Tripura University
(A Central University)

Curriculum
For
B.Tech in Electrical & Computer Science Engineering
(ECSE)

(5th Semester)

2021

5th SEMESTER

Sl. No.	Course Category	Subject Code	Subject Title	L	T	P	Contact Hours/week	Credit
1.	Humanities Science -5	HU 501	Professional Practice, Law and Ethics	2	0	0	2	2
2.	Program Core-13	PC ECS 502	Electrical Measurement & Instrumentation	3	0	0	3	3
3.	Program Core-14	PC ECS 503	Probability & Statistics	3	0	0	3	3
4.	Program Core-15	PC ECS 504	Fundamentals of Microprocessor and Micro controller	3	0	0	3	3
5.	Program Core-16	PC ECS 505	Data Sciences	3	0	0	3	3
6.	Program Core-17	PC ECS 506	Data Communication Computer Networks	3	0	0	3	3
7.	Program Core-18	PC ECS 507	Electrical Measurement & Instrumentation Lab	0	0	2	2	1
8.	Program Core-19	PC ECS 508	Microprocessor & Microcontroller Lab	0	0	2	2	1
9.	Program Core-20	PC ECS 509	Programming Lab	0	0	4	4	2
10.	Summer Internship-1	SI ECS 510	Industry Internship - I	0	0	0	0	1
			Total :	17	0	8	25	**22**

Professional Practice, Law and Ethics

Course Code	HS 501
Course Title	Professional Practice, Law & Ethics
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	-
Course Category	Humanities Science (HS)
Number of classes	26 Hours

Course Outcome:

CO Number	CO Description	K-level
CO-1	Develop ideas of the professionalism, values and ethics in a profession	K3
CO-2	Develop a good insight into contracts and contracts management in engineering, arbitration and dispute resolution mechanisms	K3
CO-3	Interpret laws governing engagement of labour in construction related works and other related areas	K2
CO-4	Demonstrate an understanding of Intellectual Property Rights and Patents	K2

Module1: Professionalism, Values and Ethics in Profession (06 Hours)

Professionalism:Professional characteristics, professional education, professional development in Industry. Values and Ethics in Profession- Value system- goodness, means and ends; Ethics-ethical premises, expectation, conflicts and practices; Moral and ego, Ethics and morality
Right, virtue ethics and justice, utility and justice, privacy, challenges to privacy, privacy on the Internet. ProfessionalEthics–DefinitionofEthics,ProfessionalEthics,BusinessEthics, CorporateEthics,EngineeringEthics,PersonalEthics;CodeofEthicsasdefinedinthewebsiteof InstitutionofEngineers(India);Profession,Professionalism,ProfessionalResponsibility, ProfessionalEthics;ConflictofInterest,GiftVsBribery,Environmentalbreaches,Negligence, Deficienciesin state-of-the-art;VigilMechanism,Whistleblowing,protecteddisclosures.

Module2: General Principles of Contracts Management and Arbitration (10 Hours)

IndianContractAct,1972andamendmentscoveringGeneralprinciplesofcontracting;Valid&VoidableContracts; Prime and Subcontracts Tenders,RequestFor Proposals,Bids&Proposals;BidEvaluation;Costescalation;Delays,Suspensions&Terminations;Timeextensions&ForceMajeure;DelayAnalysis;Liquidateddamages&Penalties;Insurance&Taxation. Arbitration,ConciliationandADR(AlternativeDisputeResolution)system:Arbitration– meaning,scopeandtypes–distinctionbetweenlawsof1940and1996;Arbitrationagreements– essentialandkinds,validity,referenceandinterimmeasuresby court;Arbitrationtribunal– appointment,challenge,jurisdictionofarbitraltribunal,powers,grounds ofchallenge,procedureandcourtassistance;AwardincludingFormandcontent,Groundsforsetting asideanaward,Enforcement, AppealandRevision.

Module3:EngagementofLabour&otherconstruction-relatedLaws(05Hours)

RoleofLabour inCivilEngineering;Methodsofengaginglabour-onrolls,laboursub-contract,pieceratework; IndustrialDisputesAct,1947;Collectivebargaining;IndustrialEmployment(StandingOrders)Act, 1946;Workmen'sCompensationAct,1923;Building&OtherConstructionWorkers(regulationof employmentandconditions ofservice)Act(1996)andRules (1998);RERAAct2017, NBC 2017

Module4:LawrelatingtoIntellectualproperty (05 Hours)

Introduction–meaningofintellectualproperty, mainforms ofIP,Copyright,Trademarks,PatentsandDesigns,Secrets;CopyRightsAct,1957,Meaningofcopyright– computer programs,Ownershipofcopyrightsandassignment,Criteriaofinfringement,PiracyinInternet– RemediesandproceduresinIndia;LawrelatingtoPatentsunderPatentsAct,1970including Conceptandhistoricalperspectiveofpatentslawin India.Processofobtaining patent– application,examination,oppositionandsealingofpatents.Durationofpatents–lawandpolicy considerations,Infringementandrelated remedies;

References / Suggested Learning Resources:

1. B.S. Patil,Legal Aspectsof BuildingandEngineeringContracts, 1974.

2.TheNationalBuildingCode,BIS,2017
3.MeenaRao(2006), Fundamental conceptsinLawof Contract, 3rdEdn. ProfessionalOffset
4.NeelimaChandiramani(2000),TheLawofContract:AnOutline,2ndEdn. AvinashPublications Mumbai
5. Avtarsingh(2002),Lawof Contract, EasternBookCo. 7.Dutt(1994), IndianContractAct,Eastern LawHouse
6. T. Ramappa(2010),Intellectual PropertyRightsLawinIndia,AsiaLawHouse
9.Baretext(2005),RighttoInformationAct
7. O.P.Malhotra,Lawof Industrial Disputes,N.M. TripathiPublishers
8. Ethics inEngineering- M.W.Martin&R.Schinzinger, McGraw-Hill
9.EngineeringEthics,National InstituteforEngineering

Electrical Measurement & Instrumentation

Course Code	PC ECS 502
Course Title	Electrical Measurement & Instrumentation
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	Physics, Basic Electrical Engineering
Course Category	Program Core (PC)
Number of classes	38 Hours

Course Outcome:

CO Number	CO Description	K-level
CO-1	Gather knowledge on basic requirements of measurement and classification of various instruments	K1
CO-2	Measure different electrical and non-electrical quantity using bridge circuits.	K5
CO-3	Measure different physical quantities using transducers.	K5
CO-4	Relate the programming language of PLC also they can apply those programming's to solve different industrial problems.	K2

Course Content:

Module 1: Basic Introduction (10 Hours)

Definition : Range, sensitivity, true & indicated value, Errors (including limiting errors), Resolutions, Accuracy, Precision and instrument efficiency. Classification of instruments : Indicating, integrating & recording instruments. Concept of deflection torque, controlling and damping torque Different types of instruments : PMMC instruments, MI Instruments, Electrodynamometer type instruments, Thermocouple instruments and Induction type instruments – their construction, working, merits and demerits. Digital instruments- voltmeter, ammeter, multimeter, energy-meter. --- Elementary idea with block diagram.

Module 2 Measuring Instruments (10 Hours)

Measurement of unknown resistance using Wheatstone bridge and Kelvin's double bridge- simple problems. Principle of dynamometer type wattmeter, Measurement of 3-phase power by two-wattmeter& 3-wattmeter method. Single phase induction type energy meter, Phantom loading, measurement of high/insulating resistance by using meggar, Measurement of Inductance: Maxwell's inductance bridge Measurement of capacitance: Schering Bridge; Magnetic measurements: Deterioration of B-H curve and measurement of iron losses.

Module 3: Transducers (10 Hours)

Introduction to transducers. Signal conditioning systems for transducers: Voltage to Current, current to voltage. Measurement of displacement using linear variable differential transducers (LVDTs) and RVDT –numerical, Concept of piezo electric transducer, electromagnetic flow meter, hot wire anemometer, Total radiation pyrometer, concept of Magneto-strictive transducers: Basic concepts, Measurement technique using Magneto-strictive sensing.

Module 4: Programmable Logic Controller (08 Hours)

Introduction to Programmable logic Controllers (PLC): Architecture and functional components, I/O Processing Methodologies, Programming Languages. Sequence Function Chart, Relay logic and switching algebra, Ladder diagram representation of sequential systems & design, PLC input/output Diagram. Applications of PLC in Industries-case studies.

References / Suggested Learning Resources:

1. Electrical measurement and measuring instruments by. A.K Sawhney– Dhanpat Rai publication
2. Electrical Measurements & Measuring Instruments, by : R.K Rajput (S. Chand Publications)
3. Electronic Measurements and Instrumentation by K Lalkishore – Pearson Publications
4. Electronic Measurement & Instrumentation, by : J.B Gupta (KATSON publications)
5. Electrical Measurement and Measuring Instruments, by : Dr. P.N. Hrisheekesha, Shiv Prakash Bihari (Vayu Education of India Publications)

Probability and Statistics

Course Code	PC ECS 503
Course Title	Probability and Statistics.
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	Physics, Basic Electrical Engineering
Course Category	Program Core (PC)
Number of classes	38 Hours

Course Outcome:

CO Number	CO Description	K-level
CO-1	Apply principles of probability, sample spaces and independence.	K3
CO-2	Apply numerical methods to find our solution of algebraic equations using different methods under different conditions, and numerical solution of system of algebraic equations.	K3
CO-3	Evaluate estimators, construct confidence intervals, and perform hypothesis tests in the context of a single population sample.	K6
CO-4	Use the principles of hypothesis testing, including power, and appropriately apply a range of statistical tests.	K3

Module 1 **(10 Hours)**

Probability: Sample space, Events, Random Variables; Definitions of probability, conditional Probability, independence, expectation and higher order moments, distributions (probability mass function, probability density function) examples of discrete and continuous distributions: Normal, Poisson, Binomial

distributions, Application of Bay's Theorem.

Module 2 **(10 Hours)**

Numerical Analysis: Approximations and round of errors, Truncation errors and Taylor Series. Determination of roots of polynomials and transcendental equations by Newton-Raphson, Secant method and the method of Falsi position, Solutions of linear simultaneous linear algebraic equations by Gauss Elimination and Gauss- Siedal iteration methods, Eigenvalue problem. Interpolation and Polynomial Approximation -Lagrange Polynomial , Hermite Interpolation.

Module 3 **(08 Hours)**

Numerical integration (Trapezoidal, Simpson's 1/3-rd & 3/8-th and Weddles rule), Applications of difference relations in the solution of partial differential equations, Numerical solution of ordinary differential equations by Euler, Modified Euler, Runge-Kutta and Predictor-Corrector method.

Module 4 **(10 Hours)**

Statistics *: Measures of Central tendency and Measures of Variations (Dispersions), standard deviation, Moments, Measures of skewness and kurtosis, Quartiles and Percentiles, covariance, correlation,* Hypothesis testing covering, Types of Error, Power of a test,Goodness of a fit, Student's t and Chi square; Sufficient Statistic and MLEs; Limit theorems and convergence of random variables, Linear regression, Curve fitting – linear and nonlinear regression analysis. Statistical Quality Control Methods: Methods for preparing control charts – Problems using x-bar, p, R charts and attribute charts.

References / Suggested Learning Resources:

1. 100 Statistical Tests, 3/e PB, Kanji G K; SAGE PUBLICATIONS (I) P. LT
2. Probability and Statistics for Engineers, 1/e PB; Ravichandran, J; WILEY INDIA PVT. LTD.
3. Probability, Random Variables, and Random Processes: Theory and Signal Processing Applications (English); Author: John J Shynk,Publisher: John Wiley & Sons Inc.
4. Statistical Methods (Volume - 2) (English) 1st Edition; Author: N. G. Das, Publisher: Mcgraw Hill Education
5. Probability And Statistics With Reliability, Queuing, And Computer Science Applications.
6. Author: Shridharbhai, Trivedi Kishor |Author; Publisher: Phi Learning
7. Statistical Methods for Practice and Research : A Guide to Data Analysis Using SPSS.
8. J. Stoer and R. Bulirsch, Introduction to Numerical Analysis, Springer-Verlag, ISBN 0-387-90420-4
9. L.N. Trefethen and D. Bau, Numerical Linear Algebra, Society of Industrial and Applied Mathematics
10. C.T. Kelley, Iterative methods for linear and nonlinear equations, Society of Industrial and Applied Mathematics.

Fundamentals of Microprocessor and Microcontroller

Course Code	PC ECS 504
Course Title	Fundamentals of Microprocessor and Microcontroller
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	Basic knowledge of Digital Electronics, Computer Organization
Course Category	Program Core (PC)
Number of classes	38 Hours

Course Outcome:

CO Number	CO Description	K-level
CO-1	Explain the 8 Bit Microprocessor.	K2
CO-2	Distinguish the Interfacing and Interrupts technique of Microprocessor	K4
CO-3	Explain the 8051 Microcontroller.	K2
CO-4	Distinguish the interfacing technique of 8051 microcontroller	K4

Course Content:

Module 1: Introduction to Microprocessor (10 Hours)

Introduction to 8-bit Microprocessor and their Features. Introduction to 8085A CPU, architecture-register organization, addressing modes and their features. Pin description and features and Reset Operation of 8085 Microprocessor. Software instruction set. Programming Model in Assembly Language of 8085 Microprocessor, 8085 Microprocessor based Simple Assembly Language Programming. Instruction cycle, machine cycle, Timing diagram, Bus Idle Machine Cycle & INA Machine Cycle.

Module 2: Interfacing and Interrupts unit of Microprocessor (12 Hours)

Hardware Interfacing: 8085 Microprocessor based Buffered System, Interfacing of memory, peripheral chips (IO mapped IO & Memory mapped IO). Interrupts of 8085 Microprocessor: Software Interrupts, Hardware Interrupts & Vectored Interrupts, Peripherals: 8255, 8155/ 8156, PPIs, and 8253/ 8254 Timer/ Counter and their Characteristics & Interfacing with the 8085 Microprocessor. Programming Techniques using PPI. Data Transfer Techniques:-Synchronous, Asynchronous, Interrupt driven and DMA Modes of Date Transfer Techniques. Interfacing Techniques of A/D and D/A converters with 8085 Microprocessor and Programming.

Module 3: Introduction to Microcontroller (08 Hours)

Introduction to 8051 Micro-controller, Internal Architecture:- Oscillator & Clock, Program Counter & Data Pointer, CPU Registers, Flag &PSW, Internal RAM & ROM, Input/ Output pins, Ports, Timer/ Counter, Serial Data Input/ Output. Interrupts:- Different Modes of Interrupts of 8051 Micro-controller.

Module 4: Interfacing Techniques **(08 Hours)**

Interfacing Techniques of External Memory units, Peripheral Devices, Analog to Digital & Digital Converters with 8051 Micro-controller. Instruction Sets of 8051 Micro-controller, Programming Model, Assembler & Assembler Directives. Simple programming in Assembly Language of 8051 Micro-controller.

References / Suggested Learning Resources:

1. "Microprocessor Architecture, Programming, and Applications with the 8085" by R Gaonkar
2. "Microprocessors: Principles and Applications" by A Pal
3. "Fundamentals of Microprocessors And Microcontrollers" by B.Ram
4. "Advanced Microprocessors and Peripherals" by A K Ray and K M Bhurchandi.
5. "The 8051 Microcontroller and Embedded Systems using Assembly and C"-by Muhammad Ali Mazidi.

Data Science

Course Code	PC ECS 505
Course Title	Data Science
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	Introduction to programming, Probability
Course Category	Program Core (PC)
Number of classes	38 Hours

Course Outcome:

CO Number	CO Description	K-level
CO-1	Demonstrate understanding of the mathematical foundations needed for data science.	K3
CO-2	Collect, explore, clean, manage and manipulate data.	K5
CO-3	Implement models such as k-nearest Neighbors, Naive Bayes, linear and logistic regression, decision trees, neural networks and clustering.	K3
CO-4	Combine data science applications using Python based toolkits	K5

Module 1: Introduction to Data Sciences **(04 Hours)**

Concept of Data Science, Traits of Big data, Web Scraping, Analysis vs Reporting.

Module 2: Introduction to Programming Tools for Data Science **(06 Hours)**

Toolkits using Python: Matplotlib, NumPy, Scikit-learn, NLTK. Visualizing Data: Bar Charts, Line Charts, Scatterplots. Working with data: Reading Files, Scraping the Web, Using APIs (Example: Using the Twitter APIs), Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction.

Module 3: Mathematical Foundations (12 Hours)

Linear Algebra: Vectors, Matrices, Statistics: Describing a Single Set of Data, Correlation, Simpson's Paradox, Correlation and Causation. Probability: Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables, Continuous Distributions, The Normal Distribution, The Central Limit Theorem. Hypothesis and Inference: Statistical Hypothesis Testing, Confidence Intervals, P-hacking, Bayesian Inference.

Module 4: Machine Learning (16 Hours)

Overview of Machine learning concepts – Over fitting and train/test splits, Types of Machine learning – Supervised, Unsupervised, Reinforced learning, Introduction to Bayes Theorem, Linear Regression- model assumptions, regularization (lasso, ridge, elastic net), Classification and Regression algorithms- Naïve Bayes, K-Nearest Neighbors, logistic regression, support vector machines (SVM), decision trees, and random forest, Classification Errors, Analysis of Time Series- Linear Systems Analysis, Nonlinear Dynamics, Rule Induction, Neural Networks- Learning And Generalization, Overview of Deep Learning.

References / Suggested Learning Resources:

1. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media
2. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems", 1st Edition, O'Reilly Media
3. Jain V.K., "Data Sciences", Khanna Publishing House, Delhi.
4. Jain V.K., "Big Data and Hadoop", Khanna Publishing House, Delhi.
5. Jeeva Jose, "Machine Learning", Khanna Publishing House, Delhi.
6. Chopra Rajiv, "Machine Learning", Khanna Publishing House, Delhi.
7. Ian Goodfellow, Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Press http://www.deeplearningbook.org
8. Jiawei Han and Jian Pei, "Data Mining Concepts and Techniques", Third Edition, Morgan Kaufmann Publishers

Data Communication and Computer Networks

Course Code	PC ECS 506
Course Title	Data communication and Computer Networks
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	Introduction to programming , computer organization .
Course Category	Program Core (PC)
Number of classes	38 Hours

Course Outcome:

CO Number	CO Description	K-level
CO-1	Review the components and rules of communications.	K2
CO-2	Examine and design of a small network.	K4
CO-3	Explain various research areas and future internets research fields.	K2
CO-4	Analyze the configuration of NAT, DHCP, switch security, VLAN.	K4

Course Content:

Module 1: Basics of Computer Networks (10 Hours)

Basic: Introduction to Networking and its origin, layered task, Protocol stack, OSI model, TCP/IP model and brief functionality Physical layer and media: Data, Signals, Transmission, Digital transmission- digital to digital conversion, Analog to digital conversion, bandwidth utilization and spread spectrum. Circuit and Packet Switching:- Switched Networks, Circuit-Switching Networks, Switching Concepts, Routing in Circuit-Switched Networks, Control Signaling, Packet-Switching Principles, Routing, Congestion Control, X.25 , structure of a switch.
Data link layer: Error correction and Detection, Data link control-framing, flow and error control, Noise less channels- Simple Protocols, Stop and wait protocol, Noisy channel protocol- Stop and Wait ARQ, Go and Back N ARQ, Selective Repeat Automatic Repeat Request, HDLC-Configuration and Transfer mode, Multiple Access-Random Access, Control access, Channelization, Wired Network, Wireless Network, Virtual LAN, Virtual Circuit Networks-Frame relay and ATM.

Module 2: Network Layer (10 Hours)

Network Layer: Logical Addressing, Internet Protocol (IP), Address mapping, Error reporting, and multicasting- ARP, RARP, BOOTP, DHCP, ICMP, IGMP , Network Address Translators (NAT), Forwarding and Routing, Unicast routing protocol- Intra & inter domain routing, distance vector routing, link state routing, path vector routing, Multicast routing protocol.

Module 3: Transport Layer (10 Hours)

Transport layer: Process to Process delivery-Connection oriented and connection less service, UDP, TCP, SCTP, error and flow controls, Congestion control and Quality of service- Open loop congestion control, Closed loop congestion control, Congestion control in TCP and in frame relay Quality of service-flow characteristics, flow cases, different techniques to improve QoS, RSVP.

Module 4: Application Layer (08 Hours)

Application layer: Name Space, Domain in Namespace, Distribution of name space, DNS- generic, country and inverse domain, Resolution: Resolver, Mapping name to Address, Mapping address to names, recursive resolution. Remote logging- telnet, Electronic mail-SMTP, POP, IMAP and file transfer- FTP architecture, commands of FTP. WWW and HTML- Architecture, web documents, HTTP, Web services. Uniform Resource Locators (URL) and Universal Resource Identifier (URI). Multimedia protocols- RTP, RTCP.

References / Suggested Learning Resources:

1. Behrouz A. Fourouzan, ―Data Communications and Networking, Tata McGraw-Hill Education
2. Andrew S. Tanenbaum, ―Computer Networks, 4/e, Pearson education
3. James F. Kurose and Keith W. Ross, ―Computer Networking – A Top-Down Approach. Featuring the Internet, 3/e, Pearson Education India.
4. S. Keshav, ―An Engineering Approach To Computer Networking: ATM Networks, The Internet, And The Telephone Network, Pearson education.
5. F. Halsall, Data Communication, ―Computer Networks and Open Systems, Pearson.

Electrical Measurement & Instrumentation Laboratory

Course Code	PC ECS 507
Course Title	Electrical Measurement & Instrumentation Laboratory
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	Physics, Basic Electrical Engineering
Course Category	Program Core (PC)
Number of classes	20 Hours

Course Outcome:

CO Number	CO Description	K-level
CO-1	Measure the unknown values of resistance, inductance, capacitance using Ac and DC bridges.	K5
CO-2	Demonstrate the characteristics of magnetic circuits.	K3
CO-3	Measure 3-phase power using wattmeter methods.	K5
CO-4	Demonstrate the characteristics of LVDT and piezo transducers	K5
CO-5	Design program coding using PLC software to trouble shoot different industrial problems.	K2

Course Content:

List of experiments:

1. Measurement of Unknown Resistance using Wheatstone bridge
2. Measurement of unknown resistance using Kelvin's bridge
3. Measurement of Unknown Inductance by Maxwell's bridge
4. Measurement of Unknown capacitance by Schering bridge.
5. Determination of Characteristics of Magnetic Circuit and observation of B-H Curve

6. Measurement of 3-phase power (both balance & unbalance) by using: (a) Two wattmeter (b)Three wattmeter method.

7. To study the characteristics of LVDT
8. To study the characteristics of Piezo-electric transducer
9. Hand on practices on introduction to PLC ladder diagram programming using Siemens software.

References / Suggested Learning Resources:

1. Electrical measurement and measuring instruments by. A.K Sawhney– Dhanpat Rai publication
2. Virtual lab IIT kharagpur.
3. Electrical Measurements & Measuring Instruments, by U A bakshi.
4. Electronic Measurements and Instrumentation by K Lalkishore – Pearson Publications
5. Electronic Measurement & Instrumentation, by : J.B Gupta (KATSON publications)
6. Electrical Measurement and Measuring Instruments, by : Dr. P.N. Hrisheekesha, Shiv Prakash Bihari (Vayu Education of India Publications)

Microprocessor and Microcontroller Lab

Course Code	PC ECS 508
Course Title	Microprocessor and Microcontroller Lab
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	Basic knowledge of Digital Electronics, Computer Organization, Microprocessor and Microcontroller
Course Category	Program Core (PC)
Number of classes	24 Hours

Course Outcome:

CO Number	CO Description	K-level
CO-1	Understand and apply the fundamentals of assembly level programming of microprocessors and microcontroller	K3
CO-2	Analyze problems and apply a combination of hardware and software to address the problem.	K4
CO-3	Analyze performance of standard microprocessor real time interfaces.	K4
CO-4	Perform standard test and measurement equipment to evaluate digital interfaces.	K4

Course Content:

List of experiments:

1. Write a Program Using 8085 & Verify for:
   a. Addition of Two 8-Bit Numbers.
   b. Addition of Two 16-Bit Numbers. (With Carry)

2. Write a Program Using 8085 & Verify for:
   a. Subtraction of Two 8-Bit Numbers. (Display of Borrow)
   b. Subtraction of Two 16-Bit Numbers. (Display of Borrow)
3. Write a Program Using 8085 & Test for Typical Data:
   a. Multiplication of Two 8-Bit Numbers by Bit Rotation Method
   b. Division of Two 8-Bit Numbers by Repeated Subtraction Method
4. Write a Program Using 8085 for Finding Square-Root of a Number & Verify.
5. Write a Program to Move a Block of Data Using 8085 & Verify.
6. Write a Program to Arrange Number in Ascending Order Using 8085 & Verify.
7. Write a Program to Check Number of 1's and 0's in Given Number Using 8085 & Verify. e
8. Write a Program to Find GCD Of Two Numbers Using 8085 & Verify.
9. Write a Program to Find LCM Of Two Numbers Using 8085 & Verify.
10. Write a Program to Add 'N' Two Digit BCD Numbers Using 8085 & Verify.

Program using IN/OUT instructions and 8255 PPI on the trainer kit e.g. subroutine for delay (03 sessions)

   a) Glowing all the LEDs one by one with particular delay
   b) Reading switch state and glowing LEDs accordingly.

11. Interfacing DAC: to generate Square, Triangular, Ramp, and Staircase waves.
12. Interfacing a Stepper motor.

References / Suggested Learning Resources:

1. The 8051 microcontrollers, architecture and programming andapplications-K.Uma Rao, AndhePallavi., Pearson, 2009.
2. Micro computer system 8086/8088 family architecture, programming and design- By Liu and GA Gibson, PHI, 2nd Ed.,
3. Microcontrollers and application, Ajay.V.Deshmukh,TMGH,2005
4. The 8085 microprocessor: Architecture, programming and interfacing- K.Uday Kumar, B.S.Umashankar,2008,Pearson
5. Microprocessors and microcontrollers- S.V.Altaf.
6. Virtual Lab IIT Kanpur.

Programming Lab

Course Code	PC ECS 509
Course Title	Programing Lab
Number of Credits	2 (L: 0, T: 0, P: 2)
Prerequisites	Computer Organization, basic computer programming
Course Category	Program Core (PC)
Number of classes	40 Hours

Course Outcome:

CO Number	CO Description	K-level
CO-1	Design and conduct experiments, to analyze and interpret results.	K5

CO-2	Solve complex heterogeneous data intensive analytical based problems of real time scenario using state of the art hardware/software tools.	K3
CO-3	Construct a local area network (LAN) and wide area network (WAN).	K5
CO-4	Formulate TCP/IP for the LAN.	K5
CO-5	Install and use different system & application software's.	K3

Course Content:

List of experiments:

List of Experiments related to data science should include but not limited to following exercises-

1. Creating and displaying Data.
2. Matrix manipulations.
3. Creating and manipulating a List and an Array.
4. Creating a Data Frame and Matrix-like Operations on a Data Frame.
5. Merging two Data Frames .
6. Applying functions to Data Frames .
7. String Manipulations.
8. Visualization Effects.
9. Plotting with Layers.
10. Histograms and Density Charts.
11. Simple Linear Regression – Fitting, Evaluation and Visualization.
12. Multiple Linear Regression, Lasso and Ridge Regression.

List of Experiments related to Computer Network should include but not limited to following exercises-

1. Study of different types of cross-wired cable and straight through cable using clamping tool.
2. Study of Basic network commands and network configuration commands.
3. Study of network IP.
4. Socket programming using Java,C or python.
5. Connect the computers in Local Area Network.
6. Configure a Network topology using packet tracer software.
7. Configure a Network using Distance Vector Routing protocol.
8. Configure Network using Link State Vector Routing protocol.
9. Network topology configuration of static routing using using packet tracer software
10. Routing Protocol Configuration of a network using any using packet tracer software (Eg. Static routing, RIP, RIP Version 2 etc)
11. Firewall Configuration to solve different general problems in Linux OS.
12. Practical on Server Configuration Example, Web Server, Mail Server, FTP Server etc.

Reference Books –

1. Python for data analysis,author:Wes Mckinney,publisher-O'Reilly
2. Hands on networking essentials with projects / M.J. Palmer
3. Internet working with TCP-IP / D.E. Comer and D. Stevens / Prentice Hall of India

4. Networking Cabling handbook / Chris Clark / Tata McGraw Hill
5. Designing and implementing local and WANs / M.J. Palmer and R.B. Sinclair / Vikas Publishing House

Industry Internship – I

Course Code	SI ECS 510
Course Title	Industry Internship – I
Number of Credits	1 (L: 0, T: 0, P: 0)
Prerequisites	Nil
Course Category	Summer Internship (SI)
Number of classes	-

Course Outcome:-

CO Number	CO Description	K-level
CO-1	Solve real life challenges in the workplace by analysing work environment and conditions, and selecting appropriate skill sets acquired from the course of study	K3
CO-2	Develop a right work attitude, self-confidence, interpersonal skills and ability to work as a team in a real organisational setting	K3
CO-3	Demonstrate the skill to communicate and collaborate effectively and appropriately with different professionals in the work environment through written and oral means	K2
CO-4	Show professional ethics by displaying positive disposition during internship.	K2
CO-5	Decide career options by considering opportunities in company, sector, industry, professional, educational advancement and entrepreneurship;	K5

Course Content:-

The industry internship aims to provide the student with:

1. A practice-oriented and 'hands-on' working experience in the real world or industry, and to enhance the student's learning experience.

2. An opportunity to develop a right work attitude, self-confidence, interpersonal skills and ability to work as a team in a real organisational setting.

3. An opportunity to further develop and enhance operational, customer service and other life-long knowledge and skills in a real world work environment.

4. Pre-employment training opportunities and an opportunity for the company or organisation to assess the performance of the student and to offer the student an employment opportunity after his/her graduation, if it deems fit.

Each student shall:

1) Identify an internship program of relevance in his/her branch of engineering to undergo during summer break between 4^{th} and 5^{th} semester,
2) Get approval of the concerned HOD,
3) Undergo the industry internship program for minimum 4 weeks duration
4) Prepare their own report
5) Present in the class among fellow students and faculty members / deliver viva voce.
6) Submit the report and participation/course completion certificate.

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