MCKV INSTITUTE OF ENGINEERING

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Approved by AICTE & affiliated to Maulana Abul Kalam Azad University of Technology, West Bengal
243 G.T. Road (N), Liluah, Howrah- 711204, West Bengal, India
Ph: +91 33 26549315/17 Fax +91 33 26549318 Web: www.mckvie.edu.in

Curriculum for Undergraduate Degree (B.Tech.) in Electronics and Communication (VLSI Design) (w.e.f. AY: 2020-21)

Part III: Detailed Curriculum

Seventh Semester

Course Name:	**Embedded Systems**		
Course Code:	PC-EC(V)701	**Category:**	Professional Core
Semester:	Seventh	**Credit:**	3
L-T-P:	3-0-0	**Pre-Requisites:**	Computer Architecture
Full Marks:	100		
Examination Scheme:	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

Course Objectives:	
1	Illustration of different embedded system and its purpose.
2	Describe the concepts of different architecture required for an embedded system
3	Impart the knowledge of different components required for an embedded system
4	To develop an insight about the Program Modeling Concepts and Operating system concepts for design of an simple embedded systems

Course Contents:		
Module No.	**Description of Topic**	**Contact Hrs.**
1	Introduction to Embedded System: Introduction to Embedded Systems and Computer Systems Terminology. Embedded system vs General computing systems, History of Embedded systems, Purpose of Embedded systems. Modular approach to Embedded System Design using Six-Box model: Input devices, output devices, embedded computer, communication block, host and storage elements and power supply. Microprocessor and Microcontroller, Hardware architecture of the real time systems.	8
2	Microcontroller Based Embedded System Design. Salient Features of Modern Microcontrollers. Elements of Microcontroller Ecosystem and their significance. Introduction to ARM microcontroller: Architecture of ARM Embedded microcontroller.	8

3	Operating Systems: Operating system basics, Tasks, Process and Threads, Multiprocessing and multitasking, task communication, task synchronization, qualities of good RTOS. Real Time Operating Systems : Different types of RTOS, Qualities of Good RTOS Real time Scheduling Algorithms Rate monotonic, Earliest Deadline First (EDF).	10
4	I/O types, serial and parallel communication devices, wireless communication devices, timer and counting devices, watchdog timer, real time clock, serial bus communication protocols, parallel communication network using ISA, PCI, PCT-X, Internet embedded system network protocols, USB, Bluetooth.	8
5	Program Modeling Concepts: Fundamental issues in Hardware software co-design, Hardware Software trade-offs DFG model, state machine programming model, model for multiprocessor system.	6
Total		**40**

Course Outcomes:	
After completion of the course, students will be able to:	
1	Describe about different embedded system and its purpose.
2	Explain the different architecture required for an embedded system
3	Analyze the different components required for an embedded system
4	Apply the Program Modeling Concepts and Real time Operating system concepts for design of an simple embedded system

Learning Resources:	
1	Embedded System Design: A Unified Hardware / Software Introduction. Tony Givargis and Frank Vahid. Wiley. ISBN-10: 812650837X
2	Embedded Systems: An Integrated Approach LyLa B. Das,Pearson Education India, 2012, ISBN 9332511675, 9789332511675
3	Intro To Embedded Systems , Shibu, McGraw-Hill Education (India) Pvt Limited ISBN 007014589X, 9780070145894
4	Embedded systems: architecture, programming and design ,Raj Kamal ,McGraw-Hill, 2003 ISBN 0070494703, 9780070494701
5	Embedded System Design, SantanuChattopadhyay, PHI Learning (2/e)

Course Name:	**VLSI Design Automation**		
Course Code:	PE-EC(V)701A	**Category:**	Professional Elective
Semester:	Seventh	**Credit:**	3
L-T-P:	3-0-0	**Pre-Requisites:**	Microelectronics and Integrated Circuit Fabrication
Full Marks:	100		
Examination Scheme:	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

Course Objectives:	
1	Describe the concepts of VLSI design and methodology.
2	To impart the knowledge of the circuits for partitioning and placement.
3	Illustrate the concept of floor-planning and routing for VLSI Circuits
4	To develop an insight about the VLSI Simulation and synthesis of circuits.

Course Contents:		
Module No.	**Description of Topic**	**Contact Hrs.**
1	Introduction to VLSI Design methodologies: Review of Data structures and algorithms - Review of VLSI Design automation tools - Introduction to VLSI Design methodologies: Algorithmic Graph Theory and Computational Complexity - Tractable and Intractable problems - general purpose methods for combinatorial optimization	8
2	Layout Compaction, Placement & Partitioning :Layout Compaction: Design rules - problem formulation - algorithms for constraint graph compaction Layout Compaction, Placement & Partitioning :Placement & Partitioning: Circuit representation - Placement algorithms -partitioning	8
3	Floor planning & Routing :Floor planning concepts: Terminologies, floorplan representation, shape functions and floorplan sizing Floor planning & Routing : Routing: Types of local routing problems - Area routing - channel routing -global routing - algorithms for global routing.	8
4	VLSI Simulation :Gate-level modeling and simulation - Switch-level modeling and simulation – Combinational Logic Synthesis - VLSI Simulation :Binary Decision Diagrams - Two Level Logic Synthesis- High level Synthesis	8
5	High Level Synthesis Hardware models - Internal representation - Allocation assignment and scheduling – High Level Synthesis Simple scheduling algorithm - Assignment problem – High level transformations	8
Total		**40**

Course Outcomes:	
After completion of the course, students will be able to:	
1	Discuss the concepts of VLSI design and methodology.
2	Analyze the circuits for partitioning and placement.
3	Apply the concept of floor-planning and routing for VLSI Circuits
4	Illustrate and analyze VLSI Simulation and synthesis of circuits.

Learning Resources:	
1	S.H. Gerez, "Algorithms for VLSI Design Automation", John Wiley & Sons, 2002.
2	N.A. Sherwani, "Algorithms for VLSI Physical Design Automation", Kluwar Academic Publishers, 2002

Course Name:	**Nano Electronics**		
Course Code:	PE-EC(V)701B	**Category:**	Professional Elective
Semester:	Seventh	**Credit:**	3
L-T-P:	3-0-0	**Pre-Requisites:**	Engineering Physics, Basic Electrical & Electronics ES-EE 101, Electron Devices PE-EC (V) 501A
Full Marks:	100		
Examination Scheme:	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

Course Objectives:	
1	To impart basic concept of semiconductor nano structure
2	To impart knowledge about nano scale device fabrication.
3	To understand the different characterization techniques of nano devices.
4	To understand the Quantum well and charge transportation in nano structures
5	To develop an insight into the construction and working of hetero structures semiconductor devices.

Course Contents:		
Module No.	**Description of Topic**	**Contact Hrs.**
1	Introduction to nanotechnology, Impacts, Limitations of conventional microelectronics, Trends in microelectronics and optoelectronics. Mesoscopic physics, trends in microelectronics and optoelectronics, characteristic lengths in mesoscopic systems, Quantum mechanical coherence, Schrodinger's Equation, wave function. Low dimensional structures Quantum wells, wires and dots, Density of states and dimensionality. Basic properties of two dimensional semiconductor nanostructures, square quantum wells of finite depth, parabolic and triangular quantum wells, Quantum wires and quantum dots, carbon nano tube, grapheme.	7
2	Introduction to methods of fabrication of nano-layers, different approaches, physical vapour deposition, chemical vapour deposition. Molecular Beam Epitaxy, Ion Implantation, Formation of Silicon Dioxide- dry and wet oxidation methods. Fabrication of nano particle- grinding with iron balls, laser ablation, 15 reduction methods, sol gel, self assembly, precipitation of quantum dots.	6
3	Introduction to characterization of nanostructures, tools used for of nano materials characterization, microscope-optical, electron, and electron microscope. Principle of operation of Scanning Tunnelling Microscope, Atomic Force Microscope, Scanning Electron microscope, Specimen interaction. Transmission Electron Microscope. X-Ray Diffraction analysis, PL & UV Spectroscopy, Particle size analyser.	6
4	MOSFET structures, Heterojunctions. Quantum wells, modulation doped quantum wells, multiple quantum wells. The concept of super lattices Kronig - Penney model of super lattice.	6
5	Transport of charge in Nanostructures under Electric field - parallel transport, hot electrons, perpendicular transport. Quantum transport in nanostructures, Coulomb blockade. Transport of charge in magnetic field - Effect of magnetic field on a crystal. Aharonov-Bohm effect, the Shubnikov-de Hass effect, the quantum Hall effect.	7
6	Nanoelectonic devices- MODFETS, heterojunction bipolar transistors. Resonant tunnel effect, RTD, RTT, Hot electron transistors. Coulomb blockade effect and single electron transistor, CNT transistors. Heterostructure semiconductor laser. Quantum well laser, quantum dot LED, quantum dot laser. Quantum well optical modulator, quantum well sub band photo detectors, principle of NEMS.	8
Total		**40**

Course Outcomes:	
After completion of the course, students will be able to:	
1	Explain the concept of nano electronics.
2	Explain different fabrication and characterization techniques for nano devices.
4	Analyze heterostructure semiconductor devices.

Learning Resources:	
1	J.M. Martinez-Duart, R.J. Martin Palma, F. Agulle Rueda Nanotechnology for Microelectronics and optoelectronics , Elsevier, 2006
2	W.R. Fahrner, Nanotechnology and Nanoelctronics, Springer, 2005
3	Chattopadhyay, Banerjee, Introduction to Nanoscience & Technology, PHI 2012
4	Poole, Introduction to Nanotechnology, John Wiley 2006.
5	Supriyo Dutta, Quantum Transport- Atom to transistor, Cambridge, 2013.
6	George W. Hanson, Fundamentals of Nanoelectronics, Pearson Education, 2009.

Course Name:	**Web Technology**			
Course Code:	OE-IT701F	**Category:**	Open Elective	
Semester:	Seventh	**Credit:**	3	
L-T-P:	3-0-0	**Pre-Requisites:**	ES-CS201(Programming for Problem Solving)	
Full Marks:	100			
Examination Scheme:	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05	

Course Objectives:	
1	To learn the basic tags of HTML.
2	To learn the principles of Object Orientated Programming.
3	To build an application using Java standalone application & Java applet

Course Contents		
Module No.	**Description of Topic**	**Contact Hrs.**
1	Web Development: HTML, Structure, Tags, Lists, Table, Link and it's types ,Images, Form, Frame, Style sheets and it's type	4
2	Introduction to Java: Java and Java applications, Java Virtual Machine(JVM), Java Runtime Environment(JRE)Java Development Kit(JDK,) Byte code, Java characteristics, Object oriented Programming, Simple java programs, Data types, Operators, Expressions, control statements, Selection statements, Iteration	4

	statements, Jump statements	
3	Classes, Inheritance : Classes in java, Declaring a class, Creating instances of class, Constructors, Argument Passing, use of static keyword, Innner class. Method overloading, Inheritance, use of super keyword ,Method overriding, Abstract class, Dynamic method dispatch, use of final keyword	5
4	Interface, Package: Package, Access control mechanism, Interface, Dynamic Method look up	2
5	Exception Handling: Java Exception Handling Mechanism, try, catch, throw, throws and finally, Exception types, Built in Exceptions: checked and unchecked exceptions, User defined Exceptions	4
6	String Handling: String and String Buffer, Constructors, String operations : character extractions, String comparisons, searching, strings, modifying a string. To String() and valueOf() methods, String Buffer operations	2
7	Java I/O Stream: I/O basics, Byte stream, Character stream, Reading console input, Writing console output, Reading and writing files	2
8	Java Utility package: Collection overview, Collection interfaces, Collection classes: ArrayList, LinkedList, Accessing a collection using, iterator and for-Each statement	4
9	Applet: Applet class, Applet architecture, Applet Skeleton, Life cycle methods, setForeground() and set Bachground()methods, Using the status window,HTML Applet tag, Passing parameters to an applet, GetCodebase() and Get Documentbase() methods.	4
10	Event Handling and AWT: Delegation Event Model, Event classes, Sources of Events, Event Listener interfaces,Event handling using adapter class, Inner and anonymous class, AWT classes: Label,Button,TextField etc.	4
	Total	**35**

Course Outcomes:	
After completion of the course, students will be able to	
1	design good web pages using different tags, tables, forms, frames and style sheets supported by HTML.
2	implement, compile, test and run Java programs, comprising more than one class, to address a particular software problem.
3	demonstrate the ability to employ various types of selection statements and iteration statements in a Java program.
4	be able to leverage the object-oriented features of Java language using abstract class and

	interface.
5	be able to handle errors in the program using exception handling techniques of Java.
6	design applets as per the requirements with event handling facility.

Learning Resources:	
1	Java-The Complete Reference,Herbert Schildt, 9th Edition, McGraw Hill Education 2014
2	HTML- Complete Reference,Powell, 3rd Edition, TMH 2007
3	Core Java-An Integrated Approach, Dr. R.Nageswara Rao, Dreamtech 2015
4	Programming with Java, E Balagurusamy , McGraw Hill Education, 2019

Course Name:	**Cyber Security**		
Course Code:	OE-CS701E	**Category:**	Open Elective
Semester:	Seventh	**Credit:**	3
L-T-P:	3-0-0	**Pre-Requisites:**	Computer Network PE- EC(V)601A
Full Marks:	100		
Examination Scheme:	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

Course Objectives:	
1	To develop policies and procedures to manage enterprise security risk.
2	To comprehend different cyber governance and infrastructure issues
3	To provide technical leadership and service to their business, profession and society.

Course Contents:		
Module No.	**Description of Topic**	**Contact Hrs.**
1	**Introduction:** Cyber Security , Cyber Security Policy , Domain of Cyber Security Policy , law and Regulations, Enterprise Policy , Technology Operations ,Technology configuration, Strategy Versus Policy , Cyber Security Evolution. Productivity , Internet ,E commerce ,Counter Measures Challenges, Botnets.	10
2	**Cyber Security objectives and guidance:** Cyber Security Metrics, Security Management Goals, Counting Vulnerabilities, Security Frameworks, E Commerce Systems, Industrial Control Systems, Personal Mobile devices, Security policy Objectives, Guidance for Decision Makers, Tone at the top, policy as a project, Cyber Security Management, Arriving at goals, Cyber Security Documentation, The Catalog Approach, Catalo Format , Cyber Security Policy Taxonomy.	10

3	**Cyber Governance Issues:** Cyber Governance Issues, Net Neutrality, Internet Names and Numbers, Copyright and Trademarks, Email and Messaging. Cyber User Issues, Malvertising, Impersonation, Appropriate Use, Cyber Crime, Geo location, Privacy. Cyber Conflict Issues, Intellectual property Theft, Cyber Espionage Cyber Sabotage, Cyber Welfare.	10
4	**Cyber Infrastructure Issues:** Cyber Infrastructure Issues, economics, finance and banking, Health care, Industrial Control systems. Cyber insurance, cyber security in international relations.	6
Total		**36**

Course Outcomes:	
After completion of the course, students will be able to:	
1	Explain cyber security policy and E-commerce.
2	Explain cyber security management goal.
3	Describe different cyber governance issues.
4	Describe cyber infrastructure issues.

Learning Resources:	
1	Jennifer L. Bayuk, J. Healey, P. Rohmeyer, Marcus Sachs, Jeffrey Schmidt, Joseph Weiss "Cyber Security Policy Guidebook" John Wiley & Sons 2012.
2	Rick Howard "Cyber Security Essentials" Auerbach Publications 2011.
3	B.G Raggad, " Information Security Management", CRC Press, Taylor Francis, 2015

Course Name:	**Operations Research and Optimizing Technique**		
Course Code:	OE-M701A	**Category:**	Open Elective
Semester:	Seventh	**Credit:**	3
L-T-P:	3-0-0	**Pre-Requisites:**	School mathematics,BS-M101,BS-M201
Full Marks:	100		
Examination Scheme:	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

Course Objectives:	
1	To impart knowledge in concepts and tools of Operations Research
2	To understand mathematical models used in Operations Research
3	To apply these techniques constructively to make effective business decisions

Course Contents		
Module No.	**Description of Topic**	**Contact Hrs.**
1	**Solving Linear Programming Problems :** Formulation, Solving LPP : Using Simultaneous Equations and Graphical Method ; Simplex,Duality, Big-M method, Transpotation &Assignment,Travelling Salesman problem	11
2	**Game Theory** : Introduction ; 2- person Zero – sum Game; Saddle Point ; Mini-Max and Maxi-Min Theorems (statement only); Games without saddle point ; Graphical Method ; Principle of Dominance	7
3	**Queuing Theory :** Introduction ; Basic Definitions and Notations ; Axiomatic Derivation of the 7L Arrival & Departure (Poisson Queue). Pure Birth and Death Models; Poisson Queue Models : M/M/1 : ∞/FIFO and M/M/1: N/ FIFO.	6
4	. **Network Analysis :** Shortest Path : Floyd Algorithm ; Maximal Flow Problem (Ford-Fulkerson); PERT-CPM (Cost Analysis, Crashing, Resource Allocation excluded).	6
5	**Non-Linear Programming:** Integer Programming, Dynamic Programming.	6
Total		**36**

Course Outcomes:	
After completion of the course, students will be able to:	
1	Solve linear programming problems using appropriate techniques and optimization solvers, interpret the results obtained.
2	Determine optimal strategy for Minimization of Cost of shipping of products from source to Destination/ Maximization of profits of shipping products using various methods, Finding initial basic feasible and optimal solution of the Transportation problems
3	Optimize the allocation of resources to Demand points in the best possible way using

	various techniques and minimize the cost or time of completion of number of jobs by number of persons
4	Analyse competitive real-world phenomena using concepts from game theory. Analyse pure and mixed strategy games
5	Formulate Network models for service and manufacturing systems, and apply operations research techniques and algorithms to solve these Network problems

Learning Resources:	
1	H. A. Taha, "Operations Research", Pearson
2	P. M. Karak – "Linear Programming and Theory of Games", ABS Publishing House
3	Ghosh and Chakraborty, "Linear Programming and Theory of Games", Central Book Agency
4	Ravindran, Philips and Solberg - "Operations Research", WILEY INDIA
5	Kanti Swaroop — "Operations Research", Sultan Chand & Sons
6	Rathindra P. Sen—"Operations Research: Algorithms and Applications", PHI
7	R. Panneerselvam - "Operations Research", PHI
8	A.M. Natarajan, P. Balasubramani and A. Tamilarasi - "Operations Research", Pearson
9	M. V. Durga Prasad – "Operations Research", CENGAGE Learning
10	J. K. Sharma - "Operations Research", Macmillan Publishing Company

Course Name:	**Economics for Engineers**		
Course Code:	HM-HU701	**Category:**	**Category:** Management Science and Humanities courses
Semester:	Seventh	**Credit:**	3
L-T-P:	3-0-0	**Pre-Requisites:**	Mathematics
Full Marks:	100		
Examination Scheme:	Semester Examination: 70	Continuous Assessment: 25	Attendance: 05

Course Objectives:	
1	Understand the role and scope of Engineering Economics and the process of economic decision making along with the different concepts of cost and cost estimation techniques.
2	Familiarization with the concepts of cash flow, time value of money and different interest formulas
3	Appreciation of the role of uncertainty in future events and using different concepts from probability to deal with uncertainty
4	Depreciation and Replacement analysis along with their methods of calculation and

	familiarization with the phenomenon of inflation and the use of price indices in engineering Economics
5	Introduction to basic concepts of Accounting and Financial Management

Course Contents		
Module No.	**Description of Topic**	**Contact Hrs.**
1	Economic Decisions Making– Overview, Problems, Role, Decision making process. Engineering Costs & Estimation– Fixed, Variable, Marginal & Average Costs, Sunk Costs, Opportunity Costs, Recurring and Nonrecurring Costs, Incremental Costs, Cash Costs vs Book Costs, Life-Cycle Costs; Types Of Estimate, Estimating Models- Per-Unit Model, Segmenting Model, Cost Indexes, Power-Sizing Model, Improvement & Learning Curve, Benefits.	**9**
2	Cash Flow, Interest and Equivalence, Cash Flow Diagrams – Categories & Computations, Time Value of Money, Debt Repayment, Nominal and Effective Interest Rate. Cash Flow & Rate Of Return Analysis– Calculations, Treatment of Salvage Value, Annual Cash Flow Analysis, Analysis Periods; Internal Rate Of Return, Calculating Rate Of Return, Incremental Analysis; Best Alternative- Choosing an Analysis Method, Future Worth Analysis, Benefit-Cost Ratio Analysis, Sensitivity And Breakeven Analysis. Economic Analysis in the Public Sector- Quantifying and Valuing Benefits & drawbacks.	**9**
3	Present Worth Analysis: End-Of-Year Convention, Viewpoint of Economic Analysis Studies, Borrowed Money Viewpoint. Inflation And Price Change– Definition, Effects, Causes, Price Change With Indexes, Types of Index, Composite vs Commodity Indexes, Use of Price Indexes In Engineering Economic Analysis, Cash Flows that inflate at different Rates. Effect of Inflation & Deflation, Taxes, Economic Criteria, Applying Present Worth Techniques, Multiple Alternatives. Uncertainty in Future events - Estimates and their use in Economic Analysis, Range of estimates, Probability, Joint Probability Distributions, Expected Value, Economic Decision Trees, Risk versus Return analysis.	**9**
4	Depreciation- Basic Aspects, Deterioration & Obsolescence, Depreciation and Expenses, Types of Property, Depreciation Calculation Fundamentals, Depreciation and Capital Allowance Methods, Straight-Line Depreciation Declining Balance Depreciation, Common Elements of Tax Regulations for Depreciation and Capital Allowances. Placement Analysis: Decision Map, Minimum Cost Life of a New Asset, Marginal Cost, Minimum Cost Life Problem. Accounting – Function, Balance Sheet, Income Statement, Financial Ratios Capital Transactions, Cost Accounting, Direct and Indirect Costs, Indirect Cost Allocation.	**9**
Total		**36**

Course Outcomes:	
After completion of the course, students will be able to:	
1	Discuss fundamentals of economic analysis.
2	Describe rate of return and profitability analysis, Present, Future, Annuity, Risk and return, BEP and Sensitivity Analysis, Bayesian joint probability and quantitative decision making, basic accounting system and balance sheet and P & L accounts etc.
3	Apply decision making skills in terms of Economic, financial considerations in practice.
4	Apply knowledge to take right financial decision at the right point in time in real world situation.
5	Apply knowledge to take right financial decision at the right point in time in real world situation.

Learning Resources:	
1	James L.Riggs, David D. Bedworth, Sabah U. Randhawa : Economics for Engineers 4e, Tata McGraw-Hill
2	Donald Newnan, Ted Eschembach, Jerome Lavelle: Engineering Economics Analysis, OUP
3	R.PaneerSeelvan: Engineering Economics, PHI
4	Sullivan and Wicks: Engineering Economy, Pearson
5	Bhatia and Maheshwari, VIKASH Publishing.

Course Name:	**Embedded Systems lab**		
Course Code:	PC-EC(V)791	**Category:**	Professional Core
Semester:	Seventh	**Credit:**	1
L-T-P:	0-0-2	**Pre-Requisites:**	Basic Knowledge of Microcontroller Programming
Full Marks:	100		
Examination Scheme:	Semester Examination: 60	Continuous Assessment: 35	Attendance: 05

Course Objectives:	
1	To impart basic concept of Microcontroller programming.
2	To explain application area about 8051 and ATMEGA Microcontroller.
3	To understand the interfacing of different sensors with Microcontroller.

Course Contents		
Module No.	**Description of Topic**	**Contact Hrs.**
1.a) b)	Introduction to ATMEGA 328P Microcontroller. To glow LED in different pattern by using ATMEGA328P Microcontroller.	03
2	To control the brightness of LED.	03
3.a) b)	To interface LCD with ATMEGA Microcontroller Display different pattern in LCD.	03
4.a) b)	To interface water level sensor with the Microcontroller. Interface a DC Motor with the Microcontroller and drive it according to water level.	03
5.a) b)	To interface Temperature and Humidity sensor with the Microcontroller. Interface a DC Fan with the Microcontroller and drive it according to temperature.	03
6.	To interface ADC with 8051 Microcontroller	03
7.	To interface stepper motor with 8051 Microcontroller.	03
Total		**21**

Course Outcomes:	
After completion of the course, students will be able to:	
1	Illustrate & Execute Microcontroller program using ATMEGA kit and 8051 Microcontroller.
2	Apply the interface of LCD to microcontroller.
3	Apply the interface of different sensors to microcontroller.
4	Design and implement the knowledge of interfacing Motor to microcontroller.

Learning Resources:	
1	The 8051 Microcontroller, Kenneth J. Ayala, 1996, Penram International Publishing
2	The 8051 Microcontroller and Embedded Systems: Using Assembly and C, M. A. Mazidi, J. G. Mazidi and R D McKinlay, 2007, Pearson.

Course Name:	**Design Lab**		
Course Code:	PW-EC(V)781	**Category:**	Sessional
Semester:	Seventh	**Credit:**	2
L-T-P:	0-0-4	**Pre-Requisites:**	Analog and Digital Electronics, Analog and Digital VLSI
Full Marks:	100		
Examination Scheme:	Semester Examination: 30	Continuous Assessment: 60	Attendance: 10

Course Objectives:	
1	To impart the essential knowledge of VLSI circuit design.
2	To enhance hands-on experience in hardware/different EDA tools and to encourage innovativeness.

Course Contents		
Module No.	**Description of Topic**	**Contact Hrs.**
	A student has to perform at least any six of the following:	
1	Design of level shifter circuit.	8
2	Design of cascode current mirror circuit.	8
3	Design of frequency divider circuit.	8
4	Design of unity gain buffer circuit.	8
5	Design of Power on Reset (PoR) circuit.	8
6	Design of ALU.	8
7	Design of composite memory unit using component memory blocks.	8
8	Design of associative memory.	8
9	Design of linear regulated power supply.	8
10	Design of linear feedback shift register.	8
Total		**48**

Course Outcomes:	
After completion of the course, students will be able to:	
1	Design and analyze a VLSI based circuit from given conditions.
2	Implement the circuit in hardware/using EDA tools.

Learning Resources:	
1	Manual of different EDA tools.

Course Name:	**Project-I**		
Course Code:	PW-EC(V)782	**Category:**	Sessional
Semester:	Seventh	**Credit:**	3
L-T-P:	0-0-6	**Pre-Requisites:**	Knowledge on domain of project work and associated tools.
Full Marks:	100		
Examination Scheme:	Semester Examination: 100	Continuous Assessment: 00	Attendance: 00

Course Objectives:	
1	To impart concepts of literature survey .
2	To impart knowledge about handling a topic independently to develop an approach for solution.
3	To impart knowledge about preliminary Modelling/Simulation/Experiment/Design related to the topic
4	To impart knowledge about writing a project report and preparing presentation on the topic.

Course Contents		
Module No.	**Description of Topic**	**Contact Hrs.**
	The objective of Project Work I is to enable the student to take up investigative study in the broad field of Electronics & Communication Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/four students in a group, under the guidance of a Supervisor. This is expected to provide a good initiation for the student(s) in R&D work. The assignment should normally include: 1. Survey and study of published literature on the assigned topic 2. Working out a preliminary Approach to the Problem relating to the assigned topic 3. Conducting preliminary Modelling/Simulation/Experiment/Design. 4. Preparing a Written Report on the Study conducted for presentation to the Department 5. Final Seminar, as oral Presentation before a departmental committee.	30

Course Outcomes:	
After completion of the course, students will be able to:	
1	Describe their project objective and state different research-oriented topics reviewed, related to their project work
2	Formulate mathematical expressions/ design electronic circuits relevant to their project objective.
3	Practically implement the designed circuits, apply different scientific software tools and techniques for design, simulation, analysis and interpretation.
4	Report and present their work and function in collaboration with the team members.

Learning Resources:	
1	Associated Books, Journals, Magazines and resources from Internet.

Course Name:	**Seminar**		
Course Code:	PW-EC(V)783	**Category:**	Sessional
Semester:	Seventh	**Credit:**	1
L-T-P:	0-0-2	**Pre-Requisites:**	English HM-HU101 Soft Skill Development Lab HM-HU491
Full Marks:	100		
Examination Scheme:	Semester Examination: 100		

Course Objectives:	
1	To study in a specialized area by doing literature survey.
2	To learn investigation methodologies.
3	To understand the balance between the depth of the work and understanding the learned process.

Course Contents		
Module No.	**Description of Topic**	**Contact Hrs.**
	1. The students are expected to do an in depth study in a specialized area by doing literature survey from various resources and understanding different aspects of the problem. 2. The Students will select a relevant technical topic and will study concepts, techniques and prevailing results. 3. Students are expected to acquire a thorough knowledge on the subject by referring back papers and reference books on the corresponding area. The Students will prepare a seminar report and presentation, which must reflect	

Course Outcomes:	
After completion of the course, students will be able to:	
1	Analyze a literature survey on a given topic.
2	Perform in depth study in a specialized area.
3	Design the flow of the presentation and improve the skill.

Learning Resources:	
1	
2	

Course Name:	**Industrial Training**		
Course Code:	PW –EC(V)784	**Category:**	Sessional
Semester:	Seventh	**Credit:**	1
L-T-P:	During Semester Break(6th & 7th)	**Pre-Requisites:**	
Full Marks:	100		
Examination Scheme:	Semester Examination: 100	Continuous Assessment: 00	Attendance: 00

Course Objectives:	
1	Participate in industry projects.
2	Get knowledge of advanced tools and techniques used in industries.
3	Communicate with industry personnel , know about industry practices and discipline.
4	To know the process of work report and presentation preparation.

Course Contents		
Module No.	**Description of Topic**	**Contact Hrs.**
	The object of Industrial Training is to familiar the students with different industry related project works and acquire knowledge about the broad field of Electronics & Communication Engineering in industry. Students may appear for the training assigned by the Department / personally arranged on an individual basis or two/three students in a group. The guidelines for execution and evaluation includes: 1. Participate in the training during the 6th & 7th semester break. 2. After completion of the training prepare a written Report on the training topic. 3. Prepare a presentation on training and place it before a departmental committee.	

Course Outcomes:	
After completion of the course, students will be able to:	
1	Participate in the projects of industries during his or her industrial training.
2	Describe use of advanced tools and techniques encountered during industrial training and visit.
3	Interact with industrial personnel and follow engineering practices and discipline prescribed in industry.
4	Develop awareness about general workplace behavior and build interpersonal and team skills.
5	Prepare professional work reports and presentations.

Learning Resources:	
1	Relevant Manuals and literatures from various sources.