

Course Code: 22BECA1	Allied – IA		T/P	C	H/W
	Electronic Measurements and Instruments		T	3	3
Objectives	<ul style="list-style-type: none"> ➤ To learn about digital instruments ➤ To familiarize in R, L,C measurements ➤ To familiarize in oscilloscopes and function generators ➤ To get knowledge in analyzing instruments 				
Unit-I	DIGITAL INSTRUMENTS Digital Instruments basics – Digital displays – Digital counters – ADC and DAC – Digital Voltmeter – Digital Multimeter – Digital Frequency meter – Frequency meter accuracy – Time and ratio measurements.				
Unit-II	R, L AND C MEASUREMENTS Low, High and Precise Resistance Measurements – Voltmeter and Ammeter methods –Substitution method – Wheatstone Bridge – Low, High and Precise measurement methods– AC bridge theory – Capacitance bridges – Inductance bridges – Multi function Impedance bridge – Digital R, C, L measurements – Digital LCR meter – Q meter.				
Unit-III	OSCILLOSCOPES CRT – Dual trace Oscilloscopes – Voltage, frequency and phase measurements – Analog storage oscilloscopes – Digital storage oscilloscopes – Sampling oscilloscopes.				
Unit-IV	SIGNAL GENERATORS Low frequency signal generators – Function generators – Pulse generators – Sweep frequency generators – RF signal generators – Frequency synthesizer – Arbitrary waveform generator – DSO applications – Representative DSO				
Unit-V	RECORDING AND WAVEFORM ANALYZING INSTRUMENTS Strip chart recorders – X-Y Plotters – Plotting device characteristics – Plotter – Digital waveform recorder / analyzer – Distortion meter – Spectrum analyzer – Digital spectrum analyzer – waveform analyzing instruments				
Reference and Textbooks:-					
Text Books:					
David A.Bell,(2003), “ <i>Electronic measurements and Instruments</i> ”, Prentice Hall of India,2/e,.					
R.S. Sedha, “ <i>Electronic measurements and Instrumentation</i> ”. Chand					
References:					
Alan S Morris, (2001) “ <i>Measurement and Instrumentation Principles</i> ”, 3 rd Edition,Butterworth-Heinemann.					
J P Navani, “ <i>Electronic Measurement And Instrumentation</i> ”, S Chand Publications					
A.K. Sawhney,(2015), “ <i>A Course in Electronic Measurements and Instrumentation</i> ”,Dhanpat Rai & Co.,					
Outcomes	After completion of the course students will be able <ul style="list-style-type: none"> ➤ To use digital displays, counters and meters ➤ To explain the principles of AC/DC bridges and their measurements ➤ To recognize the applications of oscilloscopes in measurements ➤ To handle function generators for waveform generation ➤ To study the outputs of waveform/spectrum analyzer 				

Course Code: 22BECAP1	Allied Practical – IA	T/P	C	H/W
	Electronic Measurements Lab	P	2	2
Objectives	<ul style="list-style-type: none"> ➤ To familiarize various measuring devices ➤ To familiarize measuring circuits using Op-amps ➤ To study various bridge circuits 			
Any 10 Experiments				
<ol style="list-style-type: none"> 1. Use of function generator to generate different types of waveforms 2. Use of DSO to measure amplitude and frequency 3. Measurement of phase and frequency using Lissajou’s figure in CRO 4. ADC using Op-amp 5. DAC using Op-amp 6. Instrumentation amplifier 7. Determination of impact of filter on rise time and fall time of pulses 8. Measurement of resistance using Kelvin’s double bridge 9. Measurement of resistance using Wheatstone bridge 10. Measurement of inductance using Maxwell’s bridge 11. Measurement of inductance using Hay’s bridge 12. Measurement of capacitance using Schering bridge 13. Measurement of capacitance using Desauty’s bridge 14. To determine high resistance by Megohm Bridge method 				
Reference and Textbooks:-				
<p>R.K. Rajput,(2008) “<i>Electrical and Electronic Measurements and Instrumentation</i>”, S. Chand.</p> <p>Syed Akhtar Imam, Vibhav Kumar Sachan, (2020), “<i>Electronic Measurement and Instrumentation</i>”, Wiley.</p> <p>http://vlabs.iitkgp.ac.in/asnm/exp17/index.html</p>				
Outcomes	After completion of the course students will be able <ul style="list-style-type: none"> ➤ To measure various parameters using CRO, DSO ➤ To design AC/DC bridge circuits and measure capacitance, resistance and inductance 			

Course Code: 22BECA2	Allied – I B		T/P	C	H/W
	Microprocessor/Microcontroller and Applications		T	3	3
Objectives	<ul style="list-style-type: none"> ➤ To get fundamental knowledge in microprocessor 8085 ➤ To learn assembly language programming concepts ➤ To know interfacing techniques ➤ To familiarize with microcontroller 8051 and its applications 				
Unit-I	INTEL 8085 Architecture and Instruction Set Introduction to INTEL8085 - Register structure - Pin details and functions - Instruction cycle - Timing diagram - Instruction set - Addressing modes – Status flags - Data transfer group - Arithmetic group - Logical group - Branch- Stack, I/O and machine control group.				
Unit-II	Assembly Language Programming Machine language-Assembly language-one pass and two pass assembler-Stacks subroutines- Macro- Micro programming – Data transfer and data manipulation programs-Single byte and Multi byte addition- Complement – Shift – Mask- Larger – smaller – Array manipulations- Sum of Series.				
Unit-III	Peripherals Interfacing of 8085 8255 Programmable Peripheral Interface – 8279 Keyboard and display controller – ADC/DAC interfacing - 8253 Programmable Interval Timer - 8259 Programmable Interrupt Controller– 8237 Direct Memory Access Controller.				
Unit-IV	8051 Microcontroller Features of 8051–Pin description of 8051 - 8051 Microcontroller Architecture - 8051 oscillator and clocks - Program counter and data pointer – A and B Registers – Bank Registers -Flags –PSW - Internal RAM - Stack and Stack pointer - special Function Registers-Memory organization - I/O Port – Interrupt – Timer and Counter – Serial I/O Port.				
Unit-V	8051 Programming and Applications 8051 instruction set – Addressing modes – Assembly language programming – I/O port programming – Timer and counterprogramming –Serial communication – Interrupt programming – Interfacing with 8051: ADC, DAC and Stepper motor.				
Reference and Textbooks:- Text Books: Mohammed Ali Mazidi and Janice Gillispie Mazidi, “The 8051 Microcontroller and Embedded Systems”, Pearson Education Asia, 2003. Ram. B, “Fundamentals of microprocessor and microcomputers”, Dhanpat Rai & Sons, 2012 Ramesh S. Gaonkar, “Microprocessor Architecture Programming and application with 8085”, 5th Edition, PHI, 2002. References: Kenneth. J. Ayala, “The 8051 Microcontroller Architecture Programming and Application”, 2 nd Edition, Penram International Publishers (India), 1996 Rafiqzhan. M, “Microprocessors Theory and Applications: Intel and Motorola”, PHI Pvt.Ltd., 2003. https://nptel.ac.in/courses/106/108/106108100/					
Outcomes	After completion of the course students will be able <ul style="list-style-type: none"> ➤ To define architecture, addressing modes and instruction set in 8085 ➤ To explain assembly language programming in 8085 ➤ To discuss 8255, 8279, 8253, 8259 and 8237 interfacing ➤ To recall microcontroller 8051 architecture and pin configuration ➤ To understand programming and interfacing in 8051 				

Course Code: 22BECAP2	Allied Practical – I B Microprocessor/Microcontroller Applications Lab	T/P P	C 2	H/W 2
Objectives	<ul style="list-style-type: none"> ➤ To write simple programs in 8085 / 8051 ➤ To write programs to interface ADC, DAC, Stepper motor etc. 			
<p>Any 10 Experiments</p> <ol style="list-style-type: none"> 1. Addition of 8 / 16 bit Data using 8085 2. Subtraction of 8 / 16 bit Data using 8085 3. Multiplication of 8 bit Data using 8085 4. Division of 8 bit Data using 8085 5. Smallest / largest of N Numbers 6. To arrange in ascending / Descending Order 7. Addition of 8 / 16 bit Data using 8051 8. Subtraction of 8 / 16 bit Data using 8051 9. Multiplication of 8 bit Data using 8051 10. Division of 8 bit Data using 8051 11. Logical operations using 8051 12. ADC Interfacing 13. DAC Interfacing 14. Stepper Motor interfacing 				
<p>Reference and Textbooks:-</p> <p>A. Nagoor Kani, “Microprocessor and Microcontroller”, McGraw Hill Education, 2016.</p> <p>V. Vijayendran, “Fundamental of Microprocessor 8085: Architecture Programming, and Interfacing”, 2009.</p>				
Outcomes	<p>After completion of the course students will be able</p> <ul style="list-style-type: none"> ➤ To execute and verify the outputs of elementary programs in 8085 / 8051 ➤ To analyze and verify the performance of ADC/DAC/ Stepper motor interfacing 			

Course Code: 22BECA3		Allied – II A	T/P	C	H/W
		Principles of Communication System	T	3	3
Objectives	<ul style="list-style-type: none"> ➤ To learn various modulation techniques in communication ➤ To be aware of working of domestic electronic appliances. ➤ To get knowledge in radio communication systems 				
Unit-I	Amplitude Modulation Sources of Noise – Classification of Noise – External and Internal Noises – Signal Noise Ratio – Amplitude Modulation – Expression - Different forms of Amplitude Modulation – DSBSC – SSB techniques – Transmitters – Types – AM Modulators – Demodulation – AM Detectors – Receivers.				
Unit-II	Frequency and Phase Modulation Frequency Modulation – Expression of FM wave – Pre- Emphasis and De- Emphasis – FM Versus AM - FM Generation – Methods of FM generation – Reactance Modulator - FM transmitters – Direct / indirect FM transmitter – Demodulation – FM Receivers – Phase Modulation – Expression – Generation, Transmission and Reception – Comparison of AM, FM and PM.				
Unit-III	Pulse Modulation Pulse Modulation – Quantization – Sampling – Sampling Techniques - Classification - PAM, PTM, PWM, PPM – A/D signals – Principle of Digital communication – Types of Digital Pulse Modulators – PCM – DM – Digital Carrier Modulation – ASK, FSK – Multiplexing – Transmission and Reception of TDM, FDM.				
Unit-IV	Domestic Electronics Antenna – Antenna Reciprocity – Antenna as a Transmission Line – Related Terms – Types – UHF & MW – Special Antennas – Colour Television – Primary, Secondary and Complementary Colours – Colour TV Receiver – Camera – Picture Tube – Gun Colour – Screens – Transmission – Reception – Receiver – Flat Panel TV – 3 DTV – LCD / LED TV Plasma TV – TV Studio - Cable TV – CATV Trough Internet – DTH – Merits.				
Unit-V	Radio Communication Systems Radar – Principles – Functions – Classification – Pulse Radar – MTI Radar – Beacon Radar – CW Radar – Tracking Radar – Laser Radar – Radar Displays – Satellite Communication – Classification – Related Terms – Antenna Beam Width and Size – Satellite Communication System – earth Station – Satellite Station.				
Reference and Textbooks:-					
Text Books:					
M.L.Anand, “Principles of Communication Engineering”, CRC Press, 2022.					
Herbert Taub and Donald L Schilling., “Principles of Communication Systems”, 4thEdition, TMH, Fourth reprint 2015.					
References:					
George Kennedy, Bernard Davis, S. R. M Prasanna, “Electronic CommunicationSystems”, McGraw Hill Education, 2017.					
Simon Haykin and Michael Moher, “Communication Systems”, 5th edition, Johnwiley& Sons.					
Wayne Tomasi,“Advanced Electronic Communication Systems”,6thEdition,Pearson Education, 2009.					
Outcomes	After completion of the course students will be able <ul style="list-style-type: none"> ➤ To understand AM principle, transmission and detection ➤ To discuss frequency modulation and demodulation techniques ➤ To analyze phase modulation and demodulation ➤ To define PAM, transmission and reception ➤ To describe electronic appliances like antenna, colour TV, cable TV and DTH ➤ To realize the principles of radar and satellite communication 				

Course Code: 22BECAP3	Allied Practical – II A	T/P	C	H/W
	Communication System Lab	P	2	2
Objectives	<ul style="list-style-type: none"> ➤ To design modulation and demodulation circuits ➤ To construct shift keying modulation and demodulation circuits 			
<p>Any 10 Experiments</p> <ol style="list-style-type: none"> 1. Amplitude Modulation 2. Amplitude De Modulation 3. Frequency Modulation 4. Frequency Demodulation 5. Pulse Position Modulation 6. Pulse Amplitude Modulation 7. Pulse Width Modulation 8. Amplitude Shift Keying Modulation 9. Amplitude Shift Keying Demodulation 10. Frequency Shift Keying Modulation 11. Frequency Shift Keying Demodulation 12. Frequency Division Multiplexing 13. Time Division Multiplexing 14. Pre Emphasis and De-emphasis 				
<p>Reference and Textbooks:-</p> <p>B Sasikala & S Poornachandra Rao, “Handbook of Experiments in Electronics and Communication Engineering”, 1/e, Vikas Publishing,</p>				
Outcomes	<p>After completion of the course students will be able</p> <ul style="list-style-type: none"> ➤ To analyze the performance of modulation and demodulation circuits ➤ To demonstrate shift keying modulation and demodulation experiments. 			

Course Code: 22BECA4	Allied – II B		T/P	C	H/W
	Internet of Things and its Applications		T	3	3
Objectives	<ul style="list-style-type: none"> ➤ To familiarize with the basics of IoT ➤ To learn technologies and protocols in IoT ➤ To study communication protocols in IoT ➤ To get knowledge in Development tools and security of IoT 				
Unit-I	Overview of IoT Advantages and Disadvantages of IOT – Characteristics of IOT – IOT applications – Working and implementation of IOT – Components of IOT system – IOT architectures and levels – IOT Eco system – Value chain and Global value chain – Types of networks				
Unit-II	IoT Technologies and Protocols Bluetooth – BLE –Wifi – Low power wifi - LiFi – Cellular networks – Z-Wave – RFID – X-10 – Sigfox – Zigbee – Low Range Wide Area Network – 6LoWpan – 5G – Low Power Wide Area Networks – Thread – Near Field Communications – GSM – GPRS – LTE-A –Wireless Sensor Network				
Unit-III	Communication Protocols Application Layer Protocols – Transport Layer Protocols – Network Layer Protocols – Link Layer Protocols – IOT Enabling technologies – Building blocks of IOT – Logical and Physical design of IOT – Design methodology – Communication models				
Unit-IV	Development Tools of IoT Various tools used in IOT – Introduction to Arduino – Types of Arduino boards – Introduction to Arduino IDE – Compiling, debugging, uploading and running a file				
Unit-V	Security And Future of Iot Security – Cyber Security – Need, types and challenges – Privacy for IOT enabled devices – Major IOT leaks – Security for consumer devices – Security levels – Protecting IOT Devices – Future of IOT Ecosystem – Cryptography – Artificial Intelligence - Machine learning.				
Reference and Textbooks:-					
Text Books:					
Arshdeep Bahga, Vijay Madiseti, —Internet of Things – A hands-on approach, Universities Press, 2015.					
Sathish Jain and Shashi Singh, “Internet of Things and its Applications: Madesimple”, BPB Publishers, 2020.					
Simone Cirani, Gianluigi Ferrari, Marco Picone, “Internet of Things Architectures, Protocols and Standards”, Wiley, 2019.					
References:					
David Hanes, G. Salgueiro, P. Grossetete, “IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things”, Cisco Press, 2017.					
Sachi Nandan Mohanty, Jyotir Moy Chatterjee, Suneeta Satpathy “Internet of Things and Its Applications”, Springer, 2022.					
B.K. Tripathy, J. Anuradha “INTERNET OF THINGS (IoT)-Technologies, Applications, Challenges, and Solutions”, Taylor & Francis, 2018					
Outcomes	After completion of the course students will be able <ul style="list-style-type: none"> ➤ To understand architecture, components and characteristics of IoT ➤ To analyze IoT technologies - wifi, lifi, GSM, GPRS, wireless sensor network ➤ To realize communication protocols in IoT ➤ To describe arduino types, boards and compiling ➤ To discuss security and IoT in cryptography, AI and ML 				

Course Code: 22BECAP4	Allied Practical – IIB	T/P	C	H/W
	IoT Applications Lab	P	2	2
Objectives	<ul style="list-style-type: none"> ➤ To program Arduino to control lights, motors, and other devices ➤ To test, debug, and deploy the Arduino to solve real world problems 			
<p>Any 10 Experiments</p> <ol style="list-style-type: none"> 1. Arduino software installation 2. Design of digital DC voltmeter and Ammeter 3. Interface LED / Buzzer with Arduino 4. Interface IR / LDR sensor with Arduino 5. Interface temperature sensor with Arduino 6. Interface humidity sensor with Arduino 7. Interface motor using relay Arduino 8. Controlling domestic appliances using Arduino 9. Remote monitoring using Arduino 10. Interface blue tooth with Arduino 11. Storing and retrieving data from cloud with Arduino 12. Performing basic SQL queries using MySQL data base on Arduino 13. Subscribing MQTT broker for data on Arduino 14. Creating TCP / UDP server on Arduino 				
<p>Reference and Textbooks:-</p> <p>Adeel Javed, “Building Arduino Projects for the Internet of Things”, Apress, 2016</p> <p>https://www.ee.iitkgp.ac.in</p> <p>https://www.citchennai.edu.in</p> <p>https://www.deltaww.com</p>				
Outcomes	<p>After completion of the course students will be able</p> <ul style="list-style-type: none"> ➤ To design Arduino based digital meters for measurements ➤ To interface LED/LDR/Sensor with Arduino ➤ To create TCP/UDP server on Arduino 			