SCHOOL OF ENGINEERING
SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES
Outcome based Curriculum for
Undergraduate Degree Courses in Engineering & Technology
Department of Electronics and Communication Engineering

SEMESTER -V

ECA-501

Computer Architecture

ECA-501	**Computer Architecture**	**2L:1T:0P**	**3 credits**	**3Hrs/Week**

Course Preambles:
To understand the structure, function and characteristics of computer systems. To understand the design of the various functional units and components of computers. To identify the elements of modern instructions sets and their impact on processor design.

Course Outcomes:

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.).

UNIT-I (10H)

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.

UNIT-II (6H)

Processor organization, Information representation, number formats.

UNIT-III (10H)

Multiplication & division, ALU design, Floating Point arithmetic, IEEE 754 floating point formats Control Design, Instruction sequencing, Interpretation, Hard wired control - Design methods, and CPU control unit.

UNIT-IV (10H)

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.

UNIT-V(6H)

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

ECA-501	**Computer Architecture**	**0L:0T:2P**	**1 credits**	**2Hrs/Week**

Experiment List-

1. Write the working of 8085 simulator GNUsim8085 and basic architecture of 8085 along with small introduction.

2. Study the complete instruction set of 8085 and write the instructions in the instruction set of 8085 along with examples.

3. Write an assembly language code in GNUsim8085 to implement data transfer instruction.

4. Write an assembly language code in GNUsim8085 to store numbers in reverse order in memory location.

5. Write an assembly language code in GNUsim8085 to implement arithmetic instruction.

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ECA-502

Digital Signal Processing

ECA-502	**Digital Signal Processing**	**2L:1T:0P**	**3 Credits**	**3Hrs/Week**

Course Preambles:
The primary objective of this course is to provide a thorough understanding and working knowledge of design, implementation and analysis DSP systems**.**

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

Unit-I(10H)
Introduction to Digital Signal Processing, Discrete time signals & systems, linear shift invariant systems, stability and causality, Linear-constant coefficient difference equations, Frequency domain representation of discrete time signals and systems, properties of the Discrete Time Fourier transform (DTFT), Sampling and discrete time processing of continuous-time signals.

Unit-II(10H)
Applications of z-transforms, solution of difference equations of digital filters, System function, stability criterion, frequency response of stable systems, one sided Z-transform and its applications.

Unit-III(10H)
Discrete Fourier series: Properties of discrete Fourier series, DFS representation of periodic sequences. Discrete

Fourier Transforms: Properties of DFT: Fast Fourier Transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms. Inverse FFT.

Unit-IV (6H)
IIR DIGITAL FILTERS: Analog filter approximations - Butterworth and Chebyshev, Design of

IIR Digital filters from analog filters, Bilinear transformation method, step & impulse invariance techniques, Spectral Transformations, Realization of IIR digital filters - direct, canonic, cascade & parallel forms.

Unit-V(6H)

FIR DIGITAL FILTERS: Characteristics of FIR Digital Filters frequency response, Design of FIR Digital Filters using Window Techniques. Comparison of IIR and FIR filters, Realization of FIR digital filters direct, linear phase, cascade & parallel forms.

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 andW.S.Hodgkiss, Digital Signal Processing, John Wiley& Sons, 1988.

ECA-502	Digital Signal Processing	0L:0T:2P	1Credits	2Hrs/Week

List of Experiments (Extendable)

1. Generation, analysis and plots of discrete-time signals.

2. Implementation of operations on sequences (addition, multiplication, scaling, shifting, folding

3. Implementation of Linear time-invariant (LTI) systems and testing them for stability and causality.

4. Computation and plots of z-transforms, verification of properties of z-transforms.

5. Computation and plot of DFT of sequences, verification of properties of DFT.

6. Implementation of various window design techniques (Rectangular, Bartlett, Hann, Hamming
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ECA-503
CMOS Design

ECA-503	CMOS Design	2L:1T:0P	3 Credits	3Hrs/Week

Course Preambles:

1. To learn basic CMOS Circuits.
2. To learn CMOS process technology.
3. To learn techniques of chip design using programmable devices.
4. To learn the concepts of designing VLSI Subsystems.

Course Outcomes:
At the end of the course the students will be able to
1. Design different CMOS circuits using various logic families along with their circuit layout.
2. Use tools for VLSI IC design.

UNIT-I(6H)

Review of MOS transistor models, Non-ideal behavior of the MOS Transistor.

UNIT-II (10H)

Transistor as a switch. Inverter characteristics, Integrated Circuit Layout: Design Rules, Parasitics. Delay: RC Delay model, linear delay model, logical path efforts.

UNIT-III (6H)
Power, interconnect and Robustness in CMOS circuit layout.

UNIT-IV (10H)
Combinational Circuit Design: CMOS logic families including static, dynamic and dual rail logic.

UNIT-V (10H)
Sequential Circuit Design: Static circuits. Design of latches and Flip-flops.

'Text/Reference Books:
1. N.H.E. Weste and D.M. Harris, CMOS VLSI design: A Circuits and Systems Perspective, 4thEdition, Pearson Education India, 2011.
2. C.Mead and L. Conway, Introduction to VLSI Systems, Addison Wesley, 1979.
List of Experiments:

1. Design Universal gates and all other gates using S-edit and getting its transient response
2. Obtain the DC- characteristics of CMOS Inverter using DC-analysis.
3. Design Symbol of CMOS Inverter and using instances of its getting transient response.
4. Design Symbol of Universal gates and using instances of them getting transient response.
5. Design a Transmission gate using PMOS & NMOS by instance calling.
6. Design the Layout of NMOS and PMOS transistor.
7. Design the Layout of CMOS Inverter.

ECA-503	**CMOS Design**	**0L:0T:2P**	**1 Credits**	**2Hrs/Week**

LIST OF EXPERIMENTS

1 . Familiarization with MOS model parameters in PSPICE software.
2 . Simulation of MOS Inverter with different loadsusing PSPICE software.
3 .Simulation of CMOS Inverter for different parameters *Kn*, *Kp* as a design variablein PSPICE software.
4. Study of the switching characteristics of CMOS Inverter and find out noise margins.
5. Simulate CMOS amplifier using PSPICE software.

6. Layout design of a CMOS Inverter using any layout design tool.

7. Layout design of a 2-input CMOS NAND/NOR gate using any layout design tool.

Program Elective-I
ECA-504(A)
Power Electronics

ECA-504(A)	**Power Electronics**	**3L:1T:0P**	**4 Credits**	**4Hrs/Week**

Course Preambles:

1.To understand and acquire knowledge about various power semiconductor devices.

2.To prepare the students to analyze and design different power converter circuits.

Course Outcomes:
At the end of this course students will demonstrate the ability to
1. Build and test circuits using power devices such as SCR
2. Analyze and design controlled rectifier, DC to DC converters, DC to AC inverters,
3. Learn how to analyze these inverters and some basic applications.
4. Design SMPS.

UNIT-I(10H)

Characteristics of Semiconductor Power Devices: Thyristor, power MOSFET and IGBTTreatment
should consist of structure, Characteristics, operation, ratings, protections and thermal considerations. Brief introduction to power devices viz. TRIAC, MOS controlled thyristor (MCT), Power Integrated Circuit (PIC) (Smart Power), Triggering/Driver, commutation and snubber circuits for thyristor, power MOSFETs and IGBTs (discrete and IC based).Concept of fast recovery and schottky diodes as freewheeling and feedback diode.

UNIT-II(10H)

Controlled Rectifiers: Single phase: Study of semi and full bridge converters for R, RL, RLE and level loads. Analysis of load voltage and input current- Derivations of load form factor and ripple factor, Effect of source impedance, Input current Fourier series analysis of input current to derive input supply power factor, displacement factor and harmonic factor.

UNIT-III(10H)

Choppers: Quadrant operations of Type A, Type B, Type C, Type D and type E choppers, Control techniques for choppers – TRC and CLC, Detailed analysis of Type A chopper. Step up chopper. Multiphase Chopper.

UNIT-IV(6H)

Single-phase inverters: Principle of operation of full bridge square wave, quasi-square wave, PWM inverters and comparison of their performance. Driver circuits for above inverters and mathematical analysis of output (Fourier series) voltage and harmonic control at output of inverter (Fourier analysis of output voltage). Filters at the output of inverters, Single phase current source inverter.

UNIT-V(6H)

Switching Power Supplies: Analysis of fly back, forward converters for SMPS, Resonant converters - need, concept of soft switching, switching trajectory and SOAR, Load resonant converter – series loaded half bridge DC-DC converter. Applications: Power line disturbances, EMI/EMC, power conditioners. Block diagram and configuration of UPS, salient features of UPS, selection of battery and charger ratings, sizing of UPS. Separately excited DC motor drive. P M Stepper motor Drive.

Text /Reference Books:

1. Muhammad H. Rashid, “Power electronics” Prentice Hall of India.
2. Ned Mohan, Robbins, “Power electronics”, edition III, John Wiley and sons.
3. P.C. Sen., “Modern Power Electronics”, edition II, Chand& Co.
4. V.R.Moorthi, “Power Electronics”, Oxford University Press.
5. Cyril W., Lander,” Power Electronics”, edition III, McGraw Hill.
6. G K Dubey, S R Doradla,: Thyristorised Power Controllers”, New Age International Publishers. SCR manual from GE, USA.

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ECA-504(B) Nano Electronics

ECA-504(B)	**Nano Electronics**	**3L:1T:0P**	**4 Credits**	**4Hrs/Week**

Course Preambles:

The major objectives are to provide students with knowledge and understanding of nano-electronics as an important interdisciplinary subject.

Course Outcomes:
At the end of the course, students will demonstrate the ability to:
1. Understand various aspects of nano-technology and the processes involved in making nano components and material.
2. Leverage advantages of the nano-materials and appropriate use in solving practical problems.
3. Understand various aspects of nano-technology and theprocesses involved in making nano components and material.
4. Leverage advantages of the nano-materials and appropriate use in solving practical problems.

UNIT-I(10H)

Introduction to nanotechnology, meso structures,Basics of Quantum Mechanics: Schrodinger equation, Density of States.

UNIT-II(10H)

Particle in a box Concepts, Degeneracy. Band Theory of Solids. Kronig-Penny Model. Brillouin Zones.

UNIT-III(10H)

Shrink-down approaches: Introduction, CMOS Scaling, The nanoscale MOSFET, Finfets, Vertical MOSFETs, limits to scaling, system integration limits (interconnect issues etc.).

UNIT-IV(6H)

Resonant Tunneling Diode, Coulomb dots, Quantum blockade, Single electron transistors, Carbon nanotube electronics, Band structure and transport, devices.

UNIT-V(6H)

Applications, 2D semiconductors and electronic devices, Graphene, atomistic simulation.

Text/ Reference Books:

1. G.W. Hanson, Fundamentals of Nanoelectronics, Pearson, 2009.
2. W. Ranier, Nanoelectronics and Information Technology (Advanced Electronic Materialand Novel Devices), Wiley-VCH, 2003.
3. K.E. Drexler, Nanosystems, Wiley, 1992.
4. J.H. Davies, The Physics of Low-Dimensional Semiconductors, Cambridge University Press, 1998.
5. C.P. Poole, F. J. Owens, Introduction to Nanotechnology, Wiley, 2003

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ECA-504(C) Neural Network

ECA-504(C)	**Neural Network**	**3L:1T:0P**	**4 Credits**	**4Hrs/Week**

Course Preambles: Introduce major deep learning algorithms, the problem setting and their applications to solve real world problems.

Course Outcomes:

1. Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.
2. Implement deep learning algorithms and solve real-world problems.

UNIT-I (10H)

Introduction: Various paradigms of earning problems, Perspectives and Issues in deep learning framework, review of fundamental learning techniques.
Feedforward neural network: Artificial Neural Network, activation function, multi-layer neural network.

UNIT-II (10H)

Training Neural Network: Risk minimization, loss function, backpropagation, regularization, model selection, and optimization.

UNIT-III (10H)

Conditional Random Fields: Linear chain, partition function, Markov network, Belief propagation, Training CRFs, Hidden Markov Model, Entropy.

UNIT-IV (6H)

Deep Learning: Deep Feed Forward network, regularizations, training deep models, dropouts, Convolutional Neural Network, Recurrent Neural Network, Deep Belief Network.

UNIT-V (6H)

Probabilistic Neural Network: Hopfield Net, Boltzman machine, RBMs, Sigmoid net, Autoencoders.
Deep Learning research: Object recognition, sparse coding, computer vision, natural language processing.
Deep Learning Tools: Caffe, Theano, Torch.

Reference Books

R1. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
R2. Golub, G.,H., and Van Loan,C.,F., Matrix Computations, JHU Press,2013.
R3. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

ECA-505(A) Scientific computing

ECA-504(A)	**Scientific computing**	**3L:1T:0P**	**4 Credits**	**4Hrs/Week**

Course Preambles: 1. To make students familiar with the concepts of programming and the get them accustomed with high-level languages like Matlab, Mathematica, etc.

Course Outcomes: After this course the student should be able to understand simple mathematical models and scientific problems (such as finite capacity growth models, plotting a line through data points, etc.) and implement a solution in an adequate scientific programming language (such as matlab, mathematica).

UNIT-I(10H)

- Introduction to scientific computing.
- Representing numbers in a computer: scalar data types;
- Variables and constants: guidelines for variable names.

UNIT-II (10H)

- Assignment statements: mathematical and logical operators;
- Keyboard input and screen output; • Writing a simple, linear program.
- Conditional statements; arrays and subscripts; loops. File 110; plotting;

UNIT-III (10H)

- Functions and subroutines.
- Program design; writing well structured programs; debugging techniques.
- Scientific applications of computer programs; Introduction to Matlab

UNIT-IV(6H)

- Solving nonlinear equations
- Numerical integration;
- Data analysis, plotting and smoothing;

UNIT-V (6H)

- Simulating simple physical, chemical and/or mathematical systems.
- Simulation: the simple programming approach to difference equations.
- Differential Equations

References

1. J. von zur Gathen and J. Gerhard. Modern Computer Algebra. Cambridge University Press, 3rd ed., 2013. ISBN 9781107039032

2. J.A. Storer. An Introduction to Data Structures and Algorithms. Springer, 2002 ISBN 978-1-4612-0075-8

3. D.Sankoff, J.Kruskal. Time Warps, String Edits, and Macromolecules.. The Theory and Practice of Sequence Comparison (CSLI Pub., 1999) ISBN 9781575862170

ECA-505(B)
Data Compression & Cryptography

ECA-505(B)	**Data Compression & Cryptography**	**3L:1T:0P**	**4 Credits**	**4 Hrs/Week**

Course Preambles:
This course will cover the concept of security , types of attack experienced, encryption and authentication for deal with attacks, what is data compression, need and techniques of data compression

Course Outcomes
At the end of this course the student will have the knowledge of Plaintext, cipher text, RSA and other cryptographic algorithm, Key Distribution, Communication Model, Various models for data compression

Unit-I (10H)
Introduction to the Concept of Security: Introduction, The Need of Security, Security Approaches, Principal of Security, Types of Attacks.

Unit- II (10H)
Cryptographic Techniques: Introduction, Plain Text and Cipher Text, Substitution Techniques, Transposition Techniques, Encryption and decryption, Symmetric and Asymmetric Key Cryptography, Steganography, Key Range and Key Size, Possible Types of Attacks .

Unit-III (10H)
Computer-based Symmetric Key Cryptographic Algorithms: Introduction, Algorithm Types and Models, An Overview of Symmetric Key Cryptography, Data Encryption Standard(DES), International Data Encryption Algorithm(IDEA), RC5, Blowfish, Advanced Encryption Standard(AES), Differential and Linear Cryptanalysis.

Unit- IV (6H)
Computer-based Asymmetric Key Cryptographic Algorithms: Introduction, Brief History of Asymmetric Key Cryptography, An Overview of Asymmetric Key Cryptography, The RSA Algorithm, Symmetric and Asymmetric Key Cryptography Together, Digital Signatures, Knapsack Algorithm, Some other Algorithms.

Unit- V (6H)
Public Key Infrastructure (PKI): Introduction, Digital Certificates, Private Key

Management, The PKIX Model, Public Key Cryptography standard(PKCS), XML, PKI and Security .

References: 1.Behrouz A. Forouzan and D. Mukhopadhyay- Cryptography & Network Security, 2nd Edition - 1 st reprint 2010, McGraw Hill, New Delhi.

2.WadeTrapple, Lawrence C. Washington- Introduction to Cryptography with coding Theory, 2nd Edition pearson Education.

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ECA-505(C)
Operating System

ECA-505(C)	**Operating System**	**3L:1T:0P**	**4 Credits**	**4Hrs/Week**

Course Preambles:

1. To learn the fundamentals of Operating Systems.
2. To learn the mechanisms of OS to handle processes and threads and their communication
3. To learn the mechanisms involved in memory management in contemporary OS

Course Outcomes

Students will be able to:

1. Analyze the structure of OS and basic architectural components involved in OS design
2. Analyze and design the applications to run in parallel either using process or thread models of different OS
3. Analyze the various device and resource management techniques for timesharing and distributed systems

UNIT I (10H)

Introduction:- History of operating System, Types of Operating System: Batch Processing, RealTime, Multitasking & Multiprogramming, Time-sharing system, Operating system services,Operating system structure, System Call & System Boots, Operating system design &Implementations, System protection, Buffering & Spooling.

UNIT II (10H)

Processes Management:- The Process concept, The process control block, Systems programmer'sview of processes, Operating system services for process management, Scheduling algorithms, FirstCome first serve, Round Robin, Shortest run time next, Highest response ratio next, MultilevelFeedback Queues, Performance evaluation of scheduling algorithms stated above.

UNIT III (10H)

Deadlock:- Characterization, Methods for deadlock handling, deadlock prevention, deadlockavoidance, deadlock detection, recovery from deadlock, Process Management in Linux.File Management:- File system, access methods, free space managements, allocation methods,directory systems, protection, organization,sharing& implementation issues, Disk & DrumScheduling, File system in Linux & Windows

UNIT IV (6H)

I/O Management:- I/0 devices organization, I/0 devices organization, I/0 buffering, I/O Hardware,Kernel I/O subsystem, Transforming I/O request to hardware operations.Device Management:- Path managements, Sub module, Procedure, Scheduler, Handler, InterruptService Routine.

UNIT V (6H)

Memory Management:- Memory Hierarchy, MFT & MVT, logical and physical address space,Concept of swapping and Paging, Memory management without swapping or paging, contiguousand non-contiguous allocation, segmentation, demand paging, page replacement algorithms,allocation of frames, thrashing, demand segmentation and paging combined with segmentation.Structure& implementation of Page table, Virtual memory, Cache Memory Organization.

REFERENCES:

1. Silberschatz ,"Operating system", Willey Pub.
2. Stuart,"Operating System Principles, Design & Applications",Cengage Learning.
3. Tannanbaum, "Modern opera
ting system",PHI Learning

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Industrial Training-I
ECA-506

ECA-506	**Industrial Training-I**	**0L:0T:4P**	**2 credits**	**4Hrs/Week**

Course Preamble:

1. To expose the students to actual working environment of Electronics engineering and enhance their knowledge and skill from what they have learned in the classes.
2. Another purpose of this program is to instill the good qualities of integrity, responsibility and self-confidence.
3. To persue students with the electrical field ethics and rules in terms of the society.

Course Outcomes:

Ability to communicate efficiently. Acquired to be a multi-skilled engineer with good technical knowledge of electrical and electronics components and their processing, management, leadership and entrepreneurship skills. Ability to identify, formulate and model problems and find engineering solution based on a systems approach.

Students must observe following points to enrich their learning in electrical engineering during industrial training:

- Industrial environment and work culture.
- Organizational structure and inter personal communication.
- Machines/ equipment/ instruments - their working and specifications.
- Product development procedures and phases.
- Project planning, monitoring and control.
- Quality control and assurance.
- Maintenance system.
- Costing system.
- Stores and purchase systems.
- Roles and responsibilities of different categories of personnel.
- Customer services.

-Problems related to various areas of Work etc.

- Layout if any

To be submitted : The students has to submit the power point presentation of minimum15 slides of the training performed(comprising of points stated above) along with the original certificate of training performed with proper seal and signature of the authorized person.

Scheme of Studies:

Duration: Minimum 2 weeks in summer break after IV semester, assessment to be done in V Semester

Scheme of Examination:

For the assessment of industrial training undertaken by the students, following components are considered with their weightage.

(a) Term Work in Industry Marks Allotted

Attendance and General Discipline 20
Daily diary Maintenance 20
Initiative and participative attitude during training 30
Assessment of training by Industrial Supervisor 30

Total 100*

(b) Practical/Oral Examination (Viva-Voce) in Institution Marks Allotted
1. Training Report 50
2. Seminar and cross questioning (defense) 100

Total 150

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* - Marks of various components in industry should be awarded by the I/c of training in Industry but in special circumstances if not awarded by the industry then faculty in charge /T.P.O. will give the marks.

During training students will prepare a first draft of training report in consultation with section In charge. After training they will prepare final draft with the help of T.P.O. /Faculty of the Institute. Then they will present a seminar on their training and they will face viva-voce on training in the Institute