COURSE STRUCTURE OF DIPLOMA IN ECE
AND
FULL -LENGTH SYLLABUS OF ECE-THIRD YEAR

UNIVERSITY POLYTECHNIC
BIRLA INSTITUTE OF TECHNOLOGY MESRA – 835215 (RANCHI)
DEPARTMENT OF ELECTRONICS AND COMMUNICATIONS ENGINEERING

NEW COURSE STRUCTURE – To be effective for Diploma 2023-24
Based on CBCS system & OBE model
Recommended scheme of study
(For Diploma in Electronics & Communications Engineering)

Semester of Study (Recommended)	Category of course	Course Code	Subjects	Mode of delivery & credits *L-Lecture; T-Tutorial; P-Practical*			Total Credits *C-Credits*
				L	T	P	C
			THEORY				
FIFTH	PC	DEC 501	Digital Communication	3	0	0	3
		DEC 503	Embedded Systems	3	0	0	3
	PE	DPE 531/532/533	PE-II	3	0	0	3
		DPE 534/535/536	PE-III	3	0	0	3
	OE	DOE 531/532/533	OE-II [Courses from other Branches]	3	0	0	3
			SESSIONAL				
	PC	DEC 502	Digital Communication Lab	0	0	2	1
		DEC 504	Embedded Systems Lab	0	0	2	1
		DEC 506	Control & Instrumentation Lab	0	0	2	1
	Summer Internship	DSI 531	Summer Internship-II (4 weeks) after IV Semester	0	0	0	4
	Project	DPR 531	Project	0	0	4	2
			TOTAL CREDITS				**24**
			Total Lectures Per Week			**25**	
			THEORY				
SIXTH	PC	DEC 601	Information Theory and Coding	3	0	0	3
		DEC 603	Mobile and Wireless Communication	3	0	0	3
	PE	DPE 631/632/633	PE-IV	3	0	0	3
	OE	DOE 631/632/633	OE-III [Courses from other Branches]	3	0	0	3
	HSS	DHS 601	Entrepreneurship and Startup	3	1	0	4
	Mandatory Course	DAU 601	Indian Constitution	2	0	0	0 (Non-credit)
			SESSIONAL				
	PE	DPE 634/635/636	PE-V	0	0	2	1
	Major Project	DPR 631	Project	0	0	4	2
	Seminar	DSE631	Comprehensive Viva	1	0	0	1
			TOTAL CREDITS				**20**
			Total Lectures Per Week			**25**	
			GRAND TOTAL FOR THIRD YEAR				**44**

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DEPARTMENT OF ELECTRONICS AND COMMUNICATIONS ENGINEERING

PROGRAMME ELECTIVES (PE)*

SEMESTER	Code no.	Name of the PE courses	Prerequisite/ Co-requisite courses with code	L	T	P	C
		PE-I					
SEM-IV	DPE 431	Electronic Equipment Maintenance	Basic Electronics	3	0	0	3
	DPE 432	Electronics Devices	Basic Electronics	3	0	0	3
	DPE 433	Computer System Architecture	Digital Electronics	3	0	0	3
	DPE 434	Signals and Systems	Electric Circuits and Network	3	0	0	3
		PE-II					
SEM- V	DPE 531	Industrial Automation	Electronic Measurements and Instrumentation	3	0	0	3
	DPE 532	Control System	Signals and Systems	3	0	0	3
	DPE 533	Introduction to IOT	Microprocessor and Microcontroller	3	0	0	3
		PE-III					
SEM-V	DPE 534	Microwave and RADAR	Analog Communication	3	0	0	3
	DPE 535	Optical Communication and Networking	Analog Communication	3	0	0	3
	DPE 536	Introduction to Antenna	Analog Communication	3	0	0	3
		PE-IV					
SEM-VI	DPE 631	Satellite Communication	Digital Communication	3	0	0	3
	DPE 632	Data Communication and Networking	Digital Communication	3	0	0	3
	DPE 633	Programmable Logic Controllers	Microprocessor and Microcontroller	3	0	0	3
		PE-V [Sessional]					
SEM-VI	DPE 634	Microwave and Antenna Lab	Analog Communication	0	0	2	1
	DPE 635	Programmable Logic Controllers Lab	Microprocessor and Microcontroller	0	0	2	1
	DPE 636	Wireless Communication and Networking Lab	Digital Communication	0	0	2	1

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DEPARTMENT OF ELECTRONICS AND COMMUNICATIONS ENGINEERING

OPEN ELECTIVES (OE)*

SEMESTER	Code No.	Name of the OE courses	Prerequisites courses with code	L	T	P	C
		OE-I					
FOURTH	DOE 431	Digital Electronics and Application	N/A	3	0	0	3
	DOE 432	Analog Electronics and Applications	N/A	3	0	0	3
	DOE 433	Circuit Theory and Application	N/A	3	0	0	3
		OE- II					
FIFTH	DOE 531	Introduction to Communication System	N/A	3	0	0	3
	DOE 532	Sensors and Transducers	N/A	3	0	0	3
	DOE 533	Consumer Electronics	N/A	3	0	0	3
		OE- III					
SIXTH	DOE 631	Bio-Medical Electronics	N/A	3	0	0	3
	DOE 632	Modern Instrumentation System	N/A	3	0	0	3
	DOE 633	IoT and its Applications	N/A	3	0	0	3
*OPEN ELECTIVES TO BE OPTED ONLY BY OTHER DEPARTMENT STUDENTS							

UNIVERSITY POLYTECHNIC
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DEPARTMENT OF ELECTRONICS AND COMMUNICATIONS ENGINEERING
DIGITAL COMMUNICATION

PROGRAMME: Diploma in Electronics and Communication Engineering							
COURSE CODE: DEC 501			COURSE TITLE: Digital Communication				
COMPULSORY: PROGRAMME CORE							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEK	CREDIT	PE	FINAL	TOTAL
3	0	0	3	3	50	50	100

RATIONALE: This course aims to:

1. Provide an in-depth understanding of analog and digital communication systems, channel capacity, entropy, and Shannon-Hartley theorem.
2. Introduce key concepts such as sampling theorem, Nyquist rate, aliasing, and pulse modulation schemes including PAM, PWM, PPM, PCM, and Delta modulation.
3. Explain the principles of digital modulation techniques like ASK, FSK, PSK, QPSK, QAM, and DPSK.
4. Familiarize students with coding methods, including line coding, source coding, and error detection and correction mechanisms.
5. Explore multiplexing techniques, multiple access schemes, and spread spectrum modulation.

COURSE OUTCOMES: After the completion of this course, students will be able to

CO1	Understand the channel capacity, entropy, and the Shannon-Hartley theorem.
CO2	Analyze the sampling techniques and implement pulse code modulation
CO3	Design and appraise the various digital modulation techniques.
CO4	Apply coding methods and perform error detection and correction.
CO5	Evaluate multiplexing and multiple access schemes and their applications

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	**Introduction to Digital Communication:** 1.1 Overview of digital communication systems: Block diagram 1.2 Channel capacity: Hartley's law, Shannon-Hartley theorem 1.3 Entropy: Definition, properties, and channel noise effects 1.4 Advantages and limitations of digital communication Course Outcome: CO1 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)
2	**Pulse Communication:** 2.1 Sampling theorem: Nyquist rate, aliasing, natural and flat-top sampling 2.2 Pulse modulation techniques: PAM, PWM, and PPM: Definitions, generation, block diagrams, waveforms, and comparison 2.3 Pulse code modulation (PCM): Block diagram, quantization, companding, inter-symbol interference. 2.4 Delta modulation (DM): Slope overload, granular noise 2.5 Adaptive delta modulation (ADM) and Differential PCM (DPCM): Principles and block diagrams. Course Outcome: CO1, CO2 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)
3	**Digital Modulation Techniques:** 3.1 Amplitude shift keying (ASK), Frequency shift keying (FSK), Phase shift keying (PSK): Principles and waveforms 3.2 Quadrature modulation techniques: QPSK, QAM, DPSK 3.3 Block diagrams, bandwidth, and comparison of digital modulation techniques 3.4 M-ary encoding and its applications Course Outcome: CO1, CO3 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)
4	**Coding Methods and Error Control:** 4.1 Line coding schemes: Unipolar, bipolar (NRZ, RZ), Manchester coding 4.2 Source coding: ASCII, EBCDIC, Baudot code 4.3 Error detection and correction: Causes, parity, Hamming code, numerical examples 4.4 Channel coding: Principles and implementation

	Course Outcome: CO1, CO2, CO4 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)	
5	**Multiplexing and Multiple Access:** 5.1 Multiplexing: TDM, FDM and WDM: Definitions, block diagrams, and comparisons 5.2 Access techniques: TDMA, FDMA, CDMA 5.3 Spread spectrum modulation: Concepts and applications 5.4 Advantages of TDMA over FDMA Course Outcome: CO1, CO3, CO5 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)	

Text Books:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Electronic Communication System	Wayne Tomasi, Pearson Education, 6th Edition, 2021.	978-1292027357
2.	Digital Communication	Amitabha Bhattacharya, Tata McGraw Hill, 1st Edition, 2006.	978-0070591172
3.	Digital & Analog Communication	K. Sam Shanmugar, John Wiley & Sons, 1st Edition, 2006.	978-8126509140
4.	Principles of Communication Systems	Herbert Taub, Donald Schilling, McGraw-Hill, 4th Edition, 2008.	978-0073380797
5.	Modern Digital and Analog Communication Systems	B.P. Lathi, Zhi Ding, Oxford University Press, 4th Edition, 2009.	978-0195331455

REFERENCE BOOKS:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Digital Communication Fundamentals and Applications	B. Sklar, Fred Harris, Pearson Education, 3rd Edition, 2021.	978-0134588568
2.	Digital Communication	Sanjay Sharma, S.K. Kataria & Sons, 1st Edition, 2013.	978-9350142684
3.	Communication Systems	Simon Haykin, Wiley, 5th Edition, 2009.	978-0471697909

E-REFERENCES:

1. https://onlinecourses.nptel.ac.in/noc22_ee10/preview
2. https://ocw.mit.edu/

CO VS PO MAPPING

CO	PO							PSO		
	1	2	3	4	5	6	7	1	2	3
1	3	3	2	2	1	1	2	3	1	2
2	3	3	2	3	1	1	2	3	2	2
3	3	2	3	3	2	1	1	3	2	3
4	2	3	2	3	1	1	2	3	3	2
5	2	2	3	2	2	1	2	2	3	3

UNIVERSITY POLYTECHNIC
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DEPARTMENT OF ELECTRONICS AND COMMUNICATIONS ENGINEERING

EMBEDDED SYSTEMS

PROGRAMME: Diploma in Electronics and Communications Engineering							
COURSE CODE: DEC 503			COURSE TITLE: Embedded Systems				
COMPULSORY: Programme Core							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEK	CREDIT	PE	FINAL	TOTAL
3	0	0	3	3	50	50	100

Rationale: Students are expected to:

1. Infer ARM processor core-based microcontrollers.
2. Understand Embedded C basics operators for Arduino.
3. Execute Embedded C Programs
4. Illustrate Arduino Mega
5. Implement Communication with Arduino

COURSE OUTCOMES: After the completion of this course, students will be able to

CO1	Explain the instruction set, addressing modes, and various instruction types of the Intel 8051 microcontroller; demonstrate understanding of timer operation, serial port communication, and interrupt mechanisms.
CO2	Illustrate the basics of Embedded C for Arduino, including the use of operators; develop sketches using Arduino IDE; and implement serial communication and Boolean, pointer, and bitwise operations.
CO3	Develop programs using Embedded C control structures and looping mechanisms; apply conditional branching techniques for real-time decision making in embedded applications.
CO4	Describe the specifications of Arduino Mega, including its power ratings and peripheral features; compare C and Embedded C language in the context of microcontroller programming.
CO5	Identify and evaluate various communication modules and their real-world applications; demonstrate interfacing techniques using Arduino communication ports.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	**Intel 8051:** 1.1 Instruction Set 1.2 Addressing Modes 1.3 Instruction types *1.4* Timer operation *1.5* Serial Port operation 1.6 Interrupts Course Outcome: CO1 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)
2	**Embedded C basics operators for Arduino** 2.1 Familiarizing with the Arduino IDE 2.2 Sketch designing for Arduino 2.3 Communication interface using serial port 2.4 Basic understanding of the code with Boolean operations 2.5 Pointer access operations, bitwise operations, compounded operations Course Outcome: CO2 ,CO4 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)
3	**Embedded C** 4.1 Introduction 4.2 control structure blocks 4.3 Looping mechanism – for, do and while. 4.4 The branching operations based on conditions expression Course Outcome: CO2, CO3 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)

4	**Introduction to Arduino Mega** 4.1 Arduino Mega specifications including power ratings, 4.2 Digital and analog peripherals. 4.3 Difference between the C language and Embedded C language 4.4 Arduino Mega Ports, Pins, 4.5 Digital and Analog Peripherals Course Outcome: CO4 ,CO5 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)
5	**Communication with Arduino**: 5.5 Introduction 5.6 Different communication modules available with their real-life application 5.3 Communication interface Course Outcome: CO5 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)

Text Books:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	ARM Developer's Guide.UM10139 LPC214X User manual – Rev.4	Andrew N.Sloss, Dominic Symes, Chris Wright User manual – Rev.4	13 9780470505113.
2.	Arduino Projects For Dum- mies (For Dummies Series)	Kennedy George; Davis Bernard; Prasanna, SRM, Wiley (5 July 2013)	978-1118551479
3.	Make: Getting Started With Arduino - The Open Source Electronics Prototyping Platform	Massimo Banzi and Michael Shi- loh, Shroff/Maker Media; Third edition (27 December 2014)	978-9351109075

REFERENCE BOOKS:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Microprocessors and interfacing: programming and hardware	Douglas V. Hall, Tata McGraw Hill, 2editon, 2007	978-0070257429
2.	Microcontroller – Fundamentals and Applications with Pic	Valder – Perez, Yeesdee Publishers, Tayler & Francis	978-1420077674
3.	Microprocessors and Microcontrollers	Krishna Kant, PHI Learning Private Limited, Second Edition, 2012	978-81-203-3191-4

E-REFERENCES:

1. https://www.arduino.cc/reference/en
2. https://learn.adafruit.com/category/learn-arduino

CO VS PO MAPPING

	PO							PSO		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**
1	1	2	2	3	1	3	3	2	2	2
2	1	3	3	3	1	3	3	2	2	2
3	1	2	2	2	1	3	3	2	2	2
4	1	2	2	2	2	2	3	2	2	2
5	1	2	2	2	2	3	3	2	2	2

UNIVERSITY POLYTECHNIC
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DEPARTMENT OF ELECTRONICS AND COMMUNICATIONS ENGINEERING

INDUSTRIAL AUTOMATION

PROGRAMME: Diploma in Electronics and Communications Engineering							
COURSE CODE: DPE 531			COURSE TITLE: Industrial Instrumentation				
COMPULSORY / OPTIONAL: Program Elective (PE II)							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEK	CREDIT	PE	FINAL	TOTAL
3	0	0	3	3	50	50	100

Rationale: Students are expected to:

1. Know the basics of industrial automation systems
2. Understand the principle and operation of hardware components for automation
3. Understand industrial automation synthesis
4. Understand the use of computers in industrial automation.
5. Understand some industrial applications of automation.

COURSE OUTCOMES: After the completion of this course, students will be able to

CO1	Explain the basic concepts of automation and process control, the purpose of industrial automation, and the role of computer-based industrial control systems.
CO2	Identify and describe various hardware components used in automation, including actuators, relays, and different types of sensors and switches.
CO3	Design and implement automation circuits using motors and sensors while adhering to industry standards and safety regulations.
CO4	Illustrate and compare the use of computers in industrial automation systems, including data acquisition, data logging, supervisory control, and distributed control.
CO5	Develop microcontroller-based automation systems such as traffic light control, stacking machines, and color-based separation using the MCS-51 series.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	**The industrial control system** 1.1 Automation and Process Control 1.2 Purpose of Industrial Automation 1.3 Basic elements of an Automation system 1.4 Industrial Automation Circuits 1.5 Computer based Industrial control and Automation Course Outcome: CO1, CO4 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)
2	**Hardware components for Automation and Process Control** 2.1 Actuators: Electric Motors 2.2 Relays, Relays' operation Principle 2.3 Sensors: Proximity switches, Photoelectric switches, 2.4 Limit switches, Level Switches 2.5 Temperature and pressure switches Course Outcome: CO2 , CO3 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)
3	**Principles in Designing Automation Circuits** 3.1 Automation Circuits for Motors 3.2 Automation Circuits with Sensors 3.3 Automation Circuit Design Regulations, 3.4 Implementation of Automation Circuits 3.5 Applications Course Outcome: CO2, CO3, CO5 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)
4	**Computers in industrial automation**

	4.1 Data Acquisition System 4.2 Data Loggers 4.3 Supervisory Control 4.4 Direct Digital Control 4.5 Distributed Control Systems Course Outcome: CO1, CO4 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)	
5	**Microcontroller series (MCS) – 51 Overview:** 5.7 Cyclic operation of Traffic Lights 5.8 Stacking Machine of Light Objects 5.9 Colour based separation of plastic balls Course Outcome: CO3, CO5 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)	

Text Books:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Introduction to industrial automation	Stamatios Manesis, George Nikolakopoulos, CRC Press	978-149870540

REFERENCE BOOKS:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Process Control Instrumentation Technology	Curtis D. Johnson, Prentice Hall	978-0131194571
2.	Computer Based Industrial Control	Krishna Kant, PHI	978-8120339880

E-REFERENCES:

1. Automation World — https://www.automationworld.com
2. Control Engineering — https://www.controleng.com
3. International Society of Automation (ISA) — https://www.isa.org
4. https://mrce.in/ebooks/Industrial%20Automation%20Introduction.pdf

CO VS PO MAPPING

	PO							PSO		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**
1	1	2	2	2	1	3	3	2	2	2
2	1	3	3	2	1	3	3	2	2	2
3	1	2	2	2	1	3	3	2	2	2
4	1	2	2	2	1	2	3	2	2	2
5	1	2	2	2	1	3	3	2	2	2

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DEPARTMENT OF ELECTRONICS AND COMMUNICATIONS ENGINEERING

CONTROL SYSTEM

PROGRAMME: Diploma in Electronics and Communications Engineering							
COURSE CODE: DPE 532			COURSE TITLE: Control System				
OPTIONAL: Program Elective-PE-II							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEEK	CREDIT	PE	FINAL	TOTAL
3	0	0	3	3	50	50	100

RATIONALE: This course enables the students to:

1. Understand the underlying physics of semiconductors and the various categories of classifications.
2. Explain open and closed loop control systems, application of Laplace Transform, and mathematical modelling of physical systems.
3. Analyze linear systems using the transfer function concept.
4. Explain time-domain analysis to understand the behaviour of linear systems.
5. Analyze systems using the frequency-domain approach.
6. Explain control actions of control elements.

COURSE OUTCOMES: After completion the student will be able to:

CO1	Describe open- and closed-loop control systems, apply Laplace Transform, and develop mathematical models of physical systems.
CO2	Analyze linear systems using the concept of transfer functions.
CO3	Apply time-domain analysis techniques to evaluate the behavior of linear control system
CO4	Compare and contrast system performance using frequency-domain methods.
CO5	Summarize and differentiate various control actions implemented through control elements.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	**Introduction to Control Systems** 1.1 Introduction to Laplace Transform of different functions, Inverse Laplace Transform. 1.2 Use of Laplace Transform to solve differential equations, simple RL, RC, and RLC Circuits. 1.3 Introduction to control systems, open and closed loop systems with examples. 1.4 Mathematical modelling of physical systems. Course Outcome: CO1 Teaching Hours : 8 hrs Marks: 20 (PE+FINAL)
2	**Control System Representation** 2.1 Definition and types of transfer functions. 2.2 Transfer function of single input and single output system. 2.3 Transfer function of Electrical systems. 2.4 Block diagram representation and reduction techniques. 2.5 Explain Mason's gain formula. Course Outcome: CO1 CO2 Teaching Hours : 8 hrs Marks: 20 (PE+FINAL)
3	**Time response Analysis** 3.1 Concept of Impulse Response. 3.2 Response of first and second order system to step input. 3.3 Time response specification and types of systems. 3.4 Steady- state error and error constants for step, ramp and acceleration input. Course Outcome: CO3 Teaching Hours : 8 hrs Marks: 20 (PE+FINAL)
4	**Stability & frequency response analysis** 4.1 Definition of stable, unstable and limitedly stable system. 4.2 Response terms of various natures of roots, relative stability. 4.3 Routh's stability criterion and its application for feedback systems. 4.4 Frequency response and frequency specifications, Correlation between,

	Time response and frequency response, Bode Plot, Gain Margin and Phase Margin, Polar Plot 4.5 Nyquist stability criterion, Application for first three types of transfer function, Conformal mapping Course Outcome:CO3 CO4 Teaching Hours : 8 hrs Marks: 20 (PE+FINAL)
5	**Control Actions** 5.1 Discontinuous & continuous modes, on-off controllers: neutral zone, proportional controllers, 5.2 Integral & Derivative controllers, PI, PD, PID controllers. 5.3 DC Servo motor, AC servo motor, Potentiometer, Stepper motor. 5.4 AC Synchro: Transmitter and Receiver. Course Outcome: CO2 CO4 CO5 Teaching Hours : 8 hrs Marks: 20 (PE+FINAL)

REFERENCE BOOKS:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Control System Engineering	I J Nagrath and Dr. M Gopal, New Age International Private Limited, Seventh edition, 2021.	8195175589
2.	Modern Control Engineering	Katsuhiko Ogata, Pearson college Div; 5th edition, 2009	0136156738
3.	Automatic Control system	Benjamin C. Kuo, John Wiley & Sons; 7th Edition (21 March 2003)	0471366080

E-REFERENCES:

1. https://archive.nptel.ac.in/courses/107/106/107106081.
2. https://onlinecourses.nptel.ac.in/noc19_de04/preview.

CO VS PO MAPPING

	PO							PSO		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**
1	3	2	2	2	2	2	3	3	1	3
2	3	3	2	2	2	2	3	3	1	3
3	3	3	2	2	2	2	3	3	1	3
4	3	3	3	2	2	2	3	3	1	3
5	3	2	2	2	2	2	3	3	1	3

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DEPARTMENT OF ELECTRONICS AND COMMUNICATIONS ENGINEERING

INTRODUCTION TO IOT

PROGRAMME: Diploma in Electronics and Communication Engineering							
COURSE CODE: DPE 533			COURSE TITLE: Introduction to IoT				
OPTIONAL: Program Elective (PE II)							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEK	CREDIT	PE	FINAL	TOTAL
3	0	0	3	3	50	50	100

Rationale: Students are expected to:

1. Know the basics of IoT.
2. Know about Things and Connection.
3. Understand the role of Sensors, Actuators and Microcontrollers.
4. Understand to build IoT applications.

COURSE OUTCOMES: After the completion of this course, students will be able to

CO1	Describe the basic concepts, architecture, applications, and building blocks of the Internet of Things.
CO2	Explain the design of IoT architecture including physical, network, transport, and application layers.
CO3	Illustrate and compare the logical design aspects of IoT including functional blocks, communication models, and APIs.
CO4	Demonstrate the use of Arduino IDE for developing simple IoT applications by writing and executing sketch codes.
CO5	Identify and explain the role of various sensors, actuators, and microcontrollers in IoT applications.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	**Basics of Internet of Things** 1.1 Introduction-Overview of Internet of Things 1.2 Architecture layers of IoT 1.3 IoT applications *1.4* Building blocks of IoT Course Outcome: CO1 , CO2 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)
2	**Design basics of Internet of Things** 2.1 Physical Design of IoT 2.2 How it works 2.3 Network Layer 2.4 Transport Layer 2.5 Application Layer Course Outcome: CO2 , CO3 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)
3	**Logical Design of IoT** 3.1 IoT Functional Blocks 3.2 IoT communication Models 3.3 IoT communication APIs Course Outcome: CO2, CO3 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)
4	**Building IoT applications** 4.1 Introduction to Arduino IDE 4.2 Arduino IDE initial setup step by step 4.3 Parts of the Arduino IDE environment 4.4 Writing codes in sketch Course Outcome: CO4, CO5 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)
5	**Applications of Sensors, Actuators and Microcontrollers in IoT** 5.10 Sensors: Temperature Sensors in IoT, Proximity Sensor in IoT

	5.11 Pressure Sensor in IoT, Gas Sensor in IoT 5.12 Actuator in IoT 5.13 Microcontroller in IoT Course Outcome: CO4,CO5 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)	

Text Books:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Introduction to IoT and its Applications	T Balaji, Tbalaji Publication, First Edition, February 2021	978-81-952954-4-9

REFERENCE BOOKS:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Internet of Things	Jeeva Jose, Khanna Publishing, Edition 2018, Reprint 2019	978-93-86173-59-1
2.	Internet of Things A Hands-on Approach	Arshdeep Bahaga, Vijay Madisetti, Universities Press, Reprinted in 2021	978-81-7371-954-7

E-REFERENCES:

1. https://nptel.ac.in/courses/106/105/106105166/
2. https://www.coursera.org/learn/iot
3. https://www.iotforall.com/
4. https://dokumen.pub/introduction-to-iot-9781108842952-2020037656-2020037657-9781108959742-9781108913560.html

CO VS PO MAPPING

CO	PO							PSO		
	1	2	3	4	5	6	7	1	2	3
1	1	2	2	2	1	3	3	2	2	2
2	1	3	3	2	1	3	3	2	2	2
3	1	2	2	2	1	3	3	2	2	2
4	1	2	2	2	1	2	3	2	2	2
5	1	2	2	2	1	3	3	2	2	2

UNIVERSITY POLYTECHNIC
BIRLA INSTITUTE OF TECHNOLOGY MESRA – 835215 (RANCHI)
DEPARTMENT OF ELECTRONICS AND COMMUNICATIONS ENGINEERING
MICROWAVE AND RADAR

PROGRAMME: Diploma in Electronics and Communications Engineering							
COURSE CODE: DPE 534			COURSE TITLE: Microwave and RADAR				
PROGRAMME ELECTIVE:PE III							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEK	CREDIT	PE	FINAL	TOTAL
3	0	0	3	3	50	50	100

RATIONALE: This course provides a foundational understanding of **microwave engineering** by covering essential concepts, components, and applications. It begins with **waveguides**, explaining signal transmission at high frequencies. Students then explore **passive and active microwave components**, crucial for signal routing, amplification, and oscillation. The course further delves into **microwave communication systems**, discussing propagation modes and antennas. Finally, **radar theory** introduces radar principles, types, and applications in defence, aviation, and surveillance. This knowledge equips students with the skills needed to analyse, design, and troubleshoot microwave and radar systems.

COURSE OUTCOMES: After completion of course, students will be able to:

CO1	Eexplain waveguide theory including propagation modes, cut-off frequency, and wave velocities.
CO2	Describe structure, principle, and application of passive microwave components and relate them to wave behavior.
CO3	Explain working of active microwave devices and analyze their operational principles.
CO4	Describe microwave communication systems, propagation phenomena and evaluate antenna types.
CO5	Explain radar principles and analyze working of various radar systems and beacons.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	TITLE :WAVE GUIDE 1.1 Introduction- Microwave Region and Band Designations. 1.2 Wave Designation: TEM/TE/TM wave designation, Comparison of wave guide with two wire transmission line. 1.3 Wave propagation; Propagation of waves in rectangular wave guide only. TE & TM Modes in rectangular wave guide with field pattern. 1.4 Modes & Cut-Off Frequency: Concept of dominant mode, Definition and interpretation of cut-off frequency of a waveguide. 1.5 Velocity : guide wave length, phase velocity, group velocity(Simple Numerical) Course Outcome: CO1,CO2 Teaching Hours : 8 hrs Marks: 20 (PE+FINAL)
2	TITLE: PASSIVE MICROWAVE COMPONENTS 2.1 Microwave Tees- Construction, working principle and application. 2.2 Directional Coupler- Construction, working principle and application. 2.3 Bends, Twists & Corners- Construction, working principle and application. 2.4 Isolators- Construction, working principle and application. 2.5 Circulators- Construction, working principle and application. Course Outcome: CO1,CO2, CO4 Teaching Hours : 8 hrs Marks: 20 (PE+FINAL)
3	TITLE: ACTIVE MICROWAVE COMPONENTS 3.1 Klystron- Construction , working Principles & Applications of Multi-cavity klystron amplifier, Reflex Klystron 3.2 Magnetron- Construction , working Principles & Applications 3.3 TWT- Construction , working Principles & Applications 3.4 Pin Diodes - Construction , working Principles & Applications 3.5 Gunn Oscillators - Construction , working Principles & Applications Course Outcome: CO3,CO4, CO5 Teaching Hours : 8 hrs Marks: 20 (PE+FINAL)

4	TITLE: MICROWAVE COMMUNICATION SYSTEMS 4.1 Microwave Communication- Introduction and Mode of Wave Propagation. 4.2 Range of LOS Microwave Systems 4.3 Concept of Effective Earth's Radius 4.4 Duct Propagation (Super Refraction) 4.5 Microwave Antennas- Horn, Parabolic, Spiral, Patch, Slot, Lens; working and application of each. Course Outcome: CO1,CO2,CO4 Teaching Hours : 8 hrs Marks: 20 (PE+FINAL)
5	TITLE : Radar Theory 5.1 Fundamentals- Basic concept of Radar, Radar Range equation, factors influencing maximum range 5.2 Pulsed Radar- Block diagram, Duplexer concept, Antenna Scanning & Tracking, Display methods. 5.3 MTI Radar- Principle, Block diagram and operation of MTI radar. 5.4CW Radar- Concept of continuous Wave Radar (Modulated & Un- Modulated), Doppler effect. Advantages, Disadvantage and application of CWR. 5.5 Radar Beacons- principle, operation and application. Course Outcome: CO3,CO4,CO5 Teaching Hours : 8 hrs Marks: 20 (PE+FINAL)

REFERENCE BOOKS:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1	Microwave Devices and Circuits	Samuel Liao, Prentice Hall of India	
2	Microwave and Radar Engineering	A K Gautam, S. K. Kataria & Sons	
3	Microwave Engineering	David Pozar, John Wiley and Sons	

E-REFERENCES:

1. https://www.wiley.com/en-us
2. https://www.pearson.com/
3. https://ocw.mit.edu
4. https://nptel.ac.in/courses/108/105/108105157/
5. https://ieeexplore.ieee.org/

CO VS PO MAPPING

CO	PO							PSO		
	1	2	3	4	5	6	7	1	2	3
1	3	2	1	2	0	0	1	3	0	2
2	3	2	2	2	0	1	1	2	3	2
3	3	2	2	2	0	1	2	3	2	3
4	3	2	2	2	1	2	2	2	1	3
5	3	2	1	2	0	0	1	3	0	2

UNIVERSITY POLYTECHNIC
BIRLA INSTITUTE OF TECHNOLOGY MESRA – 835215 (RANCHI)
DEPARTMENT OF ELECTRONICS AND COMMUNICATIONS ENGINEERING

OPTICAL COMMUNICATION AND NETWORK

PROGRAMME: Diploma in Electronics and Communications Engineering							
COURSE CODE: DPE 535			COURSE TITLE: Optical Communication and Network				
PROGRAMME ELECTIVE: PE III							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEK	CREDIT	PE	FINAL	TOTAL
3	0	0	3	3	50	50	100

RATIONALE: Optical communication is a crucial field in modern telecommunications, enabling high-speed, long-distance, and high-capacity data transmission. This course is designed to equip students with fundamental knowledge and practical insights into optical communication technologies, preparing them for careers in telecommunications, networking, and fibre optics industries.

COURSE OUTCOMES: After completion of the course the students will be able to:

CO1	Describe and explain the fundamental concepts of optical communication systems, fibre structures, and transmission media.
CO2	Apply principles of ray optics and fibre parameters to analyse light propagation through optical fibres.
CO3	Analyse the causes and effects of attenuation and dispersion in optical fibres and evaluate methods for their compensation.
CO4	Compare and differentiate between various optical sources and receivers based on their working principles, efficiency, and modulation techniques.
CO5	Evaluate the architecture and operational aspects of optical communication systems and networks, including current trends and applications.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	**MODULE 1: INTRODUCTION TO OPTICAL COMMUNICATION** 1.1 Different Optical Communication Systems 1.2 Analog vs. Digital Communication 1.3 Need for Optical Communication 1.4 Basic Elements of an Optical Communication System 1.5 Overview of Optical Communication Applications Course Outcome: CO1,CO5 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)
2	**MODULE 2: OPTICAL FIBRE FUNDAMENTALS** 2.1 Basic Principles of Optical Fiber 2.2 Fiber Classification 2.3 Acceptance Angle, Acceptance Cone, and Numerical Aperture 2.4 Ray Optics Representation 2.5 Advantages and Disadvantages of Optical Fiber as a Communication Medium Course Outcome: CO1, CO2 Teaching Hours : 8 hrs Marks: 20 (PE+FINAL)
3	**MODULE 3: LOSSES AND DISPERSION IN OPTICAL FIBRE** 3.1 Attenuation and its Units (with Simple Numerical Examples) 3.2 Optical Fiber Losses: Material Loss, Scattering Loss, Splice Loss, Absorption Loss, and Radiative Loss 3.3 Dispersion: Modal Dispersion, Material Dispersion, and Waveguide Dispersion 3.4 Impact of Losses and Dispersion on Signal Transmission 3.5 Compensation Techniques for Optical Losses and Dispersion Course Outcome: CO2, CO3 Teaching Hours : 8 hrs Marks: 20 (PE+FINAL)

4	**MODULE 4: OPTICAL TRANSMITTERS AND SOURCES** 4.1 Fiber Optic Communication System: Overview of Transmitter Components 4.2 Light Sources and Important Parameters 4.3 LED: Structure, Light Source Materials, Efficiency, and Modulation 4.4 Laser Diode: Structure, Radiation Pattern, Efficiency, and Modulation 4.5 Drive Circuits for Optical Sources Course Outcome: CO4, CO5 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)
5	**MODULE 5: OPTICAL RECEIVERS AND COMMUNICATION NETWORKING** 5.1 Optical Receivers: Components and Operating Principles 5.2 Optical Detectors and Their Operating Parameters 5.3 Optical Repeaters and Their Role in Optical Networks 5.4 Optical Network Architectures: SONET/SDH, WDM, and Optical Switching 5.5 Future Trends and Applications in Optical Communication Networks Course Outcome:CO4, CO5 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)

REFERENCE BOOKS:

S. No.	Title	Author(s)	Publisher	Edition & Year	ISBN
1	Fiber-Optic Communication Systems	Govind P. Agrawal	Wiley-Interscience	5th, 2021	978-1119737360
2	Optical Fiber Communications: Principles and Practice	John M. Senior	Pearson Education	3rd, 2009	978-0130326812
3	Optical Communications	J. Gowar	Wiley	2nd, 1993	978-0471542872
4	Optical Fiber Communication Systems	Leonid Kazovsky, Sergio Benedetto, Alan E. Willner	Artech House	1st, 1996	978-0890067560
5	Optical Communication Systems: Limits and Possibilities	Andrew Ellis, Mário Lima, Jaafar Elmirghani	Jenny Stanford Publishing	1st, 2019	978-9814800280

E-REFERENCES:

1. https://opg.optica.org/jocn/abstract.cfm?uri=jocn-16-12-G40&utm_source=chatgpt.com
2. https://github.com/edsonportosilva/OptiCommPy
3. https://sourceforge.net/projects/optilux/?utm_source=chatgpt.com
4. https://shijuinpallotti.files.wordpress.com/2019/07/optical-fiber-communications-principles-and-pr.pdf?utm_source=chatgpt.com

CO VS PO MAPPING

	PO							PSO		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**
1	3	2	0	0	1	0	2	3	0	2
2	3	3	2	2	0	0	2	3	2	3
3	3	3	2	3	1	0	2	3	2	3
4	2	2	2	3	1	1	2	3	2	3
5	2	2	2	2	3	2	3	3	2	3

UNIVERSITY POLYTECHNIC
BIRLA INSTITUTE OF TECHNOLOGY MESRA – 835215 (RANCHI)
DEPARTMENT OF ELECTRONICS AND COMMUNICATIONS ENGINEERING

INTRODUCTION TO ANTENNA

PROGRAMME: Diploma in Electronics and Communications Engineering							
COURSE CODE: DPE 536			COURSE TITLE: Introduction to Antenna				
PROGRAMME ELECTIVE:PE III							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEK	CREDIT	PE	FINAL	TOTAL
3	0	0	3	3	50	50	100

RATIONALE: The study of antennas is fundamental to modern wireless communication systems. This course is designed to provide students with a comprehensive understanding of antenna fundamentals, theoretical principles, types, measurements, and emerging technologies. The curriculum is structured to equip students with the necessary skills to analyse, design, and implement antenna systems in real-world applications.

COURSE OUTCOMES: The students will be able to:

CO1	Explain the basic concepts, importance, and fundamental parameters of antennas, including their types and radiation mechanism.
CO2	Apply the principles of antenna theory, such as radiation mechanisms, impedance, and array theory, to analyse antenna characteristics.
CO3	Analyse different types of antennas based on structure, working, and applications in communication systems.
CO4	Evaluate the performance of antennas through measurements and understand the effects of various propagation modes.
CO5	Design or recommend advanced antenna technologies for emerging applications such as 5G, IoT, RFID, and wearable devices.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	**MODULE 1: FUNDAMENTALS OF ANTENNAS** 1.1 Introduction to Antennas and Their Importance 1.2 Basic Terminologies: Radiation Pattern, Gain, Directivity, Efficiency 1.3 Types of Antennas: Wire, Aperture, Microstrip, Reflector, and Array 1.4 Fundamental Parameters of Antennas 1.5 Antenna Equivalent Circuit and Radiation Mechanism Course Outcome: CO1 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)
2	**MODULE 2: ANTENNA THEORY AND ANALYSIS** 2.1 Radiation Principles and Maxwell's Equations 2.2 Antenna Impedance, Polarization, and Bandwidth 2.3 Reciprocity and Equivalence Theorems 2.4 Radiation from Current Elements 2.5 Introduction to Antenna Arrays and Beamforming Course Outcome: CO1, CO2, CO4 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)

3	**MODULE 3: TYPES OF ANTENNAS AND THEIR APPLICATIONS** 3.1 Dipole, Monopole, and Loop Antennas 3.2 Yagi-Uda Antenna and Log-Periodic Antenna 3.3 Microstrip Patch Antenna: Design and Applications 3.4 Horn, Helical, and Reflector Antennas 3.5 Satellite and Mobile Communication Antennas Course Outcome: CO2, CO3, CO4, CO5 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)
4	**MODULE 4: ANTENNA MEASUREMENTS AND PROPAGATION** 4.1 Antenna Measurement Techniques: Gain, Impedance, Radiation Pattern 4.2 Far-Field and Near-Field Measurements 4.3 Ground Wave, Sky Wave, and Space Wave Propagation 4.4 Tropospheric and Ionospheric Effects on Signal Propagation 4.5 Antenna Design Considerations for Different Frequency Bands Course Outcome: CO3, CO4 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)
5	**MODULE 5: ADVANCED ANTENNA TECHNOLOGIES** 5.1 Smart Antennas and Adaptive Arrays 5.2 MIMO Antennas and Their Applications in 5G 5.3 RFID Antennas and Their Applications 5.4 Antennas for IoT and Wearable Devices 5.5 Future Trends in Antenna Technology Course Outcome: CO3, CO5 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)

REFERENCE BOOKS:

S. No.	Title	Author, Publisher, Edition, and Year of Publication	ISBN
1	Antenna Theory: Analysis and Design	C. A. Balanis, Wiley, 4th Edition, 2016	9781118642061
2	Introduction to Antennas	R. S. Elliott, IEEE Press, 2003	9780471449966
3	Antennas and Wave Propagation	John D. Kraus, McGraw-Hill, 4th Edition, 2010	9780070082489
4	Microstrip Antenna Design Handbook	Ramesh Garg, Artech House, 2001	9780890065136

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1. https://www.antenna-theory.com/
2. https://ieeexplore.ieee.org/
3. https://www.electronics-tutorials.ws/
4. https://www.rfwireless-world.com/
5. https://www.microwaves101.com/
6. https://www.rfidjournal.com/

CO VS PO MAPPING

(COs)	PO							PSO		
	1	2	3	4	5	6	7	1	2	3
CO1	3	2	1	1	1	–	2	3	–	–
CO2	3	3	2	2	–	–	–	3	–	2
CO3	3	3	3	2	–	1	–	3	–	3
CO4	3	3	2	3	–	1	–	3	3	3
CO5	3	2	3	2	2	2	3	3	2	3

UNIVERSITY POLYTECHNIC
BIRLA INSTITUTE OF TECHNOLOGY MESRA – 835215 (RANCHI)
DEPARTMENT OF ELECTRONICS AND COMMUNICATIONS ENGINEERING

INTRODUCTION TO COMMUNICATION SYSTEM

PROGRAMME: Diploma in Electronics and Communication Engineering							
COURSE CODE: DOE 531			COURSE TITLE: Introduction to Communication System				
OPTIONAL: OE-II							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEK	CREDIT	PE	FINAL	TOTAL
3	0	0	3	3	50	50	100

RATIONALE: Students are expected to:

1. Understand the fundamental concepts of communication systems.
2. Explore various types of analog and digital communication techniques.
3. Analyze signal transmission and reception processes.
4. Gain knowledge about modulation and demodulation techniques.
5. Learn the basics of wireless communication and emerging trends.

COURSE OUTCOMES: After the completion of this course, students will be able to

CO1	Understand the basic concepts and components of communication systems
CO2	Describe the analog modulation techniques.
CO3	Evaluate the principles of digital communication systems.
CO4	Apply the signal propagation and its effect on communication.
CO5	Analyze the advancements in wireless and modern communication technologies.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	**Introduction to Communication:** 1.1 Overview of Communication Systems 1.2 Elements of Communication Systems: Transmitter, Channel, Receiver 1.3 Types of Communication: Analog and Digital 1.4 Frequency Spectrum for Communication 1.5 Applications and Role of Communication Systems in Modern Society Course Outcome: CO1, CO2 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)
2	**Analog Communication:** 2.1 Amplitude Modulation (AM): Principles and Waveforms 2.2 Frequency Modulation (FM): Principles and Applications 2.3 Phase Modulation (PM): Basics and Significance 2.4 Transmission and Reception of Analog Signals 2.5 Noise in Analog Communication Systems Course Outcome: CO1, CO2 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)
3	**Digital Communication:** 3.1 Introduction to Digital Communication 3.2 Sampling and Quantization 3.3 Pulse Code Modulation (PCM) 3.4 Basics of ASK, FSK, PSK Modulation Techniques 3.5 Comparison of Analog and Digital Communication Course Outcome: CO1, CO2, CO3 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)
4	**Signal Propagation and Transmission:** 4.1 Electromagnetic Spectrum and Signal Propagation 4.2 Transmission Media: Wired and Wireless 4.3 Bandwidth and Signal Attenuation 4.4 Multiplexing Techniques: TDM, FDM 4.5 Signal Distortion and Its Mitigation

	Course Outcome: CO1, CO2, CO4 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)
5	**Wireless and Emerging Communication Technologies:** 5.1 Basics of Wireless Communication Systems 5.2 Mobile Communication: GSM and CDMA 5.3 Introduction to IoT Communication 5.4 Satellite and Optical Communication Basics 5.5 Future Trends: 5G, Li-Fi, and Beyond Course Outcome: CO1, CO2, CO5 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)

Text Books:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Principles of Communication Systems	Taub & Schilling, McGraw-Hill, 3rd Edition, 2007.	978-0070657894
2.	Communication Systems	Simon Haykin, Wiley, 4th Edition, 2007.	978-0471697909
3.	Digital and Analog Communication Systems	Leon W. Couch, Pearson, 7th Edition, 2013.	978-0132915389
4.	Modern Wireless Communication	Andrea Goldsmith, Cambridge University, 1st Edition Edition, 2012.	978-1107696057

REFERENCE BOOKS:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Wireless Communications	Rappaport T.S., Pearson Education, 2nd Edition,2010.	978-9332547687
2.	Introduction to Communication Systems	Ferrel G. Stremler, Pearson Education, 3rd Edition, 1990.	978-9332542095
3.	Analog and Digital Communication	K. Sam Shanmugam, Wiley, 1st Edition, 2019.	978-8126519985

E-REFERENCES:

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2. https://www.slideshare.net/slideshow/introduction-to-communication-systems/17358123#:~:text=Amplitude%20modulation%20(AM)%20is%20a%20modulation%20technique,amplitude%20of%20the%20carrier%20wave%20is%20modulated
3. https://unacademy.com/content/nda/study-material/physics/introduction-to-communication-systems/#:~:text=Communication%20pervades%20all%20stages%20of,the%20transmitter%2C%20channel%20and%20receiver.

CO VS PO MAPPING

	PO							PSO		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**
1	1	2	2	3	3	3	3	2	2	2
2	1	3	3	3	1	3	3	2	2	2
3	1	2	2	2	2	3	3	2	2	2
4	1	2	2	2	2	2	3	2	2	2
5	1	2	2	2	2	1	3	2	2	2

UNIVERSITY POLYTECHNIC
BIRLA INSTITUTE OF TECHNOLOGY MESRA – 835215 (RANCHI)
DEPARTMENT OF ELECTRONICS AND COMMUNICATIONS ENGINEERING

SENSORS AND TRANSDUCERS

PROGRAMME: Diploma in Electronics and Communication Engineering							
COURSE CODE: DOE 532			COURSE TITLE: Sensors and Transducers				
OPTIONAL: Open Elective-II							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEEK	CREDIT	PE	FINAL	TOTAL
3	0	0	3	3	50	50	100

RATIONALE: This course enables the students to:

1. Understand the fundamentals of sensors and transducers.
2. Identify working of commonly used sensors.
3. Explain signal conditioning circuits.
4. Understand about data acquisition methods.

COURSE OUTCOMES: After completion the student will be able to:

CO1	Describe the working of commonly used sensors in industry for measurement of displacement, force and pressure.
CO2	Explain the working of commonly used sensors in industry for measurement of temperature, position, accelerometer, vibration sensor, flow and level.
CO3	Analyse the working of signal conditioning circuits.
CO4	Compare and evaluate about different signal conditioning circuits and data acquisition methods.
CO5	Summarize and differentiate different smart sensors and their applications in automation systems.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	**Transducers and sensors** 1.1 Introduction, Classification of Transducers. 1.2 Advantages and Disadvantages of Electrical Transducers. 1.3 Resistance Transducers, Variable Inductance Transducers, Capacitive Transducers. 1.4 Piezoelectric Transducers, Hall Effect Transducers, Photoelectric Transducers. 1.5 Measurement of pressure using LVDT. Course Outcome: CO1 CO2 Teaching Hours : 8 hrs Marks: 20 (PE+FINAL)
2	**Transducers and sensors (Continued)** 2.1 Proximity Sensors, Pneumatic Sensors. 2.2 Light Sensors, Tactile Sensors. 2.3 Temperature sensor. 2.4 Ultrasonic sensors. 2.5 Proximity sensor. Course Outcome: CO1 CO2 Teaching Hours : 8 hrs Marks: 20 (PE+FINAL)
3	**Signal Conditioning** 3.1 Introduction of Signal Conditioning circuits. 3.2 Analog Signal Conditioning circuits. 3.3 Need of amplifiers and its types. 3.4 Need of filters and its types. 3.5 Digital signal conditioning circuits. Course Outcome: CO2 CO3 Teaching Hours : 8 hrs Marks: 20 (PE+FINAL)
4	**Data Acquisition Systems** 4.1 Introduction of DAS. 4.2 Objectives & Configuration of Data Acquisition System. 4.3 Analog & Digital DAS.

	4.4 Comparison between Analog DAS and Digital DAS. Course Outcome: CO3 CO4 Teaching Hours : 8 hrs Marks: 20 (PE+FINAL)
5	**Smart Sensors** 5.1 General Structure of smart sensors & its components. 5.2 Characteristic of smart sensors. 5.3 Self calibration, Self-testing & self-communicating in smart sensors. 5.4 Application of smart sensors. Course Outcome:CO1 CO2 CO5 Teaching Hours : 8 hrs Marks: 20 (PE+FINAL)

REFERENCE BOOKS:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Electrical & Electronic Measurements & Instrumentations	A.K. Sawhney, Dhanpat Rai & Co. (P) Limited (1 January 2015)	978-8177001006
2.	Electronic Instrumentation and Measurements	H S Kalsi, McGraw-Hill; Forth edition (25 March 2019)	978-0-470-82353-8
3.	Sensors and Transducers	D. Patranabis, PHI Learning; 2nd edition (2003)	978-8120321984

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1. https://www.youtube.com/watch?v=1uPTyjxZzyo.
2. https://youtube.com/playlist?list=PLbRMhDVUMngcoKrA4sH-zvbNVSE6IpEio&si=QbS5tZEZqVgYn46T.

CO VS PO MAPPING

	PO							PSO		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**
1	3	3	3	3	2	2	3	2	2	2
2	3	3	3	3	2	2	3	2	2	2
3	3	3	3	2	1	2	2	2	2	2
4	3	3	3	2	1	2	3	2	2	2
5	3	3	3	3	3	1	2	2	2	2

UNIVERSITY POLYTECHNIC
BIRLA INSTITUTE OF TECHNOLOGY MESRA – 835215 (RANCHI)
DEPARTMENT OF ELECTRONICS AND COMMUNICATIONS ENGINEERING

CONSUMER ELECTRONICS

PROGRAMME: Diploma in Electronics and Communication Engineering							
COURSE CODE: DOE 533			COURSE TITLE: Consumer Electronics				
OPTIONAL: Open Elective-II							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEEK	CREDIT	PE	FINAL	TOTAL
3	0	0	3	3	50	50	100

RATIONALE: This course enables the students to:

1. Understand the fundamentals of Audio Systems and Audio Parameters.
2. Learn the working Principle of TV Transmitter and their Components.
3. Learn the working Principle of TV Receiver and their Components.
4. Familiarize about the working of different Home Appliances.
5. Explore different Digital Electronic System.

COURSE OUTCOMES: After completion the student will be able to:

CO1	Describe the types of Microphones and Speakers.
CO2	Compare the Operating Principle of Color TV and Monochrome TV.
CO3	Illustrate the Architecture of TV Receiver System.
CO4	Compare and contrast the operating Principle of different Home Appliances.
CO5	Summarize and differentiate between Photocopier, Digital camera and Camcorder.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	**Audio Fundamentals, Devices and System** **1.1** Basic characteristics of sound signal: Frequency response, Pitch, Sensitivity, and Selectivity, Loudness. 1.2 Microphone: Working Principle and types. 1.3 Speakers: Working Principle and types. 1.4 CD Player: working Principle with block diagram. 1.5 Block diagram of a basic Public Address system. Course Outcome: CO1 CO2 Teaching Hours : 8 hrs Marks: 20 (PE+FINAL)
2	**Television Systems** 2.1 Monochrome TV Standards: Scanning process, Aspect Ratio, Persistence Of Vision And Flicker, Composite Video (CVD) Signal, Picture Resolution, Horizontal And Vertical Sync Details. 2.2 Different type of TV camera: Single Tube and Three Tube Camera. 2.3 Colour TV Standard: Colour Theory, Luminance, Hue, and Chrominance. 2.4 Transmission Standards: PAL system, Channel Bandwidth 2.5 Block Diagram of Colour TV Transmitter. Course Outcome: CO1 CO2 Teaching Hours : 10 hrs Marks: 30 (PE+FINAL)
3	**Television Receivers and Video Systems** 3.1 PAL-D Colour TV receiver block diagram. 3.2 Different TV Technologies: LCD TV, LED TV, PLASMA TV etc. their advantages and Disadvantages. 3.3 Video Interface, Serial Digital Interface (SDI), High-Definition Multimedia Interface (HDMI), Digital Video Interface (DVI) 3.4 Video Amplifier. 3.5 Sync Separation and Sync Processing. Course Outcome: CO2 CO3 CO4 Teaching Hours : 8 hrs Marks: 20 (PE+FINAL)

4	**Home / Office Appliances** 4.1 Microwave Oven: Introduction, Precautions, Advantages & Disadvantages. 4.2 DVD Player: Brief explanation with block diagram. 4.3 DTH: Outdoor unit and Indoor unit. 4.4 Washing Machine: Introduction, Classification based on Washers and Working. 4.5 Air-Conditioning: Introduction and Working. Course Outcome: CO1 CO4 Teaching Hours : 8 hrs Marks: 20 (PE+FINAL)
5	**Digital Electronic Systems** 5.1 Photocopier: Introduction and Working 5.2 Digital Camera: Introduction and Types of camera. 5.3 Camcorder: Introduction and Types of Camcorder. Course Outcome: CO2 CO5 Teaching Hours : 6 hrs Marks: 10 (PE+FINAL)

REFERENCE BOOKS:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Consumer Electronics	Amit M. Joshi, Maulin M. Joshi, Urvashi Prakash Shukla, All India Council for Technical Education (AICTE)	978-81-960386-7-0
2.	Audio and Video Systems	Gupta, R. G. , Tata McGraw-Hill Education, 2nd , 2010.	978-0070699762
3.	Monochrome and colour Television	Gulati, R. R., New Age International, 3rd, 2014	978-8122436068

E-REFERENCES:

1. https://www.crutchfield.com/S- ytKW8B7yX0G/learn/learningcenter/home/multiroom_power.html.
2. https://www.youtube.com/watch?v=40eNsj9MGlU.
3. https://www.youtube.com/watch?v=-AY43nb_438.

CO VS PO MAPPING

	PO							PSO		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**
1	3	2	2	2	2	2	2	3	2	3
2	3	3	3	3	2	2	3	2	2	2
3	3	3	3	2	1	2	2	2	2	2
4	3	3	3	2	1	2	3	2	2	2
5	3	3	3	3	3	1	2	2	2	2

UNIVERSITY POLYTECHNIC
BIRLA INSTITUTE OF TECHNOLOGY MESRA – 835215 (RANCHI)
DEPARTMENT OF ELECTRONICS AND COMMUNICATIONS ENGINEERING

DIGITAL COMMUNICATION LAB

PROGRAMME: Diploma in Electronics and Communications Engineering							
COURSE CODE: DEC 502			COURSE TITLE: Digital Communication Lab				
COMPULSORY / OPTIONAL: Programme Core							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEK	CREDIT	PE	FINAL	TOTAL
0	0	2	2	1	60	40	100

RATIONALE: Students are expected to:

1. Understand signal sampling and reconstruct waveforms using sample/hold circuits.
2. Learn PAM, PWM, and PPM modulation and demodulation techniques.
3. Study pulse code modulation and demodulation.
4. Explore delta modulation, adaptive delta modulation, and their demodulation.
5. Analyze ASK, FSK, PSK, and various multiplexing techniques.

COURSE OUTCOMES: After the completion of the course, students will be able to:

CO1	Understand the signal sampling and its reconstruction.
CO2	Design and implement the generation and detection of waveforms such as PAM, PWM, and PPM.
CO3	Develop and evaluate pulse code modulation and demodulation.
CO4	Analyze waveforms of delta modulation, adaptive delta modulation, and their demodulation.
CO5	Apply and observe ASK, FSK, and PSK waveforms for various multiplexing schemes.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	1. Observe signal sampling and reconstruction techniques. 2. Study the effects on reconstructed waveforms using sample/hold circuits. Course Outcome: CO1 Teaching Hours: 4 hrs
2	3. Compare the frequency response of 2nd- and 4th-order low-pass filters (LPF). 4. Observe waveforms of Pulse Amplitude Modulation (PAM) and demodulation. Course Outcome: CO1, CO2 Teaching Hours: 4 hrs
3	5. Analyze waveforms of Pulse Width Modulation (PWM) using natural and flat-top sampling. 6. Observe waveforms of Pulse Position Modulation (PPM) using natural sampling. Course Outcome: CO1, CO3 Teaching Hours: 4 hrs
4	7. Study waveforms of Pulse Code Modulation (PCM) and demodulation. 8. Observe waveforms of Delta Modulation (DM). Course Outcome: CO1, CO4 Teaching Hours: 4 hrs
5	9. Analyze waveforms of Adaptive Delta Modulation (ADM). 10. Study waveforms of Amplitude Shift Keying (ASK) modulation and demodulation. 11. Observe waveforms of Frequency Shift Keying (FSK) modulation and demodulation. 12. Analyze waveforms of Phase Shift Keying (PSK) modulation and demodulation. Course Outcome: CO1, CO3, CO5 Teaching Hours: 4 hrs

OPTIONAL EXPERIMENTS:

1. Observe waveforms of Quadrature Phase Shift Keying (QPSK) modulation and demodulation.
2. Study waveforms of Quadrature Amplitude Modulation (QAM) and demodulation.
3. Perform error detection and correction using parity bits.
4. Implement error detection and correction using Hamming codes.
5. Generate and decode the following line codes:
   - NRZ (Unipolar)
   - Bipolar NRZ
   - RZ (Unipolar)
   - Bipolar RZ
6. Implement Time Division Multiplexing (TDM) and demultiplexing.
7. Implement Frequency Division Multiplexing (FDM) and demultiplexing.

TEXT BOOKS

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Electronic Communication System	Wayne Tomasi, Pearson Education, 6th Edition, 2021.	978-1292027357
2.	Digital Communication	Amitabha Bhattacharya, Tata McGraw Hill, 1st Edition, 2006.	978-0070591172
3.	Digital & Analog Communication	K. Sam Shanmugar, John Wiley & Sons, 1st Edition, 2006.	978-8126509140
4.	Principles of Communication Systems	Herbert Taub, Donald Schilling, McGraw-Hill, 4th Edition, 2008.	978-0073380797
5.	Modern Digital and Analog Communication Systems	B.P. Lathi, Zhi Ding, Oxford University Press, 4th Edition, 2009.	978-0195331455

REFERENCE BOOKS:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Digital Communication Fundamentals and Applications	B. Sklar, Fred Harris, Pearson Education, 3rd Edition, 2021.	978-0134588568
2.	Digital Communication	Sanjay Sharma, S.K. Kataria & Sons, 1st Edition, 2013.	978-9350142684
3.	Communication Systems	Simon Haykin, Wiley, 5th Edition, 2009.	978-0471697909

E-REFERENCES:

1. https://nptel.ac.in/
2. https://ocw.mit.edu/

CO VS PO MAPPING

	PO							PSO		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**
1	3	3	2	2	1	1	2	3	1	2
2	3	3	2	3	1	1	2	3	2	2
3	3	2	3	3	2	1	1	3	2	3
4	2	3	2	3	1	1	2	3	3	2
5	2	2	3	2	2	1	2	2	3	3

UNIVERSITY POLYTECHNIC
BIRLA INSTITUTE OF TECHNOLOGY MESRA – 835215 (RANCHI)
DEPARTMENT OF ELECTRONICS AND COMMUNICATIONS ENGINEERING

EMBEDDED SYSTEMS LAB

PROGRAMME: Diploma in Electronics and Communications Engineering							
COURSE CODE: DEC 504			COURSE TITLE: Embedded Systems Lab				
COMPULSORY / OPTIONAL: Programme Core							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEK	CREDIT	PE	FINAL	TOTAL
0	0	2	2	1	60	40	100

RATIONALE: Students are expected to:

1. List the various components, and characteristics of each component in a 8051 microcontroller, and commands for working on the experiment kit.
2. Understand the programming concepts of 8051 for efficient coding.
3. Write and explain algorithms and flowcharts for simple programs.
4. Explain examples for different addressing modes, and no. of bytes for different instructions
5. Write the code for a given requirement, execute the program, debug, and demonstrate that the program produces the required result/output.

COURSE OUTCOMES: After the completion of the course, students will be able to:

CO1	Understand the architecture and working of the Intel 8051 microcontroller, and apply knowledge to write and execute assembly language programs for 8-bit addition.
CO2	Apply assembly language programming skills to implement 8-bit subtraction and multiplication operations on the 8051 microcontroller.
CO3	Develop and execute assembly language programs for 8-bit division and BCD multi-byte arithmetic operations using the 8051 microcontroller.
CO4	Construct and execute assembly language programs to manipulate register contents, including doubling a number and swapping register values using the 8051 microcontroller.
CO5	Develop and execute programs for addition and addition with carry for three hexadecimal numbers using assembly language on the 8051 microcontroller.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	1.Study of microcontroller INTEL 8051 Training Kit. 2. Write and execute an assembly language program for 8-bit addition. Course Outcome: CO1 Teaching Hours: 4 hrs
2	3. Write and execute an assembly language program for 8- bit subtraction. 4. Write and execute an assembly language program for 8- bit multiplication. Course Outcome: CO2 Teaching Hours: 4 hrs
3	5. Write and execute an assembly language program for 8- bit division. 6. Write and execute an assembly language program for BCD multiple byte arithmetic operation. Course Outcome: CO3 Teaching Hours: 4 hrs
4	7. Write and execute an assembly language program to double the number in register R2 and put the number in register R3 (Higher Byte) and R4 (Lower Byte). 8. Write and execute an assembly language program to swap the content of register R7 and R6 in Register bank 0. Course Outcome: CO4 Teaching Hours: 4 hrs

5	9. Write and execute an assembly language program to add three hexadecimal numbers. 10. Write and execute an assembly language program to add with carry three hexadecimal numbers. Course Outcome: CO5 Teaching Hours: 4 hrs

TEXT BOOKS

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Fundamentals of Microprocessor and Microcontrollers	B. Ram, Dhanpat Rai Publications, Seventh Edition,31 March 2018	978-8189928605
2.	Microprocessor Architecture, Programming, and Applications with the 8085	Ramesh Gaonkar, Penram International Publishing (I) PVT. LTD., 6th Edition, 1 October 2013	978-8187972884
3.	The 8051 Microcontroller	Kenneth J. Ayala THOMSON, Cengage Learning, Third Edition	978-1401861582
4.	Microcontrollers (Theory and Applications)	Ajay V. Deshmukh, McGraw-Hill Education (India) Pvt Limited, 2005	978-0070585959

REFERENCE BOOKS:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	The 8051 Microcontroller and Embedded Systems	Md. Ali Mazidi, Pearson Education India, 2007	9788131758991

E-REFERENCES:

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CO VS PO MAPPING

	PO							PSO		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**
1	1	3	3	2	1	3	3	2	2	2
2	1	3	3	2	1	3	3	2	2	2
3	1	3	3	2	1	3	3	2	2	2
4	1	3	3	2	1	3	3	2	2	2
5	1	3	3	2	1	3	3	2	2	2

UNIVERSITY POLYTECHNIC
BIRLA INSTITUTE OF TECHNOLOGY MESRA – 835215 (RANCHI)
DEPARTMENT OF ELECTRONICS AND COMMUNICATIONS ENGINEERING

CONTROL AND INSTRUMENTATION LAB

PROGRAMME: Diploma in Electronics and Communications Engineering							
COURSE CODE: DEC 506			COURSE TITLE: Control and Instrumentation Lab				
COMPULSORY / OPTIONAL: Programme Core							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEK	CREDIT	PE	FINAL	TOTAL
0	0	2	2	1	60	40	100

RATIONALE: Students are expected to:

1. To outline and explain Basic components used in control system Specifications used for a system in time domain and frequency domain Understand the programming concepts of 8051 for efficient coding.
2. To illustrate performance characteristics of DC motor and AC Servomotor.
3. To apply comprehensive knowledge of techniques used to analyse system and solve problems.
4. Understand basics of MATLAB commands and Programming
5. Write the code for a given control system requirement, execute the program, debug, and demonstrate that the program produces the required result/output.

COURSE OUTCOMES: After the completion of the course, students will be able to:

CO1	Analyze the performance and essential components of a control system, and describe various system specifications.
CO2	Interpret and evaluate the performance characteristics of DC motors, AC servomotors, and PID controllers.
CO3	Establish the relationship between time-domain and frequency-domain analysis techniques for control systems.
CO4	Develop and explain simple MATLAB programs for control system applications.
CO5	Write, execute, debug, and demonstrate MATLAB code for a given control system requirement to achieve the desired output.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	1. To study & implement Temperature Control in Open Loop 2. To study & implement Temperature Control in Closed Loop- ON/OFF Control Course Outcome: CO1 Teaching Hours: 4 hrs
2	3. To study & implement Temperature Control in Closed Loop- Proportional Controller 4. To study & implement Temperature Control in Closed Loop- Proportional Integral (PI) Controller. Course Outcome: CO2 Teaching Hours: 4 hrs
3	5. To study & implement Temperature Control in Closed Loop- Proportional Integral Derivative (PID) Controller. 6. To observe the position control system for different values of angular position commands. Course Outcome: CO3 Teaching Hours: 4 hrs
4	7. Study of Stepper Motor in Full Step, Single Phase, Free Running Mode8Study and use of stepper motor in wobble mode 8. Study and use of stepper motor in wobble mode. Course Outcome: CO4 Teaching Hours: 4 hrs
5	9. Study of Synchro Transmitter 10. Study of Synchro Transmitter and Receiver pair Course Outcome: CO5 Teaching Hours: 4 hrs

TEXT BOOKS

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Control Systems Engineering.	I. J. Nagrath, M. Gopal, New Age International Private Limited, 7th Edition	978-8195175581

REFERENCE BOOKS:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Automatic Control System	Benjamin C. Kuo, Farid Golnaraghi, John Wiley & Sons, 9th Edition	978-8126552337

E-REFERENCES:

1. https://nptel.ac.in/courses/108/102/108102043/
2. https://www.ti.com/lit/ml/slua618/slua618.pdf
3. https://www.mathworks.com/help/simscape/ref/pidcontroller.html

CO VS PO MAPPING

	PO							PSO		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**
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4	1	3	3	2	1	3	3	2	2	2
5	1	3	3	2	1	3	3	2	2	2