	Signals and System	3L:0T:0P	3 credits
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Signals and systems as seen in everyday life, and in various branches of engineering and science.

Energy and power signals, continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability.

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Linear shift-invariant (LSI) systems, impulse response and step response, convolution, input output behaviour with aperiodic convergent inputs. Characterization of causality and stability of linear shift-invariant systems. System representation through differential equations and difference equations.

Periodic and semi-periodic inputs to an LSI system, the notion of a frequency response and its relation to the impulse response, Fourier series representation, the Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem. The idea of signal space and orthogonal bases,

The Laplace Transform, notion of eigen functions of LSI systems, a basis of eigen functions, region of convergence, poles and zeros of system, Laplace domain analysis, solution to differential equations and system behaviour.

The z-Transform for discrete time signals and systems- eigen functions, region of convergence, z-domain analysis.

State-space analysis and multi-input, multi-output representation. The state-transition matrix and its role. The Sampling Theorem and its implications- Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold, and so on. Aliasing and its effects. Relation between continuous and discrete time systems.

Text/Reference books:

1. A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", Prentice Hall, 1983.
2. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete", 4th edition, Prentice Hall, 1998.
3. Papoulis, "Circuits and Systems: A Modern Approach", HRW, 1980.
4. B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, c1998.
5. Douglas K. Lindner, "Introduction to Signals and Systems", McGraw Hill International Edition: c1999.
6. Simon Haykin, Barry van Veen, "Signals and Systems", John Wiley and Sons (Asia) Private Limited, c1998.
7. Robert A. Gabel, Richard A. Roberts, "Signals and Linear Systems", John Wiley and Sons, 1995.
8. M. J. Roberts, "Signals and Systems - Analysis using Transform methods and MATLAB", TMH, 2003.
9. J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, "Signals and Systems", TMH New Delhi, 2001.
10. Ashok Ambardar, "Analog and Digital Signal Processing", 2nd Edition, Brooks/ Cole Publishing Company (An international Thomson Publishing Company), 1999

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Course outcomes:

At the end of this course students will demonstrate the ability to

1. Analyze different types of signals
2. Represent continuous and discrete systems in time and frequency domain using different transforms
3. Investigate whether the system is stable
4. Sampling and reconstruction of a signal

GSC303	ESP & SDP-III	3L:0T:0P	3 credits
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Pre-requisite: Basic concepts in mathematics, English

Introduction:

This course examines economy, governance. The Topics to be covered, (tentatively): Economic Affairs, Quantitative Aptitude, Reasoning, Ancient & Medieval History

Course Outcomes (CO):

In this course we will study the basic components of Indian economy and Reasoning. Students are expected to be capable of understanding their advantages and drawbacks, how to implement them all over the country, how their drawbacks can be overcome and what the applications are and where they can be used. To reach this goal, the following objectives need to be met:

- CO1: Understand the values of the exam like Gate, IAS etc.
- CO2: Understand the values of tax payment and mutual Fund
- CO3: Understand the values of literature, languages etc.
- CO4: Understand Working & Policies, Money Market & Capital Market.
- CO5: Know about different short cut techniques to solve any kind of aptitudes.
- CO6: Know about different short cut techniques to solve any kind of reasoning.
- CO7: Know about different short cut techniques to solve any kind of communicating problems.
- CO8: Know about different short cut techniques to solve any kind of societal problems.

Course Contents:

Essential Studies for Professionals-III

Module-1: GK & CA, National income: Concept of GDP, GNP, NNP both in FC & MP, PCI Tax: Concept of TAX, objective of TAX, Direct & Indirect Tax, Progressive, Regressive & Proportional tax.

Module-2: Market structure: Perfect competition, monopoly, oligopoly, duopoly, monopony, duopoly, Oligopoly. SEBI, IRDA, NHB –Working & Policies, Money Market & Capital Market, functions of Banks & Types of accounts, cheques & loans, Mutual Fund, Banking Terminologies.

Module-3: Science, Technology, Literature (with current updates): Monuments, sculptures, Literature, Languages, Visual arts – paintings etc. Performing arts – classical and folk dances, puppetry etc. ,Religious diversity, Satellite, GPS, SIM, GSM, CDMA, Indian Regional Navigation Satellite System (IRNSS), NAVIC,WIFI, SIM, GPRS, ISRO, NASA.

Module-4: Ancient & Medieval History at a glance: From Indus valley civilization to Pre-Foreign (British, Dutch, French) Invasion. Current Affairs.

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Skill Development for Professional – III

Module-1: Quantitative Aptitude: Basic concept of SI & CI, different formulas & their applications, concept of Growth & Contraction of Business. Data Interpretation- Tables, pie chart, histogram, Bar chart, solution tricks & techniques. Quant Review- Miscellaneous problems from different chapters & short cuts. Indices & Surds- Basic concept, Formulae & their applications, Finding out the square roots, Elimination of Surds, Equation solve. Quadratic Equation- Polynomials, degree, powers, Equation & factors Solution. Progression-Concept of AP, GP & HP

Module-2: Reasoning: Syllogism: a) Logical Venn diagram b) The If Else Statement Puzzles a) Seating Arrangement b) Classification c) Seating Arrangement with Blood relations Machine Input-Output: a) Pattern Based I/O, Inequality: a) Coded Inequality, b) Jumbled Inequality, c) Conditional inequality

Sentence: a) Sentence Corrections b) Fill the blanks with appropriate words/articles/preposition/verbs/adverbs/conjunction. d) Reading Comprehension (Advance Level) d) Vocabulary

Module-3: Advanced Data Interpretation level-III, Newspaper reading: The Hindu & Economic Times

Text Books

1. Quantitative Aptitude for Competitive Examinations by R S Aggarwal
2. The Indian Economy, An Analysis of Economic Survey 2019-20 & Budget 2020-21 by Sanjiv Verma
3. Indian Financial System by Sujatra Bhattacharyya

References

1. Indian Economy for Civil Services, Universities and Other Examinations by Ramesh Singh
2. Indian Financial System, by Pathak PEARSON publisher

OEC381	Data Structure and Algorithm	0L:0T:2P	1 credits
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INT301	Mini Project-I	0L:0T:2P	1 credits
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Guidelines:

1. The mini-project is a team activity having 3-4 students in a team. This is electronic product design work with a focus on electronic circuit design.
2. The mini project may be a complete hardware or a combination of hardware and software. The software part in mini project should be less than 50% of the total work.
3. Mini Project should cater to a small system required in laboratory or real life.
4. It should encompass components, devices, analog or digital ICs, micro controller with which functional familiarity is introduced.
5. After interactions with course coordinator and based on comprehensive literature survey/ need analysis, the student shall identify the title and define the aim and objectives of mini-project.
6. Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and submit the proposal within first week of the semester.
7. The student is expected to exert on design, development and testing of the proposed work as per the schedule.
8. Art work and Layout should be made using CAD based PCB simulation software. Due considerations should be given for power requirement of the system, mechanical aspects for enclosure and control panel design.
9. Completed mini project and documentation in the form of mini project report is to be submitted at the end of semester.

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Fourth Semester								
Theory								
Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points	
1	EC	ECC401	Microcontrollers	3	0	0	3	
2	EC	ECC402	Digital System Design	3	0	0	3	
3	EC	ECC403	Analog and Digital Communication	3	0	0	3	
4	ES	ECC404	Object Oriented Programming	2	0	0	2	
5	HS	GSC404	ESP & SDP- IV	2	0	0	2	
6	BS	BM401	Mathematics & Statistics IV	3	0	0	3	
7		MC401	Environmental Science(non-credited)	-	-	-	0	
		NPT401	(NPTEL/MOOCs)				2	
			Total Credits (Theory)					18
## NPTEL courses are based on the respective year's offered course								
Practical								
Sl No.		Subject Code	Topic	L	T	P	Credit Points	
1	EC	ECC492	Digital System Design Lab	0	0	2	1	
2	EC	ECC491	Microcontrollers Lab	0	0	2	1	
3	ES	ECC494	Object Oriented Programming Lab	0	0	2	1	
4	EC	ECC493	Analog and Digital Communication lab	0	0	2	1	
6	ECP	INT-401	Mini Project-II	0	0	2	2	
			Total Credits (Practical)					6
			Total Credits (Semester)					24

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ECC401	Microcontrollers	3L:0T:0P	3 credits
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Overview of microcomputer systems and their building blocks, memory interfacing, concepts of interrupts and Direct Memory Access, instruction sets of microprocessors (with examples of 8085 and 8086);

Interfacing with peripherals - timer, serial I/O, parallel I/O, A/D and D/A converters; Arithmetic Coprocessors; System level interfacing design;

Concepts of virtual memory, Cache memory, Advanced coprocessor Architectures- 286, 486, Pentium; Microcontrollers: 8051 systems,

Introduction to RISC processors; ARM microcontrollers interface designs.

Text/Reference Books:

1. R. S. Gaonkar, Microprocessor Architecture: Programming and Applications with the 8085/8080A, Penram International Publishing, 1996
2. D A Patterson and J H Hennessy, "Computer Organization and Design The hardware and software interface. Morgan Kaufman Publishers.
3. Douglas Hall, Microprocessors Interfacing, Tata McGraw Hill, 1991.
4. Kenneth J. Ayala, The 8051 Microcontroller, Penram International Publishing, 1996.

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Do assembly language programming
2. Do interfacing design of peripherals like, I/O, A/D, D/A, timer etc.
3. Develop systems using different microcontrollers
4. Understand RISC processors and design ARM microcontroller based systems

ECC491: Microcontroller Lab

[0L:0T:2P 1 credit]

Hands-on experiments related to the course contents ECC401

ECC402	Digital System Design	3L:0T:0P	3 credits
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Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 6 variables, Binary codes, Code Conversion.

MSI devices like Comparators, Multiplexers, Encoder, Decoder, Driver & Multiplexed Display, Half and Full Adders, Subtractors, Serial and Parallel Adders, BCD Adder, Barrel shifter and ALU

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Sequential Logic Design: Building blocks like S-R, JK and Master-Slave JK FF, Edge triggered FF, Ripple and Synchronous counters, Shift registers, Finite state machines, Design of synchronous FSM, Algorithmic State Machines charts. Designing synchronous circuits like Pulse train generator, PseudoRandom Binary Sequence generator, Clock generation Logic Families and Semiconductor Memories: TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, Tristate TTL, ECL, CMOS families and their interfacing, Memory elements, Concept of Programmable logic devices like FPGA. Logic implementation using Programmable Devices.

VLSI Design flow: Design entry: Schematic, FSM & HDL, different modeling styles in VHDL, Data types and objects, Dataflow, Behavioral and Structural Modeling, Synthesis and Simulation VHDL constructs and codes for combinational and sequential circuits.

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.

Course outcomes:

At the end of this course students will demonstrate the ability to

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

ECC492: Digital System Design Laboratory

[0L:0T:2P 1 credit]

Hands-on experiments related to the course contents ECC402

ECC403	Analog and Digital Communication	3L:0T:0P	3 credits
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Review of signals and systems, Frequency domain representation of signals, Principles of Amplitude Modulation Systems- DSB, SSB and VSB modulations. Angle Modulation, Representation of FM and PM signals, Spectral characteristics of angle modulated signals.

Review of probability and random process. Gaussian and white noise characteristics, Noise in amplitude modulation systems, Noise in Frequency modulation systems. Pre-emphasis and Deemphasis, Threshold effect in angle modulation.

Pulse modulation. Sampling process. Pulse Amplitude and Pulse code modulation

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(PCM), Differential pulse code modulation. Delta modulation, Noise considerations in PCM, Time Division multiplexing, Digital Multiplexers.

Elements of Detection Theory, Optimum detection of signals in noise, Coherent communication with waveforms- Probability of Error evaluations. Baseband Pulse Transmission- Inter symbol Interference and Nyquist criterion. Pass band Digital Modulation schemes- Phase Shift Keying, Frequency Shift Keying, Quadrature Amplitude Modulation, Continuous Phase Modulation and Minimum Shift Keying.

Digital Modulation tradeoffs. Optimum demodulation of digital signals over band-limited channels- Maximum likelihood sequence detection (Viterbi receiver). Equalization Techniques. Synchronization and Carrier Recovery for Digital modulation.

Text/Reference Books:

1. Haykin S., "Communications Systems", John Wiley and Sons, 2001.
2. Proakis J. G. and Salehi M., "Communication Systems Engineering", Pearson Education, 2002.
3. Taub H. and Schilling D.L., "Principles of Communication Systems", Tata McGraw Hill, 2001.
4. Wozencraft J. M. and Jacobs I. M., "Principles of Communication Engineering", John Wiley, 1965.
5. Barry J. R., Lee E. A. and Messerschmitt D. G., "Digital Communication", Kluwer Academic Publishers, 2004.
6. Proakis J.G., "Digital Communications", 4th Edition, McGraw Hill, 2000.

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Analyze and compare different analog modulation schemes for their efficiency and bandwidth
2. Analyze the behavior of a communication system in presence of noise
3. Investigate pulsed modulation system and analyze their system performance
4. Analyze different digital modulation schemes and can compute the bit error performance

ECC493: Analog and Digital Communication Laboratory

[0L:0T:2P 1 credit]

Hands-on experiments related to the course contents ECC403

ECC404	Object Oriented Programming	3L:0T:0P	3 credits
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Paradigm:

Evolution of programming paradigm, structured versus object-oriented development, Introduction to Object oriented programming concepts: Objects, classes, encapsulation and abstraction, inheritance, polymorphism, dynamic binding, message passing.

Moving from C to C++:

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Introduction to C++, streams based I/O, name space, scope resolution operator (::), variable declaration at the point of use, variable aliases-reference variables, strict type checking, parameter passing by reference, inline function, function overloading, default arguments.

Object and Classes:

Specifying and using classes, access specifiers: private, public, functions and data members, default arguments, function overloading, friend functions, static members.

Objects: memory considerations for objects, new and delete operators.

Constructors - default constructor, parameterized constructor, constructor with dynamic allocation, copy constructor, destructors. Operator overloading- overloading through friend and member functions Binary operators: arithmetic, relational, assignment, insertion, extraction

Unary operators: unary minus, post and pre-increment, post and pre-decrement, Conversion functions: class to basic, basic to class, class to class.

Inheritance:

Derived and base classes, Class hierarchies, public, private, and protected derivations, constructors in

derived classes, destructors in derived classes, constructors invocation and data members initialization in derived classes, classes within classes, virtual base class.

Polymorphism:

Pointer to objects, pointer to derived class object, this pointer, run time and compile time polymorphism, virtual functions, pure virtual functions, abstract class, virtual destructor.

Files and Streams:

Introduction to file handling, hierarchy of file stream classes, opening and closing of files, file modes, file pointers and their manipulators, sequential access, random access.

Exception handling and Templates:

Introduction to exception handling, throw point outside try, Multiple catch, Catch-all, throwing objects. Introduction to templates, class templates, function templates

Text Book

1. Object Oriented Programming with C++, E. Balaguruswamy, 6th Edition, 2013 TMG Hill
2. Object Oriented Programming with C++, R.S. Salaria, Khanna Publishing House, New Delhi.

Reference Book

1. Object Oriented Programming with C++, Reema Thareja, OXFORD University Press, 1st Edition, 2015.
2. C++ completes reference, Herbert Schildt, TMG Hill, 4th Edition, 2002.
3. C++ How to Program, Deitel and Deitel, Pearson Education Asia, 8th Edition, 2011.
4. Object Oriented Programming with Ansi and Turbo C++, Ashok N Kamthane, Pearson Education, 1st Edition, 2003.
5. Object-Oriented Programming in C++, Robert Lafore, CourseSams Publishing, 4th Edition

ECC494: Digital System Design Laboratory

[0L:0T:2P 1 credit]

Programming laboratory related to the course contents ECC494

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GSC404	ESP & SDP-IV	3L:0T:0P	3 credits
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Pre-requisite: Basic concepts in mathematics and economics.

Introduction:

This course examines Taxes in India and market structure. The Topics to be covered (tentatively) include: National income, Market structure, Science & Technology, Logical Reasoning.

Course Outcomes (CO):

In this course we will study the basic components of upcoming Science & technology. Students are expected to be capable of understanding the Indian Tax system, their advantages and drawbacks, how to implement in Indian Economy, how their drawbacks can be overcome and what the applications are and where they can be used. To reach this goal, the following objectives need to be met:

CO1: Know about many books and authors.

CO2: Gain knowledge about important dances & festivals of Indian states.

CO3: Understand the values of Important about banks like payment banks, small banks & license system.

CO4: Know about many learning techniques.

CO5: Know about different short cut techniques to solve any kind of aptitudes.

CO6: Know about different short cut techniques to solve any kind of reasoning.

CO7: Know about different short cut techniques to solve any kind of communicating problems.

CO8: Know about different short cut techniques to solve any kind of societal problems.

Course Contents:

Section A: Employment Enhancement Skills-IV

Module-1: GK & CA, Modern History & National Movement. Indian Geography at a glance (Physical, Regional & Economic)

Tax: Concept of TAX, objective of TAX, Direct & Indirect Tax, Progressive, Regressive & Proportional tax.

Module-2: Calendar etc. capitals of countries, currency of countries, important dates, Sports football, hockey etc. recent events & awards too.

Module-3: Important books & authors, Important Hydropower dams, atomic power plants, important national parks, Minister & portfolio & constituencies, Population census, Persons in news

- most famous, popular recent only,

Module-5: Important dances & festivals of Indian states, International Head Quarters & world organization, important president & pm elected from various countries

Module-6: Important about banks like payment banks, small banks & license system, Awards, Sports,

Books & author, National & International affairs.

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Section B: Skill Development for Professional – IV

Module-1: Quantitative Aptitude: Permutation & Combination. Probability- basic concepts of probability, different theorems & applications, binomial, poisson & normal Distributions. Geometry Concept of different shapes like triangle, quadrilateral, rectangle, square, circle etc. different theorems & their applications. Mensuration- Formulae on triangles, square, Rhombus, parallelogram, sphere, circle, cone, pyramid etc. Application based problem solving. Coordinate Geometry- Locus, Straight lines, Circle etc

Module-2: Reasoning: Puzzles: Seating Arrangement a) Circular seating arrangement b) Square seating Arrangement c) Line Arrangement, Calendar and Clock, Miscellaneous Problems

Sentence: a) Sentence Corrections b) Fill the blanks with appropriate words/articles/ preposition/ verbs/adverbs/conjunction. d) Reading Comprehension (Advance Level) d) Vocabulary

Logical Reasoning: Alphanumeric series, Analogies, Artificial Language, Blood Relations, Calendars, Cause and Effect, Clocks, Coding-Decoding, Critical path, Cubes and cuboids. Data Sufficiency, Decision Making, Deductive Reasoning/Statement Analysis, Dices, Directions Embedded Images, Figure Matrix, Input-Output, Mirror and Water Images, Odd One Out, Picture Series and Sequences, Paper Folding, Puzzles, Pattern Series and Sequences, Order & Ranking, Seating Arrangements, Shape Construction, Statement and Assumptions, Statement and Conclusions, Syllogism

Module-4: Advanced Data Interpretation level-IV

Newspaper reading: The Hindu & Economic Times

Text Books

1. The Oxford Handbook of Tax System in India: An Analysis of Tax Policy and Governance (Oxford Handbooks) by Mahesh C. Purohit, Vishnu Kanta Purohit
2. Taxation of Income From Non Resident Indian under Direct Tax Law - 2019 Edition by Ram Dutt Sharma

References

1. Marketing Management | marketing cases in the Indian context | Fifteenth Edition | By Pearson by Philip Kotler, Keven Lane Keller
2. A Modern Approach to Logical Reasoning, by R.S. Aggarwal

INT401	Mini Project-II	0L:0T:4P	2 credits
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Guidelines:

1. The mini-project is a team activity having 3-4 students in a team. This is electronic product design work with a focus on electronic circuit design.
2. The mini project may be a complete hardware or a combination of hardware and software. The software part in mini project should be less than 50% of the total work.
3. Mini Project should cater to a small system required in laboratory or real life.
4. It should encompass components, devices, analog or digital ICs, micro controller with which functional familiarity is introduced.

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5. After interactions with course coordinator and based on comprehensive literature survey/ need analysis, the student shall identify the title and define the aim and objectives of mini-project.
6. Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and submit the proposal within first week of the semester.
7. The student is expected to exert on design, development and testing of the proposed work as per the schedule.
8. Art work and Layout should be made using CAD based PCB simulation software. Due considerations should be given for power requirement of the system, mechanical aspects for enclosure and control panel design.
9. Completed mini project and documentation in the form of mini project report is to be submitted at the end of semester.

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Fifth Semester							
Theory							
SI No.	Type	Subject Code	Topic	L	T	P	Credit Points
1	EC	ECC501	Electromagnetic Waves	3	0	0	3
2	EC	ECC502	Digital Signal Processing	3	0	0	3
3	EC	ECC503	Computer Architecture	3	0	0	3
4	ECEL	ECC504	Program Elective:	2	0	0	2
			A. Bio-Medical Electronics				
			B. Information Theory and Coding				
			C. Scientific Computing				
			D. CMOS Design				
5	OE	OEC505	Open Elective	2	0	0	2
			A. Probability Theory and Stochastic Processes				
			B. Cyber Law & Intellectual Property Rights				
			C. Artificial Intelligence & Expert Systems				
6	MC	MC501	Disaster Management	0	0	0	0
7	HS	GSC505	Essentials studies for Professionals V	3	0	0	2
8		NPT501	NPTEL				2
			Total Credits (Theory)				17
## NPTEL courses are based on the respective year’s offered course							
Practical							
SI No.	Type	Subject Code	Topic	L	T	P	Credit Points
1	EC	ECC591	Electromagnetic Waves Lab	0	0	2	1
2	EC	ECC592	Digital Signal Processing Lab	0	0	2	1
3	EC	ECC593	Computer Architecture Lab	0	0	2	1
4	ECP	INT501	Internship/Mini Project-III	0	0	2	1
5	ES	OEC581	Circuit Design using SPICE (Sessional)	1	0	3	2
			Total Credits (Practical)				6
			Total Credits (Semester)				23

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ECC501	Electromagnetic Waves	3L:0T:0P	3 credits
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Transmission Lines- 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.

Maxwell's Equations- Basics of Vectors, Vector calculus, Basic laws of Electromagnetics, Maxwell's Equations, Boundary conditions at Media Interface.

Uniform Plane Wave- Uniform plane wave, Propagation of wave, Wave polarization, Poincare's Sphere, Wave propagation in conducting medium, phase and group velocity, Power flow and Poynting vector, Surface current and power loss in a conductor

Plane Waves at a Media Interface- Plane wave in arbitrary direction, Reflection and refraction at dielectric interface, Total internal reflection, wave polarization at media interface, Reflection from a conducting boundary.

Wave propagation in parallel plane waveguide, Analysis of waveguide general approach, Rectangular waveguide, Modal propagation in rectangular waveguide, Surface currents on the waveguide walls, Field visualization, Attenuation in waveguide.

Radiation: Solution for potential function, Radiation from the Hertz dipole, Power radiated by hertz dipole, Radiation Parameters of antenna, receiving antenna, Monopole and Dipole antenna

Text/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, Prentice Hall

Course Outcomes:

At the end of this course students will demonstrate the ability to

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

ECC591: Electromagnetic Waves Lab

[0L:0T:2P 1 credit]

Hands-on experiments related to the course contents EC13

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ECC502	Digital Signal Processing	3L:0T:0P	3 credits
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Discrete time signals: Sequences; representation of signals on orthogonal basis; Sampling and reconstruction of signals; Discrete systems attributes, Z-Transform, Analysis of LSI systems, frequency Analysis, Inverse Systems, Discrete Fourier Transform (DFT), Fast Fourier Transform Algorithm, Implementation of Discrete Time Systems

Design of FIR Digital filters: Window method, Park-McClellan's method. Design of IIR Digital Filters: Butterworth, Chebyshev and Elliptic Approximations; Lowpass, Bandpass, Bandstop and High pass filters.

Effect of finite register length in FIR filter design. Parametric and non-parametric spectral estimation. Introduction to multirate signal processing.

Application of DSP.

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.

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Represent signals mathematically in continuous and discrete time and frequency domain
2. Get the response of an LSI system to different signals
3. Design of different types of digital filters for various applications

ECC592: Digital Signal Processing Laboratory

[0L:0T:2P 1 credit]

Hands-on experiments related to the course contents EC17

ECC504	Computer Architecture	3L:0T:0P	3 credits
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Basic Structure of Computers, Functional units, software, performance issues software, machine instructions and programs, Types of instructions, Instruction sets: Instruction formats, Assembly language, Stacks, Ques, Subroutines.

Processor organization, Information representation, number formats.

Multiplication & division, ALU design, Floating Point arithmetic, IEEE 754 floating point formats

Control Design, Instruction sequencing, Interpretation, Hard wired control - Design methods,

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and CPU control unit. Microprogrammed Control - Basic concepts, minimizing microinstruction size, multiplier control unit. Microprogrammed computers - CPU control unit

Memory organization, device characteristics, RAM, ROM, Memory management, Concept of Cache & associative memories, Virtual memory.

System organization, Input - Output systems, Interrupt, DMA, Standard I/O interfaces

Concept of parallel processing, Pipelining, Forms of parallel processing, interconnect network

Text/Reference Books:

1. V.Carl Hammacher, "Computer Organisation", Fifth Edition.
2. A.S.Tanenbum, "Structured Computer Organisation", PHI, Third edition
3. Y.Chu, "Computer Organization and Microprogramming", II, Englewood Chiffs, N.J., Prentice Hall Edition
4. M.M.Mano, "Computer System Architecture", Edition
5. C.W.Gear, "Computer Organization and Programming", McGraw Hill, N.V. Edition
6. Hayes J.P, "Computer Architecture and Organization", PHI, Second edition

Course Outcomes

At the end of this course students will demonstrate the ability to

1. learn how computers work
 2. know basic principles of computer's working
 3. analyze the performance of computers
 4. know how computers are designed and built
 5. Understand issues affecting modern processors (caches, pipelines etc.).
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