Scheme & Syllabus of

UNDERGRADUATE DEGREE COURSE

B.Tech. VII & VIII Semester

Electronics Instrumentation & Control

Rajasthan Technical University, Kota

Effective from session: 2020 – 2021

Teaching & Examination Scheme
B.Tech.: Electronics Instrumentation & Control
4th Year - VII Semester

SN	Category	Course Code	Course Title	Contact hrs/week			Marks				Cr
				L	T	P	Exm Hrs	IA	ETE	Total	
THEORY											
1	PEC		Program Elective	3	0	0	3	30	70	**100**	**3**
		7EI5-11	Distributed Control System								
		7EI5-12	Wireless Sensor Networks								
		7EI5-13	Nonlinear Control System								
2	OE		Open Elective-I	3	0	0	3	30	70	**100**	**3**
			Sub total	**6**	**0**	**0**		**60**	**140**	**200**	**6**
PRACTICAL & SESSIONAL											
3	PCC	7EI4-21	Real Time Control Lab	0	0	4	2	60	40	**100**	**2**
4		7EI4-22	Advance communication lab (MATLAB Simulation)	0	0	2	2	60	40	**100**	**1**
5		7EI4-23	Optical Instrumentation Lab	0	0	2	2	60	40	**100**	**1**
6	PSIT	7EI7-30	Industrial Training	1	0	0		60	40	**100**	**2.5**
7		7EI7-40	Seminar	2	0	0		60	40	**100**	**2**
8	SODECA	7EI8-00	Social Outreach, Discipline & Extra Curricular Activities	0	0	0			100	**100**	**0.5**
			Sub Total	**3**	**0**	**8**		**300**	**300**	**600**	**9**
			TOTAL of VII SEMESTER	**9**	**0**	**8**		**360**	**440**	**800**	**15**

L: *Lecture,* ***T:*** *Tutorial,* ***P:*** *Practical,* ***Cr:*** *Credits*

ETE: *End Term Exam,* ***IA:*** *Internal Assessment*

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

Teaching & Examination Scheme
B.Tech. : Electronics Instrumentation & Control
4th Year - VIII Semester

SN	Category	Course Code	Course Title	Contact hrs/week			Marks				Cr
				L	T	P	Exm Hrs	IA	ETE	Total	
THEORY											
1	PEC	Program Elective		3	0	0	3	30	70	**100**	**3**
		8EI5-11	Artificial Intelligence and Expert Systems								
		8EI5-12	Process Modelling & Optimization								
		8EI5-13	Network Control System								
2	OE		Open Elective-II	3	0	0	3	30	70	**100**	**3**
			Sub Total	**6**	**0**	**0**		**60**	**140**	**200**	**6**
PRACTICAL & SESSIONAL											
3	PCC	8EI4-21	IOT Lab	0	0	2	2	60	40	**100**	**1**
4		8EI4-22	Skill Development Lab	0	0	2	2	60	40	**100**	**1**
5	PSIT	8EI7-50	Project	3	0	0		60	40	**100**	**7**
6	SODECA	8EI8-00	Social Outreach, Discipline & Extra Curricular Activities						100	**100**	**0.5**
			Sub Total	**3**	**0**	**4**		**180**	**220**	**400**	**9.5**
			TOTAL of VII SEMESTER	**9**	**0**	**4**		**240**	**360**	**600**	**15.5**

L: *Lecture,* ***T:*** *Tutorial,* ***P:*** *Practical,* ***Cr:*** *Credits*

ETE: *End Term Exam,* ***IA:*** *Internal Assessment*

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List of Open Electives for Electronics Instrumentation & Control

Subject Code	Title		Subject Code	Title
Open Elective - I			**Open Elective - II**	
7AG6-60.1	Human Engineering and Safety		8AG6-60.1	Energy Management
7AG6-60.2	Environmental Engineering and Disaster Management		8AG6-60.2	Waste and By-product Utilization
7AN6-60.1	Aircraft Avionic System		8AN6-60.1	Finite Element Methods
7AN6-60.2	Non-Destructive Testing		8AN6-60.2	Factor of Human Interactions
7CH6-60.1	Optimization Techniques		8CH6-60.1	Refinery Engineering Design
7CH6-60.2	Sustainable Engineering		8CH6-60.2	Fertilizer Technology
7CR6-60.1	Introduction to Ceramic Science & Technology		8CR6-60.1	Electrical and Electronic Ceramics
7CR6-60.2	Plant, Equipment and Furnace Design		8CR6-60.2	Biomaterials
7CE6-60.1	Environmental Impact Analysis		8CE6-60.1	Composite Materials
7CE6-60.2	Disaster Management		8CE6-60.2	Fire and Safety Engineering
7CS6-60.1	Quality Management/ISO 9000		8CS6-60.1	Big Data Analytics
7CS6-60.2	Cyber Security		8CS6-60.2	IPR, Copyright and Cyber Law of India
7EC6-60.1	Principle of Electronic communication		8EC6-60.1	Industrial and Biomedical applications of RF Energy
7EC6-60.2	Micro and Smart System Technology		8EC6-60.2	Robotics and control
7ME6-60.1	Finite Element Analysis		8ME6-60.1	Operations Research
7ME6-60.2	Quality Management		8ME6-60.2	Simulation Modeling and Analysis
7MI6-60.1	Rock Engineering		8MI6-60.1	Experimental Stress Analysis
7MI6-60.2	Mineral Processing		8MI6-60.2	Maintenance Management
7PE6-60.1	Pipeline Engineering		8PE6-60.1	Unconventional Hydrocarbon Resources
7PE6-60.2	Water Pollution control Engineering		8PE6-60.2	Energy Management & Policy
7TT6-60.1	Technical Textiles		8TT6-60.1	Material and Human Resource Management
7TT6-60.2	Garment Manufacturing Technology		8TT6-60.2	Disaster Management

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

7EI5-11: Distributed Control System (Program Elective-3)

Credit: 3 **Max. Marks: 100(IA:30, ETE:70)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	INTRODUCTION: Objective, scope and outcome of the course.	1
2	INTRODUCTION- Hierarchical organization for a process computer control and computer system structure for a manufacturing complex. Centralized and distributed control concept. Lower level and higher level computer tasks and duties. Functional requirement of DPCS. Aims of plant automation and distributed computer control systems and subsystems. DPCS system configuration and integration with PLCs and computers.	9
3	ARCHITECTURE- Overviews of DPCS, systems architectures, data base organization. DPCS elements, comparison of different DPCS systems, state of the art in DPCS, configuration of control unit, different cards (I/O, O/P , Memory , PLC etc) system implementation concepts, work stations and its key – functions and function chart.	8
4	DCS DISPLAYS- Standard and user defined displays, continuous process display, Ground display, overview display, detail display, graphic display, trend display, loop display, alarm summary display, annunciator display, batch/ sequence display, tuning display, tuning panel, instrument faceplate.	6
5	DATA COMMUNICATIONS LINKS AND PROTOCOL - Communication Hierarchy (point to point to field bus) Network requirements, ISO reference model. Transmission media, network topologies, internetworking, data transmission, bus access methods, error handling Field buses, MAP and TOP Protocols. Features and capabilities of various field buses. FB standardization, comparison of MODBUS, PROFIBUS and FIPBUS, HART protocol, IEEE project 1002 on LAN implementation.	9
6	DCS CONTROL FUNCTIONS- control unit, sequential control, system maintenances, utility, switch instrument, batch system builder, graphic builder, feedback control builder, security, and process reporting function.	7
	Total	40

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

Text/Reference Books:

1.	John.W. Webb Ronald A Reis, "Programmable Logic Controllers - Principles and Applications", 4th Edition, Prentice Hall Inc., New Jersey. 1998
2.	Lukcas M.P, "Distributed Control Systems", Van Nostrand Reinhold Co., New York. 1986
3.	Frank D. Petruzella, "Programmable Logic Controllers", 2nd Edition, McGraw Hill, New York. 1997
4.	Deshpande P.B and Ash R.H, "Elements of Process Control Applications", ISA Press, New York. 1995
5.	Curtis D. Johnson, "Process Control Instrumentation Technology", 7th Edition, Prentice Hall, New Delhi, 2002
6.	Krishna Kant, "Computer-based Industrial Control", Prentice Hall, New Delhi, 1997
7.	Process/Industrial Instruments and Control Hand Book, Gregory Mcmillan, TMH. 2009
8.	Process Control - Principles And Applications, Bhanot, Oxford. 2008
9.	Process Dynamics Control, Dale E. Seborg, Oxford. 1994
10.	Advanced Process Control: Beyond Single Loop Control, Cecil Smith, Oxford. 2010

7EI5-12: Wireless Sensor Network (Program Elective-3)

Credit: 3 **Max. Marks: 100(IA:30, ETE:70)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Types of wireless sensor networks Mobile Ad-hoc Networks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks.	10
3	Issues and challenges in wireless sensor networks Routing protocols, MAC protocols: Classification of MAC Protocols, S-MAC Protocol, B-MAC protocol, IEEE 802.15.4 standard and ZigBee, Dissemination protocol for large sensor network.	8
4	Data dissemination, data gathering, and data fusion; Quality of a sensor network; Real-time traffic support and security protocols.	6
5	Design Principles for WSNs, Gateway Concepts Need for gateway, WSN to Internet Communication, and Internet to WSN Communication.	8
6	Single-node architecture, Hardware components & design constraints, Operating systems and execution environments, introduction to TinyOS and nesC.	7
	Total	40

Text/Reference Books:

1.	WaltenegusDargie , Christian Poellabauer, “Fundamentals Of Wireless Sensor NetworksTheory And Practice”, By John Wiley & Sons Publications, 2011.
2.	SabrieSoloman, “Sensors Handbook" by McGraw Hill publication. 2009.
3.	Feng Zhao, Leonidas Guibas, “Wireless Sensor Networks”, Elsevier Publications, 2004.
4.	KazemSohrby, Daniel Minoli, “Wireless Sensor Networks”: Technology, Protocols and Applications, Wiley-Inter science.
5.	Philip Levis, And David Gay "TinyOS Programming” by Cambridge University Press2009.

7EI5-13: Nonlinear Control System (Program Elective-3)

Credit: 3 **Max. Marks: 100(IA:30, ETE:70)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction: Nonlinear Control, Common Nonlinearities in Control systems, Points of Differences in Linear and Nonlinear System Behavior	9
3	Describing Function Fundamentals: Describing Functions of Common Nonlinearities-computing describing functions, describing functions of common nonlinearities- describing functions analysis of non linear systems-stability analysis.	9
4	Fundamentals of Lyapunov Theory: Nonlinear Systems and Equilibrium Points, Concepts of Stability, Linearization and Local Stability, Lyapunov's Direct Method, Equilibrium Point Theorems, Krasovskii's method- variable gradient method	9
5	Nonlinear Control System Design: Feedback Linearization and the Canonical Form, Input State Linearization, Input-Output Linearization, Gain Scheduling, Sliding Control, Model Reference Adaptive Control.	12
	Total	40

Text/Reference Books:

1.	Jean-Jacques E. Slotine, "Applied Nonlinear Control", Prentice Hall Englewood Cliffs, New Jersey, (1991).
2	Vidyasagar.M, "Nonlinear System Analysis", Prentice Hall Englewood Cliffs, New Jersy, 1978
3.	M. Gopal "Digital Control & State variable Methods", Tata-Mc-Grew hills 2003

7EI4-21: Real Time Control Lab

Credit: 2 **Max. Marks: 100(IA:60, ET 40)**

0L+0T+4P

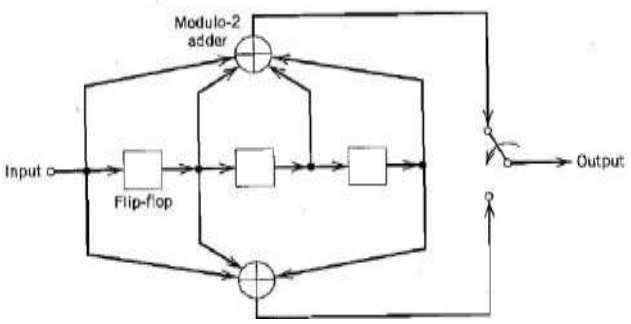
SN	Contents
1	Introduction: Objective, scope and outcome of the course.
2	Characteristics of control valve
3	Closed loop response of flow control loop.
4	Closed loop response of level control loop
5	Closed loop response of temperature control loop
6	Operation of on-off controlled thermal process. Response of on-off controller
7	Response of P+I+D controller. Tuning of PID controller
8	Measurement & Control of level using PID.
9	Measurement & Control of flow using PID
10	Measurement & Control of pressure using PID.
11	Measurement & Control of flow using PLC.
12	Measurement & Control of level using PLC.
13	Measurement & Control of temperature using PLC.
14	Measurement & Control of pressure using PLC.
15	Using SCADA for process control: • preparation of process graphics • tagging trends • reporting • process monitoring and control
16	Study of Communication and Configuration of HART Field Devices: • Communicate with HART device • Re-ranging of HART Field Devices • Basic setup of HART Device • Detailed setup of HART Device
17	Study of Process Calibrator: • Test & Calibration of Process Indicators & Controllers using • Resistance, RTD, Thermocouple • mili Volts, 4-20 mA, • Frequency & Volt • Error calculation.
18	Study of thermal Imager: Non-contact type temperature measurement of Process, Machines, Material etc.
19	Study of Vibration Analyzer: Measurement and Analysis of vibration in electrical and mechanical machines.
20	Familiarization with the Instrumentation and Process Control Training System (IA- FLTP): Process Workstation, Instrumentation Workstation, PID Controller, ON/OFF Controller, Programmable Logic Controller, Signal Isolator, Flow Meter, Level Transmitter, Temperature Sensor, Emergency Push-Button, Pneumatic Unit, Trend Recorder, Pressure Gauge, Pressure Transmitter, Pneumatic Control Valve, Accessories, Basic Setup.
21	I.S.A. Standard and Instrument Symbols. Introduction to Measurement instruments.
22	Study of Interacting systems and Non-interacting systems.

7EI4-22: Advance Communication Lab (MATLAB Simulation)

Credit: 1 **Max. Marks: 100 (IA:60, ETE:40)**

0L+0T+2P

SN	Contents
1	Introduction: Objective, scope and outcome of the course.
Part-A	**Analog-to-digital conversion** 1. Generate a sinusoidal signal. Sample and reconstruct a signal through interpolation. Vary the sampling rate below and above the Nyquist rate and hence verify the Sampling theorem. 2. Generate a sequence of length 500 of zero-mean, unit variance Gaussian random variables. Using a uniform PCM scheme, quantize this sequence to 16, 64 and 128 levels. (a). Find and compare the resulting signal-to-quantization noise ratios. (b). Find the first ten values of the sequence, the corresponding quantized values and the corresponding code words for each case. (c). Plot the quantization error and the quantized value as a function of the input value for each case. **Digital modulation techniques** 3. Simulate the transmitter and receiver for QPSK. Plot the signal and signal constellation diagram. Plot the average probability of symbol error as a function of SNR E_b/N_o, where E_b is the transmitted energy per bit and $N_o/2$ is the double sided power spectral density of additive white Gaussian noise (AWGN) with zero mean. 4. Simulate the transmitter and receiver for 16-QAM. Plot the signal and signal constellation diagram. Plot the average probability of symbol error as a function of SNR E_b/N_o, where E_b is the transmitted energy per bit and $N_o/2$ is the double sided power spectral density of additive white Gaussian noise (AWGN) with zero mean.

PART-B Attempt any four experiment	1. Find all the code words of the (15,11) Hamming code and verify that its minimum distance is equal to 3. 2. Generate an equiprobable random binary information sequence of length 15. Determine the output of the convolutional encoder shown below for this sequence.  3. Generate the L=31 Gold sequences. Consider a time-synchronous CDMA system (direct sequence spread spectrum) having four users, each employing a distinct Gold sequence of length L=31 and the binary (±1) modulation of their representative Gold sequences. The receiver for each user correlates the composite CDMA received signal, which is corrupted by AWGN (added on a chip-by-chip basis) with each user's respective sequence. Using 10000 information bits, estimate and plot the probability of error for each user as a function of SNR. 4. Consider a MIMO (multiple-input, multiple-output) system with N_T= 2 transmit antennas and NR = 2 receive antennas. Generate the elements of the channel matrix **H**for a Rayleigh fading (frequency nonselective) AWGN channel and the corresponding inputs to the detectors for the two receive antennas. 5. Perform feature extraction from a given Image and use Principal Components as image descriptors. 6. By using an image dataset, train a Neural Network to recognise a given Image. Apply this in context to face/object recognition and calculate recognition accuracy of the training set. 7. Develop a Fuzzy Inference System (FIS) by using a set of fuzzy rule base between some key image parameters and calculate output after defuzzification. 8. Design a Fuzzy PID controller using Matlab for a Dc Motor. 9. Classify ECG signals using Neural networks.

7EI4-23: Optical Instrumentation Lab

Credit: 1 **Max. Marks:100 (IA:60,ETE:40)**

0L+0T+2P

SN	Contents
1	Introduction: Objective, scope and outcome of the course.
	Hardware based experiment;
2	To set up Fiber Optic Analog and fiber Optic Digital link.
3	Measurement of Propagation loss and numerical aperture.
4	Measurement of optical power bending loss in a plastic optical fiber.
5	Study and measure characteristics of fiber optic LED's, LDR and Laser diode.
6	OTDR Measurement of Fiber Length, Attenuation and Dispersion Loss.
	Software based experiment:
7	Design and simulate of single and multimode transmission in optical fiber system.
8	Show and simulate the optical system performance analysis using Eye diagram and measure the value of Q-factor & BER of optical signals.
9	Study and simulate the linear and parabolic waveguide structure use in optical fiber communication.
10	Design and simulate the Dispersion compensators for fiber optic communication.
11	Design and calculate the power budget for optical communication link.
12	Design and simulate the DWDM and WDM techniques use in optical communication.
13	Design and simulate the Fiber Bragg grating and find its transmission characteristics and optical band-gap.

8EI5-11: Artificial Intelligence And Expert Systems (Program Elective-4)

Credit: 3 **Max. Marks: 100(IA:30, ETE:70)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction to Artificial Intelligence: Intelligent Agents, State Space Search, Uninformed Search, Informed Search, Two Players Games, Constraint Satisfaction Problems.	8
3	Knowledge Representation: Knowledge Representation And Logic, Interface in Propositional Logic, FirstOrder Logic, Reasoning Using First Order Logic, Resolution in FOPL	8
4	KNOWLEDGE ORGANIZATION: Rule based System, Semantic Net, Reasoning in Semantic Net Frames, Planning	6
5	KNOWLEDGE SYSTEMS: Rule Based Expert System, Reasoning with Uncertainty, Fuzzy Reasoning	7
6	KNOWLEDGE ACQUISITION: Introduction to Learning, Rule Induction and Decision Trees, Learning Using neural Networks, Probabilistic Learning Natural Language Processing	10
	Total	40

Text/Reference Books:

1.	Elaine Rich and Kevin Knight, Artificial Intelligence 3/e, TMH (1991)
2.	Padhy: Artificial Intelligence & Intelligent Systems, Oxford (2005)
3.	James A Anderson, An introduction to Neural Networks. Bradford Books 1995
4.	Dan. W Patterson, Artificial Intelligence and Expert Systems, PHI 1990
5.	Kumar Satish, "Neural Networks" Tata Mc Graw Hill 2004
6.	S. Rajsekaran& G.A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications" Prentice Hall of India. 2006
7.	SimanHaykin,"Neural Netowrks" Prentice Hall of India 1990
8.	Artificial Intelligence, Kaushik, cengage learning

8EI5-12: Process Modelling & Optimization (program elective-4)

Credit: 3 **Max. Marks: 100(IA:30, ETE:70)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Definition of process model, physical and mathematical modeling, deterministic and stochastic process, classification of models, model building, black-box model, white box model, gray model, classification of mathematical methods.	6
3	Mathematical models of chemical engineering systems: Introduction, uses of mathematical models, scope of coverage, principles of formulation, fundamental laws, continuity equations, energy equations, equation of motion, transport equation, equation of state, equilibrium, kinetics. Examples of mathematical models of chemical engineering systems	8
4	The nature and organization of optimization problems: Scope and hierarchy of optimization, examples of applications of optimization, the essential features of optimization problems, general procedure for solving optimization problems, obstacles to optimization.	7
5	Developing models for optimization: Classification of models, selecting functions to fit empirical data, factorial experimental designs, degrees of freedom, formulation of the objective function. Basic concepts of optimization: Continuity of function, NLP problem statement, convexity and its applications, interpretation of the objective function in terms of its quadratic approximation, necessary and sufficient conditions for an extremum of an unconstrained function.	8
6	Optimization of unconstrained functions: One-dimensional search numerical methods for optimizing a function of one variable, scanning and bracketing procedures, Newton and Quasi-Newton methods of uni-dimensional search, polynomial approximation methods, how one-dimensional search is applied in a multidimensional problem, evaluation of uni-dimensional search methods. Application of optimizations: Examples of optimization in chemical processes.	10
	Total	40

Text/Reference Books:

1.	B Wayne Bequette, Process Dynamics: Modeling, Analysis and Simulation, Prentice Hall International Inc. 1st Edition, 1998.
2.	William L. Luyben, Process Modeling, Simulation and Control for Chemical Engineers, McGraw Hill International Editions, 2nd Edition,1989.
3.	Edger, Himmelblau, Lasdon, Optimization of Chemical Processes, McGraw-Hill International Edition, 2nd Edition, 2001.
4.	MC Joshi and K M Moudgalya, Optimization: Theory and Practice, Narosa Publishing, 1st Edition,2013.
5.	Singiresu S. Rao, Engineering Optimization Theory and Practices, John Wiley & Sons, 4th Edition, 2009.
6.	W D Seider, J D Seader and D R Lewin, Product and Process Design Principles-Synthesis, Analysis, and Evaluation, John Wiley and Sons Inc, 3rd Edition 2012.
7.	Gordon S. G. Beveridge and Rober S. Schechter, Optimization: Theory and Practice, McGraw-Hill Book Company, 1st Edition, 2010
8.	K. Deb, Optimization for Engineering Design, Prentice-Hall India learning private limited, 2nd Edition, 2012.

8EI5-13: Network Control System (Program Elective-4)

Credit: 3 **Max. Marks: 100(IA:30, ETE:70)**

2L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Network Models - graphs, random graphs, random geometric graphs, state-dependent graphs, switching networks.	8
3	Decentralized Control - limited computational, communications, and controls resources in networked control systems.	7
4	Multi-Agent Robotics - formation control, sensor and actuation models.	8
5	Mobile Sensor Networks - coverage control, voronoi-based cooperation strategies.	8
6	Mobile communications networks, connectivity maintenance.	8
	Total	40

Text/Reference Books:

1.	P. J. Antsaklis and P. Tabuada, Networked Embedded Sensing and Control, Springer, 2006.
2.	F. Bullo, J. Cortes, and S. Martinez, Princeton, Distributed Control of Robotic Networks, University Press, 2009.
3.	MehranMesbahi and Magnus Egerstedt, Graph Theoretic Methods in Multiagent Networks, Princeton University Press, 2010.

8EI4-21: IOT Lab

0L+0T+2P

LIST OF PRACTICALS

1.	Study the fundamental of IOT softwares and components.
2.	Familiarization with Arduino/Raspberry Pi and perform necessary software installation.
3.	To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.
4.	To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
5.	To interface DHT11 sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings.
6.	To interface motor using relay with Arduino/Raspberry Pi and write a program to turn ON motor when push button is pressed.
7.	To interface OLED with Arduino/Raspberry Pi and write a program to print temperature and humidity readings on it.
8.	To interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to smartphone using Bluetooth.
9.	To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when '1'/'0' is received from smartphone using Bluetooth.
10	Write a program on Arduino/Raspberry Pi to upload temperature and humidity data to thingspeak cloud.
11.	Write a program on Arduino/Raspberry Pi to retrieve temperature and humidity data from thingspeak cloud.
12.	To install MySQL database on Raspberry Pi and perform basic SQL queries.
13.	Write a program to create UDP server on Arduino/Raspberry Pi and respond with humidity data to UDP client when requested.
14.	Write a program to create TCP server on Arduino/Raspberry Pi and respond with humidity data to TCP client when requested.

LIST OF SUGGESTED BOOKS:	
1.	Vijay Madisetti, Arshdeep Bahga, Ïnternet of Things, "A Hands on Approach", University Press.
2.	Dr. SRN Reddy, Rachit Thukral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs.
3.	Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press
4.	Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi
5.	Adrian McEwen, "Designing the Internet of Things", Wiley
6.	Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill

8EI4- 22 Skill Development Lab

Credit:1 **Max. Marks : 100 (IA:60,ETE:40)**

0L+0T+2P

Part A: Training

SN	Contents
1	Introduction: Objective, scope and outcome of the lab.
	Every student has to learn any two software from the following list, with consultation of their lab in charge. Students may get online certification or is advised to learn these from available freeware. Students may register online training courses from institutes of repute i.e. IITs/NITs/AICTE/MHRD, etc. Industrial experts /professional may be deputed to train the students in department.
1	Network simulator (NS_2)
2	Lab view
3	Software for Robotics/Artificial intelligence (AI) /machine learning
4	Java
5	Python

PART B: Implementation

SN	Contents
1	**Student has to complete any one assignment with detailed project report based on the software/tool learn in part A.**
2	Student cab select any Social engineering project: Any problem of the society can be taken which can be solved with the help of electronics engineering software and gadgets.
3	Student cab select Startup for innovation/entrepreneurship.
4	Engineering solution of any Industrial problem. Sufficient number of such problem may be identified by the department from nearby industry and may be given to the student for innovative solutions under guidance of faculty.
	This lab may be evaluated by an external examiner from industry along with internal faculty.