ARKA JAIN University
Jharkhand
Estd. Under Jharkhand State Private University Act

Syllabus of

Diploma in Electrical & Electronics Engineering

(POLYTECHNIC-EEE)

Semester-I, II, III, IV, V & VI

(Batch 2020-2023)

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ARKA JAIN University
Jharkhand

Syllabus of

Diploma in Electrical & Electronics Engineering

Semester-I

ARKAJAIN University, Jharkhand
School of Engineering & IT
Department of Engineering
Faculty – Diploma in Electrical & Electronics Engineering (DEEE)
Scheme of Study (w.e.f Batch 2020-23)

SEMESTER –I

Sr. No.	Subject	Group	L-T-P	Credit
1	Mathematics-I	A & B	3-1-0	4
2	Communication Skills in English	A	3-0-0	3
	Fundamentals of Electrical & Electronics Engg.	B	3-1-0	4
3	Applied Physics	A	3-1-0	4
	Introduction to IT system	B	3-0-0	3
4	Applied Chemistry	A	3-1-0	4
	Engineering Mechanics	B	3-1-0	4
5	Environmental Science	B	2-0-0	0
	PRATICAL			
6.	Applied Physics Lab	A	0-0-1	1
	Fundamentals of electrical & electronics Engg. Lab	B	0-0-1	1
7.	Applied Chemistry Lab	A	0-0-1	1
	Introduction to IT system Lab	B	0-0-1	1
8.	Communication Skills in English Lab	A	0-0-1	1
	Engineering Mechanics Lab	B	0-0-1	1
9.	Engineering Workshop Practice	A	0-0-2	2
	Engineering Graphics	B	0-0-2	2
	Total	**A or B**	**23-5-10**	**36**

SEMESTER -II

Sr. No.	Subject	Group	L-T-P	Credit
1	Mathematics-II	A & B	3-1-0	4
2	Communication Skills in English	B	3-0-0	3
	Fundamentals of Electrical & Electronics Engg.	A	3-1-0	4
3	Applied Physics	B	3-1-0	4
	Introduction to IT system	A	3-0-0	3
4	Applied Chemistry	B	3-1-0	4
	Engineering Mechanics	A	3-1-0	4
5	Environmental Science	A	2-0-0	0
	PRATICAL			
6.	Applied Physics Lab	B	0-0-1	1
	Fundamentals of electrical & electronics Engg. Lab	A	0-0-1	1
7.	Applied Chemistry Lab	B	0-0-1	1
	Introduction to IT system Lab	A	0-0-1	1
8.	Communication Skills in English Lab	B	0-0-1	1
	Engineering Mechanics Lab	A	0-0-1	1
9.	Engineering Workshop Practice	B	0-0-2	2
	Engineering Graphics	A	0-0-2	2
	Total	**A or B**	**23-5-10**	**36**

SEMESTER –I(Group-A)

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Communication Skills in English	HSC	3	3	100	70	20	5	5
2	Mathematics-I	BSC	4	4	100	70	20	5	5
3	Applied Physics	BSC	4	4	100	70	20	5	5
4	Applied Chemistry	BSC	4	4	100	70	20	5	5
	Practical								
5.	Engineering Workshop Practice	ESC	2	4	50	35	5	5	5
6.	Applied Physics Lab	BSC	1	2	50	35	5	5	5
7.	Applied Chemistry Lab	BSC	1	2	50	35	5	5	5
8.	Communication Skills in English Lab	HSC	1	2	50	35	5	5	5
	Total		**20**	**25**	**600**	**420**	**100**	**40**	**40**

SEMESTER I (Group-B)

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Mathematics -I	BSC	4	4	100	70	20	5	5
2	Fundamentals of Electrical & Electronics Engg.	ESC	4	4	100	70	20	5	5
3	Introduction to IT system	ESC	3	3	100	70	20	5	5
4	Engineering Mechanics	ESC	4	4	100	70	20	5	5
5	Environmental Science	AC	0	2	50	35	10	2.5	2.5
	Practical								
6	Fundamentals of electrical & electronics Engg. Lab	ESC	1	2	50	35	5	5	5
7	Introduction to IT system Lab	ESC	1	2	50	35	5	5	5
8	Engineering Mechanics Lab	ESC	1	2	50	35	5	5	5
9	Engineering Graphics	ESC	2	4	50	35	5	5	5
	Total		**20**	**27**	**650**	**455**	**110**	**42.5**	**42.5**

SEMESTER II (Group-A)

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Mathematics -II	BSC	4	4	100	70	20	5	5
2	Fundamentals of Electrical & Electronics Engg.	ESC	4	4	100	70	20	5	5
3	Introduction to IT system	ESC	3	3	100	70	20	5	5
4	Engineering Mechanics	ESC	4	4	100	70	20	5	5
5	Environmental Science	AC	0	2	50	35	10	2.5	2.5
	Practical								
6	Fundamentals of electrical & electronics Engg. Lab	ESC	1	2	50	35	5	5	5
7	Introduction to IT system Lab	ESC	1	2	50	35	5	5	5
8	Engineering Mechanics Lab	ESC	1	2	50	35	5	5	5
9	Engineering Graphics	ESC	2	4	50	35	5	5	5
	Total		**20**	**27**	**650**	**455**	**110**	**42.5**	**42.5**

SEMESTER –II(Group-B)

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Communication Skills in English	HSC	3	3	100	70	20	5	5
2	Mathematics-II	BSC	4	4	100	70	20	5	5
3	Applied Physics	BSC	4	4	100	70	20	5	5
4	Applied Chemistry	BSC	4	4	100	70	20	5	5
	Practical								
5.	Engineering Workshop Practice	ESC	2	4	50	35	5	5	5
6.	Applied Physics Lab	BSC	1	2	50	35	5	5	5
7.	Applied Chemistry Lab	BSC	1	2	50	35	5	5	5
8.	Communication Skills in English Lab	HSC	1	2	50	35	5	5	5
	Total		**20**	**25**	**600**	**420**	**100**	**40**	**40**

SEMESTER-III

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Introduction to Electric Generation Systems	PCC	3	3	100	70	20	5	5
2	Electrical Circuits	PCC	3	3	100	70	20	5	5
3	Electrical and Electronic Measurements	PCC	3	3	100	70	20	5	5
4	Electric Motors and Transformers	PCC	3	3	100	70	20	5	5
5	Applied Electronics	PCC	3	3	100	70	20	5	5
	PRACTICAL								
6	Electrical Circuits Lab	PCC	1	2	50	35	5	5	5
7	Electrical and Electronic Measurements Lab	PCC	1	2	50	35	5	5	5
8	Electric Motors and Transformers Lab	PCC	1	2	50	35	5	5	5
9	Applied Electronics lab	PCC	1	2	50	35	5	5	5
10	Summer Internship-I (3-4 Weeks)	PROJ	2	0	50	35	15	0	0
	TOTAL		**21**	**23**	**750**	**525**	**135**	**45**	**45**

SEMESTER-IV

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Digital Electronics	PCC	3	3	100	70	20	5	5
2	Electric Power Transmission and Distribution	PCC	4	4	100	70	20	5	5
3	Induction, Synchronous and Special Electrical Machines	PCC	4	4	100	70	20	5	5
4	Elective I Industrial Instrumentation and ConditionMonitoring Electrical Testing & Commissioning Illumination Practices	PEC	3	3	100	70	20	5	5
5	Elective II Industrial Drives Electrical Estimation & Contracting Biomass and Micro-hydro Power plants	PEC	3	3	100	70	20	5	5
6	Essence of Indian Knowledge Tradition	AC	0	2	50	35	10	2.5	2.5
	PRACTICAL								
7	Digital Electronics Lab	PCC	1	2	50	35	5	5	5
8	Electrical& Electronics Engg. Drawing	PCC	2	4	50	35	5	5	5
9	Induction, Synchronous and Special Electrical Machines Lab	PCC	1	2	50	35	5	5	5
10	Minor Project	PROJ	2	4	50	35	15	0	0

	TOTAL		**23**	**31**	**750**	**525**	**140**	**42.5**	**42.5**

SEMESTER V

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA	Attendance
1	Microprocessor & Microcontroller	PCC	4	4	100	70	20	5	5
2	Fundamentals of Power Electronics	PCC	4	4	100	70	20	5	5
3	Elective III Switchgear and Protection Wind Power Technologies Electric Vehicles	PEC	3	3	100	70	20	5	5
4	Elective IV Industrial Automation & Control Communication Technologies Electric Traction	PEC	3	3	100	70	20	5	5
5	Open Elective I Artificial Intelligence & Machine Learning Introduction to E-Governance Robotics	OEC	3	3	100	70	20	5	5
	PRACTICAL								
6	Microprocessor & Microcontroller Lab	PCC	1	2	100	70	20	5	5
7	Fundamentals of Power Electronics Lab	PCC	1	2	50	35	5	5	5
8	Summer Internship-II(4-6 Weeks)	PROJ	3	0	100	70	30	0	0

9	Major Project-I (Project to be carried over to next semester)	PROJ	1	2	50	35	15	0	0
	TOTAL		**23**	**23**	**800**	**560**	**170**	**35**	**35**

SEMESTER VI

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Building Electrification	PCC	4	4	100	70	20	5	5
2	Entrepreneurship and Start –ups	HSC	4	4	100	70	20	5	5
3	Open Elective II Internet of Things Project Management Operations Research	OEC	3	3	100	70	20	5	5
4	Open Elective III Economic Policies in India Energy Efficiency and Audit	OEC	3	3	100	70	20	5	5
5	Indian constitution	AC	0	2	50	35	10	2.5	2.5
	PRACTICAL								
6	Seminar	PROJ	1	2	50	35	15	0	0
7	Major Project-II	PROJ	3	6	100	70	30	0	0
	TOTAL		**18**	**24**	**600**	**455**	**135**	**22.5**	**22.5**

Distribution of Credit across 6 semesters:

Sl. No	Type of Paper	No. of Paper	Total Credit
1	Humanities and Social Sciences Courses **(HSC)**	3	8
2	Basic Science courses**(BSC)**	6	18
3	Engineering Science courses **(ESC)**	8	18
4	Professional core courses (**PCC)**	20	48
5	Professional Elective courses**(PEC)**	4	12
6	Open Electives Courses (**OEC)**	3	9
7	Project work, seminar and internship in industry or elsewhere**(PROJ)**	6	12
8	Audit Courses [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Knowledge Tradition]**(AC)**	3	(non-credit)
	Total	53	125

CIA – Continuous Internal Assessment – Based on Projects / Assignment during the semester

Note:

AICTE Activity Points to be earned by students admitted to Diploma program (For more details refer to Chapter 6, AICTE, Activity Point Program, Model Internship Guidelines):

Every regular student, who is admitted to the 3 year Diplomaprogram, is required to earn 75 activity points in addition to the total credits earned for the program. Students entering 3 years Diploma Program through lateral entry are required to earn 50 activity points in addition to the total credits earned for the program. The activity points earned by the student shall be reflected on the students 6th Semester grade card.

The activities to earn the points can be spread over the duration of the course. However, minimum prescribed duration should be fulfilled.

Activity Points (non-credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression.

Incase student fail to earn the prescribed activity points, Sixth semester Grade Card shall be issued only after earning the required activityPoints.

Students shall be eligible for the award of degree only after the release of the Six Semester grade card.

There are two groups (A & B) in semester 1 & 2. The Group division will be decided by The Dean SoE&

*IT before commencement of classes**

ARKAJAIN University, Jharkhand
School of Engineering & IT
Department of Engineering
Faculty – Diploma in Electrical & Electronics Engineering (DEEE)
PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

PROGRAM OUTCOMES

After completing this undergraduate program, a learner:

[PO.1]. Basic knowledge: An ability to apply knowledge of basic mathematics, science and engineering to solve the engineering problems

[PO.2]. Discipline knowledge: An ability to apply discipline - specific knowledge to solve core and/or applied engineering problems.

[PO.3]. Experiments and practice: An ability to plan and perform experiments and practices and to use the results to solve engineering problems.

[PO.4]. Engineering Tools: Apply appropriate technologies and tools with an understanding of the limitation.

[PO.5]. The engineer and society: Demonstrate knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering practice.

[PO.6]. Environment and sustainability: Understand the impact of the engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development..

[PO.7]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

[PO.8]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse/multidisciplinary teams.

[PO.9]. Communication: An ability to communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

[PO.10]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the context of technological changes.

PROGRAM SPECIFIC OUTCOMES

[PSO.1]. Students will able to design, test and trouble shoot of electrical & electronics circuits, equipment and appliances.

[PSO.2]. Apply latest techniques, skills and modern engineering tools of industrial and system engineering throughout their professional careers in the fields of Electrical & Electronics.

PROGRAM ARTICULATION MATRIX

SEM	COURSE CODE	PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES											
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
I	Communication Skills in English –DIP11149			1	1		1			1	1		
	Mathematics-I –DIP11001	1	1	1	2	1		1			1		
	Applied Physics –DIP11147	2	1	3	2								
	Applied Chemistry-DIP11145	1	1			1	1				1		1
	Engineering Workshop Practice-DIP11151	1	1	1	1		1			1			
	Applied Physics Lab –DIP11148	1	1	3	2		1						
	Applied Chemistry Lab-DIP11146			1	1		1					1	
	Communication Skills in English Lab-DIP11150	1		1	1		1	1	1	1			
II	Mathematics -II –DIP12008	1	1	1	1	1						1	
	Fundamentals of Electrical & Electronics Engg-DIP12278	1	1	1	2	1					1	1	1
	Introduction to IT system –DIP12157	1		2	3		1			1	2		
	Engineering Mechanics –DIP12153	3	3		3						3		3
	Environmental Science –DIP12155					2	3				2		
	Fundamentals of electrical & electronics Engg. Lab –DIP12156	1	2	2	3	2		2					
	Introduction to IT system Lab-DIP12279	1		2	3		1			1	2	1	
	Engineering Mechanics Lab –DIP12154	1	2	2	3	2		2					
	Engineering GraphicsDIP13100	2	1		1							2	2
III	Introduction to Electric Generation Systems –DIP13173	2	2		3	3	2	2			2	2	2
	Electrical Circuits –DIP13170	2	2	2	2		2	2		2		2	2
	Electrical and Electronic Measurements –DIP13168	3	2	2	2	2	2				2	2	3
	Electric Motors and Transformers –DIP13166	2	2	2	2						2	2	2

	Applied Electronics –DIP14082	2	3	2	2	2			2	2		2	2
	Electrical Circuits Laboratory DIP13171	2	2	2	2	2	2		2	2	2	2	2
	Electrical and Electronic Measurements Laboratory –DIP13169	2	2	2	2				2	2	2	2	2
	Electric Motors and Transformers Laboratory – DIP13167	2	2	2	2		2		1	2	2	2	2
	Applied Electronics lab –DIP14085	1	2	2	2		2		1	2	2	2	2
	Summer Internship-I (3-4 Weeks)-DIP13177												
IV	Digital electronics-DIP14187	2	3	3	3	2	2	0	0	0	0	3	2
	Electric power transmission and distribution-DIP14079	2	3	3	3	0	3	0	0	2	2	3	2
	Induction, synchronous and special electric machines-DIP14196	2	2	3	3	0	0	0	0	0	0	3	2
	Industrial instrumentation and condition monitoring-DIP14198	2	2	3	3	2	2	0	0	0	0	3	3
	Electrical testing and commissioning-DIP14189	2	3	3	3	0	0	0	0	0	0	3	2
	Illumination practices-DIP14194	2	3	3	3	2	2	0	0	0	0	3	3
	Industrial drives-DIP14197	2	3	2	3	0	2	0	0	0	0	3	2
	Electrical estimation and contracting-DIP14282	2	3	3	2	0	0	0	0	0	2	3	2
	Biomass and micro-hydro power plants-DIP14182	2	3	3	3	2	2	0	0	0	2	2	2
	Essence of Indian Knowledge Tradition-DIP13172						2	1			1		
	Digital electronics lab-DIP14188	2	3	3	3	0	0	0	0	0	2	3	2
	Electrical & electronics engineering drawing-DIP14083	2	2	3	3	2	0	0	2	0	2	3	2
	Induction, synchronous and special electric machines lab-DIP14195	2	3	3	2	2	0	0	0	0	0	2	2
	Minor Project-DIP14203												
V	Microprocessor & microcontroller-DIP15133	2	2	2	2	2			2	2		2	2
	Fundamentals of power electronics-DIP15226	2	2	2	2	2	2				2	2	3

	Switchgear & protection-DIP15245	2	2	2	2		2			2	2	2	2
	Wind power technologies-DIP15250	2	2	2	2	2	2				2	2	2
	Electric vehicles-DIP15222	2	2	2	2	2	2				2	2	3
	Industrial automation and control-DIP15230	2	2	2	2	2	2				2	1	2
	Communication technologies-DIP15218	2	2	2	2		2			2	2	1	2
	Electric traction-	2	2	2	2		2			2	2	2	2
	Artificial intelligence and machine learning-DIP15215	2	2	2	2	2	2	2			2	2	2
	Introduction to e-governance-DIP15235	1	1		2	3	2	2	2	2	2		
	Robotic-DIP16273	2	2	2	2	2	2				2	2	2
	Microprocessor & microcontroller laboratory-DIP15237	2	2	3	2	2					2	2	2
	Fundamentals of power electronics laboratory-DIP15227	2	2	3	2					2	3	2	2
	Summer Internship-II(4-6 Weeks)-DIP15244												
	Major Project-I (Project to be carried over to next semester)-DIP15236												
VI	Building electrification-DIP16261	2	3	2	3	1	0	0	0	0	0	3	2
	Entrepreneurship and start-ups-DIP16265	2	0	0	0	2	3	2	3	3	2	2	2
	Internet of things-DIP15234	2	2	3	3	2	2	0	0	0	0	2	3
	Project management-DIP16257	0	0	0	0	2	3	2	2	3	1	1	1
	Operations research-DIP16256	1	1	0	0	0	3	2	2	3	2	0	1
	Economic policies in india-DIP16263	0	0	0	0	3	3	3	2	2	2	1	1
	Energy effiency and audit-DIP16264	3	3	3	3	2	0	0	0	2	0	3	2
	Indian constitution-DIP16266					3	2	3		2			
	Seminar-DIP16274												
	Major Project-II-DIP16267												
	AVERAGE												

Subject: Mathematics-I

Code:DIP11001

4 Credits | Semester 1

A. Introduction:

- To develop logical understanding, mathematical skill of the subject.
- To make aware students about importance and relation between mathematics and engineering
- To gives sufficient basic concepts for future applications in different subjects

B. Course Outcomes: At the end of the course, students will be able to

[CO1] Rememberingthe concept of Vectors and use of vectors in mathematics
[CO2] Understand, predict and optimize engineering systems.
[CO3] Analyze vectors in geometrically and algebraically.
[CO4] Analyzing about different forms of the equation of straight line and curves
[C05] Evaluating why mathematical thinking is valuable in daily life..

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

TRIGONOMETRY: Concept of angles, measurement of angles in degrees, grades and radians and their conversions,). T-Ratios of Allied angles (without proof), Sum, difference formulae and their applications (without proof). Product formulae (Transformation of product to sum, difference and vice versaT- Ratios of multiple angles, sub-multiple angles (2A, 3A, A/2). Graphs of sin x, cos x, tan x and e^x.

ALGEBRA: Complex Numbers: Definition, real and imaginary parts of a Complex number, polar and Cartesian, representation of a complex number and its conversion from one form to other, conjugate of a complex number, modulus and amplitude of a complex number.
Addition, Subtraction, Multiplication Division of a complex number. De-movier's theorem and ., its applicationPartial fractions: Definition of polynomial fraction proper & improper fractions and definition of partial fractions. To resolve proper fraction into partial fraction with denominator containing non-repeated linear factors, repeated linear factors and irreducible non-repeated quadratic factors. To resolve improper fraction into partial fraction.
Permutations and Combinations: Fundamental rules of counting, Value of nPr
Value of nCr.**Binomial theorem:** Binomial theorem (without proof) for positive integral index (expansion and general form); binomial theorem for any index (expansion without proof) first and second binomial approximation with applications to engineering problems

CO-ORDINATE GEOMETRY: Straight lines: Different forms of equations of straight lines: $y = mx + c$, $y - y_1 = m(x - x_1)$, $y - y_1 = \left(\frac{y_2 - y_1}{x_2 - x_1}\right)(x - x_1)$. General equation of a line $ax + by + c = o$ (graphical representation and statements) and problems on above equations. Equation of lines through a point and parallel or perpendicular to a given line. Problems.**Conic Section:** Definition of conic section. Definition of axis, vertex, eccentricity, focus and length of latus rectum. Equation and Geometrical representation of parabolaEquations of ellipse and hyperbola. Finding axes, vertices, eccentricity, foci and length of lattice rectum of conics. Problems on finding the above said equations with direct substitutionGeneral equation of a circle and its characteristics. To find the equation of a circle, giveni. Centre and radius,ii. Three points lying on it andiii. Coordinates of ends of a diameter;

VECTORS: Definition of vector. Representation of vector as a directed line segment. Magnitude of a vector. Types of vectors. Position vectorExpression of vector by means of position vectors. Addition and subtraction of vectors in terms of line segment. Vector in plane and vector in a space in terms of unit vector i, j and k respectivelyProduct of vectors. Scalar product and vector product of two vectors. Geometrical meaning of scalar and vector product. Applications of dot (scalar) and cross (vector) productsProjection of a vector on another vector. Area of parallelogram and area of triangle.

E. TEXT BOOKS

T1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 40th Edition2007.

F. REFERENCE BOOKS

R2. G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edition, 1995.
R3. NCERT Mathematics Text books of class XI and XII.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES						CORRELATION WITH PROGRAM SPECIFIC OUTCOMES					
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Remembering the concept of Vectors and use of vectors in mathematics	2		1									
[CO2]	Understand, predict and optimize engineering systems.		1		1								
[CO3]	Analyze vectors in geometrically and algebraically				1	1							
[CO4]	Analyzing about different forms of the equation of straight line and curves							1			1		
[CO5]	Evaluating why mathematical thinking is valuable in daily life									1	1		

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Communication Skills in English

Code: DIP11149

Credit - 3 | Semester 1

A. Introduction:

- To introduce students to the understanding of English language and its usage in their field of engineering. It helps the students to enhance their ability to read, write and speak English well.

B. Course Outcomes: At the end of the course, students will be able to

[CO1] Learn the different forms & type of communication.
[CO2] Learn the writing formats and letter story.
[CO3] Learn the Reading comprehension
[CO4] Learn Grammar and Vocabulary
[CO5] Learn Soft skills and Professional Excellence.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

COMMUNICATION: THEORY AND PRACTICE: Basics of communication: Introduction, meaning and definition, process of communication etc.Types of communication: formal and informal, verbal, non-verbal and written Barriers to effective communication**7** Cs for effective communication (considerate, concrete, concise, clear, complete, correct, and courteous).Art of Effective communicationchoosing words, Voice, Modulation, Clarity, Time, Simplification of words, Technical Communication.

PROFESSIONAL WRITING: The art of precise writing, Letters: - business and personnel

READING COMPREHENSION BASED ON FOLLOWING TEXTS: Malgudi days: r.kNarayan, The room on the roof; ruskin bond, The gift of the magi by o. Henry, Night of the scorpion: nizzimezekeil, Stopping by woods on a snowy evening: robert frost

VOCABULARY AND GRAMMAR: Vocabulary of commonly used, Glossary of administrative terms (English and Hindi), One-word substitution, Idioms and phrases etcnelsParts of speech, active and passive voice, tenses etc., Punctuation, subject of agreement , preposition , articles

SOFT SKILLS FOR PROFESSIONAL EXCELLENCE: Introduction: Soft Skills and Hard Skills, Importance of soft skills.Life skills: Self-awareness and Self-analysis, adaptability, resilience, emotional intelligence etc., Applying soft skills across cultures, Case Studies

E. TEXT BOOKS

T1. J.D.O'Connor. Better English Pronunciation. Cambridge: Cambridge University Press, 1980.

T2. Lindley Murray. An English Grammar: Comprehending Principles and Rules. London: Wilson and Sons, 1908.

T3. Kulbhushan Kumar, Effective Communication Skills, Khanna Publishing House, New Delhi (Revised Edition 2018).

T4. Margaret M. Maison. Examine your English. Orient Longman: New Delhi, 1964.

F. REFERENCE BOOKS

R1. M. Ashraf Rizvi. Effective Technical Communication. Mc-Graw Hill: Delhi, 2002.
R2. John Nielson. Effective Communication Skills. Xlibris, 2008.
R3. Oxford Dictionary
R4. Roget's Thesaurus of English Words and Phrases
R5. Collin's English Dictionary
R6. High school english grammar and composition- Wren and Martin (s.chand&co.)
R7. The king's grammar- Sanjay kumarsinha (s.chand& co.)

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES						CORRELATION WITH PROGRAM SPECIFIC OUTCOMES					
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Learn the different forms & type of communication						2			2			
[CO2]	Learn the writing formats and letter story.			2									
[CO3]	Learn the Reading comprehension								2		2		
[CO4]	Learn Grammar and Vocabulary			2	2								
[CO5]	Learn Soft skills and Professional Excellence.								2				

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Applied Physics

Code: DIP11147

Credits- 4 | Semester 1

A. Introduction:

- Identify, formulate, and solve engineering problems by applying principles of physics.
- To give an understanding of this world both by observation and by prediction of the way in which objects behave.
- Acquire and apply new knowledge as needed, using appropriate learning strategies

B. Course Outcomes: At the end of the course, students will be able to

[CO1] Represent physical quantities as scalar and vectors and solve real life relevant problems.

[CO2] Define scientific work, energy and power and their units. Drive relationships for work, energy and power and solve related problems.

[CO3] Compare and relate physical properties associated with linear motion and rotational motion and apply conservation of angular momentum principle to known problems.

[CO4] Explain the phenomenon of surface tension, viscosity, fluid motion & Hooke's law, which helps to illustrate the properties of matter.

[CO5] Apply the basic knowledge of semiconductors to illustrate the functioning of simple electronic devices &nano technology.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

A. SYLLABUS

FORCE AND MOTION: Units and Measurements: Physical quantities; Definition of unit, types of unit (fundamental and derived) SI units: Definition, Basic and supplementary units, advantages. Scalars and Vectors: Scalar and Vector quantities – examples, representation of vector, types of vectors. Addition and Subtraction of Vectors, Triangle and Parallelogram law (Statement only), Lami'stheorems, Scalar and Vector Product, Resolution of a Vector and its application to inclined plane and lawn roller.Force: Definition of Force, Momentum, Statement and derivation of conservation of linear momentum, its applications such as recoil of gun,

rockets, Impulse and its applications.Circular motion, definition of angular displacement, angular velocity, angular acceleration, frequency, time period, Relation between linear and angular velocity, linear acceleration and angular acceleration (related numerical), Centripetal and Centrifugal forces with live examples, Expression and applications such as banking of roads and bending of cyclist.

WORK, ENERGY AND HEAT: Work Energy & Power: Concept and units, examples of zero work, positive work and negative work .Energy and its units, kinetic energy, gravitational potential energy with examples and derivations, mechanical energy, conservation of mechanical energy for freely falling bodies, transformation of energy (examples). Power and its units, power and work relationship, **Numerical on work , potential and kinetic energy),** calculation of power (numerical problems), **Concept of heat & temperature**: Definitions of heat and temperature with S.I units, definition of Specific heat of substance with S I unit, equation for specific heat of a substance (no derivation).scales of temperature and their relationship, Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansionsand relation amongst them,**Transmission of heat:** Definitions of conduction, convection and radiation with examples, definition of thermal conductivity, derivation of co-efficient of thermal conductivity (K) and its S.I unit. Applications of conduction, convection and radiation, simple problems on K.**Thermodynamics**: Definition of thermodynamics, Laws of thermodynamics: Zeroth law, I^{st}law and II^{nd}law(only statement), types of thermodynamics process: isothermal process, adiabatic process.

ANGULAR MOTION AND WAVE MOTION: Angular and Rotational Motion: Definition of angular displacement, angular velocity and angular acceleration, relation between linear velocity and angular velocity. Translational and rotational motions with examples, Definition of torque and angular momentum and their examples, Conservation of angular momentum (quantitative) and its applications, **Wave motion**: Transverse and longitudinal waves with examples, definitions of wave velocity, frequency and wave length and their relationship, Sound and light waves and their properties, wave equation (y =r sin t) amplitude, phase, phase difference, principle of superposition of waves and beat formation, **Simple Harmonic Motion:** Definition of periodic motion with example, definition of Simple Harmonic Motion, SHM as a projection of uniform circular motion on any diameter , equation of SHM, derivation of displacement, velocity and acceleration of a body executing SHM.Free vibrations, Forced vibration, Damped vibrations and Un-damped vibrations with examples. **Simple problems**.

PROPERTIES OF MATTER: Properties of solids: Elasticity: definition of stress and strain, moduli of elasticity, Hooke's law, significance of stress-strain curve.**Properties of liquids**:

Pressure: definition, units, atmospheric pressure, gauge pressure, absolute pressure, Fortin's Barometer and its application**Hydrodynamics**: Fluid motion, stream line and turbulent flow, Reynold's number Equation of continuity, Bernoulli's Theorem (only formula and numericals) and its applications.**Surface Tension**: Concept, units, cohesive and adhesive forces, angle of contact, Ascent Formula (No derivation), applications of surface tension, effect of temperature and impurity on surface tension.**Viscosity**: viscosity and coefficient of viscosity, Terminal velocity, Stoke's law and effect of temperature on viscosity, application in hydraulic systems. Simple problems.

SEMICONDUCTOR & MODERN PHYSICS: Semiconductor: Energy bands in solids, Types of materials (insulator, semi-conductor, conductor), intrinsic and extrinsic semiconductors, p-n junction, junction diode and V-I characteristics, types of junction diodes. Diode as rectifier – half wave and full wave rectifier (centre taped). Transistor; description and three terminals, Types- PNP and NPN, some electronic applications (list only). Photocells, Solar cells; working principle and engineering applications. **Lasers**: Principle and Working of Laser, properties of Laser, Types of lasers; Ruby, He-Ne,characteristics and applications. **Optical fibre**: Introduction, Total internal reflection, critical angel acceptance angle, Structure of optical fiber, Numerical Aperture, applications in communication system (Numerical on critical angel , numerical aperture) **Nano-Technology**: Definition of Nanoscale, nanometer &nano particle application of Nano-Technology-electronics, automobiles, medical, textile, cosmetics, environmental, spaces and defence, advantages and dis-advantages of nano-Technology. **Nonconventional source of energy :**Introduction – Non Renewable and renewable (Alternate), energy sources, Examples –Solar Energy, Wind Energy, Tidal Energy, Geo-Thermal Energy and Bio-Mass, Advantages and disadvantages of renewable energy.

E. TEXT BOOKS

T1. Text Book of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi
T2. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
T3. Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi

F. REFERENCE BOOKS

R1. Applied Physics, Vol. Vol. II and TTTI Publications, Tata McGraw Hill, Delhi, I
R2. Concepts in Physics by HC Verma, Vol. I & II, BhartiBhawan Ltd. New Delhi
R3. Modern approach to Applied Physics-I and II, AS Vasudeva, Modern Publishers.
R4. A Textbook of Optics, N Subramanyam, BrijLal, MN Avahanulu, S Chand and Company Ltd.

R5. Introduction to Fiber Optics, AjoyGhatak and K Thyagarajan, Cambridge University Press India Pvt. Ltd, New Delhi.
R6. Nanoscience and Nanotechnology, KK Choudhary, Narosa Publishing House, Pvt. Ltd. New Delhi.
R7. Nanotechnology: Importance and Applications, M.H. Fulekar, IK International Publishing House Pvt. Ltd, New Delhi.
R8. E-books/e-tools/ learning physics software/websites etc.
R9. Principle of physics for class XI and XII by V.K.Mehata and Rohit Mehta, as per Karnataka state PUC syllabus S.Chand and Company, New Delhi
R10. Principle of physics by P.V.NaikPHI Learning Pvt. Ltd. New Delhi

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES						CORRELATION WITH PROGRAM SPECIFIC OUTCOMES					
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Represent physical quantities as scalar and vectors and solve real life relevant problems.	3		2									
[CO2]	Define scientific work, energy and power and their units. Drive relationships for work, energy and power and solve related problems.			2									
[CO3]	Compare and relate physical properties associated with linear motion and rotational motion and apply conservation of angular momentum principle to known problems.			2	3								
[CO4]	Explain the phenomenon of surface tension, viscosity, fluid motion & Hooke's law, which helps to illustrate the properties of matter.				2								
[CO5]	Apply the basic knowledge of semiconductors to illustrate the functioning of simple electronic devices & Nano technology.	2	3										

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Applied Chemistry

Code:DIP11145

Credits- 4 | Semester I

A. Introduction:

- There are numerous number materials are used in fabricating and manufacturing devices for the comfort of life.
- The selection, characterization and suitability assessment of natural raw materials essentially requires principles and concepts of Applied Chemistry for technicians.

B. Course Outcomes: At the end of the course, students will be able

[CO1] Understand the classification and general properties of engineering materials such as metal, alloys, glasses, cement, refractory and composite materials using knowledge of chemical bonding.

[CO2] Understand and assess the suitability of water source for domestic and industrial application, effluents and minimize water pollution.

[CO3] Qualitatively analyze the engineering materials and understand their properties and applications.

[CO4] Choose fuel and lubricants suitable for economical industrial processing to obtain eco-friendly finished products

[CO5] Ascertain construction, mechanism efficiency of electrochemical cells, solar cell fuel cells. Understand corrosion and develop economical prevention techniques.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

ATOMIC STRUCTURE, CHEMICAL BONDING AND SOLUTIONS: Rutherford model of atom, Bohr's theory (expression of energy and radius to be omitted), and hydrogen spectrum explanation based on Bohr's model of atom, Heisenberg uncertainty principleQuantum numbers – orbital concept. Shapes of s,p and d orbitals, Pauli's exclusion principle, Hund's rule of maximum multiplicity Aufbau rule, electronic configurationConcept of chemical bonding – cause of chemical bonding, types of bonds: ionic bonding (NaCl example), covalent bond (H2,

F2, HF hybridization in BeCl2, BF3, CH4, NH3, H2O) Coordination bond in NH4+, and anomalous properties of NH3, H2O due to hydrogen bonding, and metallic bonding.

WATER: Graphical presentation of water distribution on Earth (pie or bar diagram). Classification of soft and hard water based on soap test, salts causing water hardness, unit of hardness and simple numerical on water hardness.Cause of poor lathering of soap in hard water, problems caused by the use of hard water Iboiler (scale and sludge, foaming and priming, corrosion etc) Quantitative measurement of water hardness by ETDA method, total dissolved solids (TDS) alkalinity estimation. Municipal water treatment BOD &CODEnlist Indian standard specification of drinking water (collect data and understand standards)

ENGINEERING MATERIALS: Natural occurrence of metals – minerals, ores of iron, aluminum and copper, gangue (matrix), flux, slag, metallurgy – brief account of general principles of metallurgy.Extraction of - iron from hematite ore using blast furnace, aluminumfrom bauxite along with reactions. Alloys – definition, purposes of alloying, ferrous alloys and non-ferrous with suitable examples, properties and applications.Port land cement and hardening, Glasses Refractory and Composite materials.Polymers – monomer, homo and co polymers, degree of polymerization, simple reactions involved in preparation and their application of thermoplastics and thermosetting plastics (usingPVC, PS, PTFE, nylon – 6, nylon – 66, Bakelite only), rubber and vulcanization of rubber

CHEMISTRY OF FUELS AND LUBRICANTS: Definition of fuel and combustion of fuel, classification of fuels, calorific values (HCV and LCV)Proximate analysis of coal solid fuel petrol and diesel - fuel rating (octane and cetane numbers),Chemical composition, calorific values and applications of LPG, CNG, water gas, coal gas, producer gas and biogas.Lubrication – function and characteristic properties of good lubricant, classification with examples, lubrication mechanism –, physical properties (viscosity and viscosity index, oiliness, flash and fire point, could and pour point only) and chemical properties (coke number, total acid number saponification value) of lubricants

ELECTRO CHEMISTRY: Electronic concept of oxidation, reduction and redox reactions.Definition of terms: electrolytes, non-electrolytes with suitable examples, Faradays laws of electrolysis and simple numerical problems.Industrial Application of Electrolysis – Electrometallurgy Application of Redox reactions in electrochemical cells –Primary cells – dry cell,Secondary cell - commercially used lead storage battery, fuel and Solar cells.Introduction to Corrosion of metals – definition, types of corrosion (chemical and electrochemical), H_2 liberation andO_2 absorption mechanism of electrochemical corrosion, factors affecting rate of corrosion.Internal corrosion preventive measures – Purification, alloying and heat treatment and external corrosion preventive measures: metal (anodic, cathodic) coatings.

E. TEXT BOOKS

T1. Text Book of Chemistry for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi, 2017-18.
T2. Agarwal, &Shikha, Engineering Chemistry, Cambridge University Press; New Delhi, 2015.
T3. Agnihotri, Rajesh, Chemistry for Engineers, Wiley India Pvt.Ltd., 2014.
T4. Jain & Jain, Engineering Chemistry, DhanpatRai and Sons; New Delhi, 2015.

F. REFERENCE BOOKS

R1. C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.
R2. Dara, S. S. &Dr.S.S. Umare, Engineering Chemistry, S.Chand. Publication, New Delhi, New Delhi, 2015.
R3. Dr. Vairam, S., Engineering Chemistry, Wiley India Pvt.Ltd., New Delhi, 2013.
R4. Dr. G. H. Hugar& Prof A. N. Pathak, Applied Chemistry Laboratory Practices, Vol. I and Vol. II NITTTR, Chandigarh, Publications, 2013-14.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES						CORRELATION WITH PROGRAM SPECIFIC OUTCOMES					
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Understand the classification and general properties of engineering materials such as metal, alloys, glasses, cement, refractory and composite materials using knowledge of chemical bonding.		2				1						
[CO2]	Understand and assess the suitability of water source for domestic and industrial application, effluents and minimize water pollution.	2											1
[CO3]	Qualitatively analyze the engineering materials and understand their properties and applications				1	1						1	
[CO4]	Choose fuel and lubricants suitable for economical industrial processing to obtain eco-friendly finished products				2			1					1
[CO5]	Ascertain construction, mechanism efficiency of electrochemical cells, solar cell fuel cells. Understand corrosion and develop economical prevention techniques.			2					1				

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

ENGINEERING WORKSHOP PRACTICE

Code:DIP11151
Credits 2 | Semester I

A. Introduction:

- To understand basic engineering processes for manufacturing and assembly
- To understand, identify, select and use various marking, measuring, and holding, striking and cutting tools and equipment's
- To understand and interpret job drawings, produce jobs, and inspect the job for specified dimension.

B. Course Outcomes: At the end of the course, students will be able to

[CO1] Acquire skills in basic engineering practice to identify, select and use various marking, measuring, and holding, striking and cutting tools &equipment's and machines
[CO2] Understand job drawing and complete jobs as per specifications in allotted time
[CO3] Inspect the job for the desired dimensions and shape
[CO4] Operate, control different machines and equipment's adopting safety practices

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	5
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	35
Total		50
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

FITTING SHOP: Introduction Of Workshop Tools & Measuring InstrumentFitting: - Demonstration of different fitting tools, safety practice and general guidelines. Cutting and Filing. Filing, Measurement and Finishing etc Practice: T-fitting , V-Fitting etc

CARPENTRY SHOP: Demonstration of power tools and equipment for carpentry, safety practices and general guidelines. Carpentry: Demonstration of different wood working tools / machines. Demonstration of Different Wood Working Processes Like Plaining Marking ,Chiseling ,Grooving ,Turning of Wood etc Practice: - T-Lap joint, Dovetail joint etc

WELDING SHOP: Demonstration of tools and equipment for welding, safety practices and general guidelines. Demonstration of different welding tools / machines. Demonstration on Arc Welding, Gas Welding, MIG, MAG welding, gas cutting and rebuilding of broken parts with welding Practice : Butt , lap joint etc.

PLUMBING SHOP: Demonstration – plumbing tools, symbols and joints.Joining GI pipes by threading, PVC pipes by gluing and cementingPractice :- To Make Internal & External Thread

MACHINE SHOP: Demonstration of tools and equipment for Machine, safety practices and general guidelines. Demonstration of all machine like Lathe Machine, Drill machine, Milling Machine, Shaper machine etc. Practice :- To make Step Turning , Tapper Turning, Turning, Facing etc.

E. TEXT BOOKS

T1. Workshop Technology Vol-I,II,IIIHajraChoudry., Media Promotors and Publishers P Ltd.

T2.Manufacturing Technology vol 1 by P.N. RaoMc.Grow Hill.

F. REFERENCE BOOKS

R1. Workshop technology by R.S. Raghuwanshi.Dhanpat Ray & co

R2. Workshop technology by R.S. Khurmi&J.K.GuptaS.Chand co.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT .	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Acquire skills in basic engineering practice to identify, select and use various marking, measuring, and holding, striking and cutting tools & equipment's and machines	2								2			
[CO2]	Understand job drawing and complete jobs as per specifications in allotted time						2			2			
[CO3]	Inspect the job for the desired dimensions and shape		2										
[CO4]	Operate, control different machines and equipment's adopting safety practices			2									

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Applied Physics Lab

Code: DIP11148

Credits- 1 | Semester I

A. Introduction:

- To give an understanding of physical world by observations and measurements.
- Use of physical principles and analysis in various fields of engineering and technology is very prominence.
- To supplement the factual knowledge gained in the lecture with hands-on experience with the apparatus & developing skills in taking measurements.
- To develop scientific temper and help to apply the basic concepts and principles in solving engineering and technology based problems.

B. Course Outcomes: At the end of the course, students will be able

[CO1] Select right kind of measuring tools (Meter scale, Vernier caliper, Screw gauge, Spherometer) for determining dimensions of physical quantities and make measurements with accuracy and precision.

[CO2] Apply and verify laws of forces and determine resultant force acting on a body.

[CO3] Determine the velocity of sound in air.

[CO4] Understand the fall of a sphere through a viscous liquid

[CO5] Understand gravitational force & calculate the time of a pendulum.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	5
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	35
Total		50
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

S.No	Name of Experiments
1.	To measure length, radius of a given cylinder, a test tube and a beaker using a Vernier caliper and find volume of each object.
2.	To determine diameter of a wire, a solid ball and thickness of cardboard using a screw gauge.
3.	To determine radius of curvature of a convex and a concave mirror surface using a spherometer.
4.	To verify experimentally the law of parallelogram of forces.

5.	To verify experimentally the law of converse of triangle of forces.
6.	To determine force constant of a spring using Hook's Law
7.	To find the viscosity of a given liquid (Glycerin) by Stoke's law.
8.	To verify experimentally the Lami's theorems.
9.	To determine the velocity of sound in air at room temperature and at 0 C by using Resonance Air Column method.
10.	To determine force constant of a spring using Hook's Law.
11.	To find the Moment of Inertia of a flywheel about its axis of rotation
12.	To find the time period of a simple pendulum for small amplitudes and draw the graph of length of the pendulum against square of the time period. Use the graph to find the length of the simple pendulum.

E. TEXT BOOKS

T1. Text Book of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi

T2. Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publications (P) Ltd., New Delhi

F. REFERENCE BOOKS

R1. Practical Physics by C. L. Arora, S. Chand & Company Ltd.

R2. e-books/e-tools/ learning physics software/you Tube videos/ websites etc.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES						CORRELATION WITH PROGRAM SPECIFIC OUTCOMES					
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Select right kind of measuring tools (Meter scale, Vernier caliper, Screw gauge, Spherometer) for determining dimensions of physical quantities and make measurements with accuracy and precision.				2								
[CO2]	Apply and verify laws of forces and determine resultant force acting on a body.			2	1								
[CO3]	Determine the velocity of sound in air.		2	1									
[CO4]	Understand the fall of a sphere through a viscous liquid						1						
[CO5]	Understand gravitational force & calculate the time of a pendulum.	2		1									

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Applied Chemistry Laboratory

Code: DIP11146

Credits- 1 | Semester I

A. Introduction:

- There are numerous number of materials used in fabricating and manufacturing devices for the comfort of life.
- The course aims to supplement the factual knowledge gained in the lectures by first hand manipulation of processes and apparatus.
- This will develop scientific temper and help to apply the basic concepts and principles in solving engineering problems.

B. Course Outcomes: At the end of the course, students will be able

[CO1] To express quantitative measurements accurately.
[CO2] To practice and adapt good measuring techniques.
[CO3] To use various apparatus for precise measurements.
[CO4] To understand and differentiate different methods of quantitative analysis.
[CO5] To know and understand principles of quantitative analysis using instruments.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	5
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	35
Total		50
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

S.No	Name of Experiments
1	Preparation of standard solution of oxalic acid or potassium permanganate.
2	To determine strength of given sodium hydroxide solution by titrating against standard oxalic acid solution using phenolphthalein indicator.
3	Standardization of KMnO4 solution using standard oxalic acid and Determine the percentage ofiron present in given Hematite ore by KMnO4 solution.
4	Alkalinity of given water sample using 0.01M sulphuric acid

5	To determine the viscosity and relative viscosity of given sample by using Ostwald's Viscometer.
6	Volumetric estimation of total hardness of given water sample using standard EDTA solution.
7	Proximate analysis of coal a) Gravimetric estimation moisture in given coal sample
8	Determine the conductivity of given water sample.
9	Determination of the Iron content in given cement sample using colorimeter.
10	Determination of calorific value of solid or liquid fuel using bomb calorimeter.
11	Determination of flash and fire point of lubricating oil using Able's flash point apparatus.
12	Determination of viscosity of lubricating oil using Redwood viscometer.

D. TEXT BOOKS

T1.Dr. G. H. Hugar and Prof A. N. Pathak, Applied Chemistry Laboratory Practices, Vol. Vol. II and NITTTR, Chandigarh, Publications, 2013-14, I

T2. Practical Chemistry by S.S. Dara

E. REFERENCE BOOKS

R1. Practical Chemistry by D N Bajpai – S. Chand Publishing

R2. Advanced Practical Chemistry Book by pragatiprakashan

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES						CORRELATION WITH PROGRAM SPECIFIC OUTCOMES					
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	To express quantitative measurements accurately.	1		1									
[CO2]	To practice and adapt good measuring techniques.		1		1							1	
[CO3]	To use various apparatus for precise measurements.			1									2
[CO4]	To understand and differentiate different methods of quantitative analysis.					1	1						
[CO5]	To know and understand principles of quantitative analysis using instruments.												

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: COMMUNICATION SKILLS IN ENGLISH LAB

Code: DIP11150

Credits- 1 | Semester I

A. Introduction:

- To develop listening skills for enhancing communication.
- To develop speaking skills with a focus on correct pronunciation and fluency.
- To introduce the need for Personality development- Focus will be on developing certain qualities, which will aid students in handling personal and career challenges, leadership skills etc. for that purpose group discussion, extempore and other activities should be conducted during lab classes.

B. Course Outcomes: At the end of the course, students will be able

[CO1] They will also demonstrate a significant increase in word power

[CO2] The variety of exercises and activities that will be conducted in the Language Lab will developtheir skills needed to participate in a conversation like listening carefully and respectfully to others' viewpoints; articulating their own ideas and questions clearly and over all students will be able to prepare, organize, and deliver an engaging oral presentation

[CO3] They will also develop non-verbal communication such as proper use of body language and gestures

[CO4] Managing personal and professional is life.

[CO5] Enhancing personality development

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	5
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	35
Total		50
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

LISTENING SKILLS: Listening Process and Practice: Introduction to recorded lectures, poems, interviews and speeches, listening tests.

INTRODUCTION TO PHONETICS: Sounds: consonant, vowel, diphthongs, etc. transcription of words (IPA), weak forms, syllable division,word stress, intonation, voice etc.

SPEAKING SKILLS: Standard and formal speech: Group discussion, oral presentations, public speaking, business presentationsetc. Conversation practice and role-playing, mock interviews etc.

BUILDING VOCABULARY: Etymological study of words and construction of words, phrasal verbs, foreign phrases, idioms and phrases. Jargon/ Register related to organizational set up, word exercises and word games to enhance self-expression and vocabulary of participants.

E. TEXT BOOKS

T1. Daniel Jones. The Pronunciation of English. Cambridge: Cambridge University Press, 1956.
T2. James Hartman& et al. Ed. English Pronouncing Dictionary. Cambridge: Cambridge University35 First Year Curriculum Structure Common to All Branches Press, 2006.
T3. Kulbhushan Kumar, Effective Communication Skills, Khanna Publishing House, New Delhi (Revised Ed. 2018)
T4. J.D.O'Connor. Better English Pronunciation. Cambridge: Cambridge University Press, 1980.

F. REFERENCE BOOKS

R1. Lindley Murray. An English Grammar: Comprehending Principles and Rules. London: Wilsonand Sons, 1908.
R2. Margaret M. Maison. Examine your English. Orient Longman: New Delhi, 1964.
R3. J.Sethi& et al. A Practice Course in English Pronunciation. New Delhi: Prentice Hall, 2004.
R4. Pfeiffer, William Sanborn and T.V.S Padmaja. Technical Communication: A Practical Approach.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES						CORRELATION WITH PROGRAM SPECIFIC OUTCOMES					
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	They will also demonstrate a significant increase in word power			2						2			
[CO2]	exercises and activities that will be conducted in the Language	2							2				
[CO3]	develop non-verbal communication				2					2			
[CO4]	Managing personal and professionals life						2	2					
[CO5]	Enhancing personality development						2				2		

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

ARKA JAIN University
Jharkhand

Syllabus of

Diploma in Electrical & Electronics Engineering

Semester-II

ARKAJAIN University, Jharkhand
School of Engineering & IT
Department of Engineering
Faculty – Diploma in Electrical & Electronics Engineering (DEEE)
Scheme of Study (w.e.f Batch 2020-23)

SEMESTER –I(Group-A)

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Communication Skills in English	HSC	3	3	100	70	20	5	5
2	Mathematics-I	BSC	4	4	100	70	20	5	5
3	Applied Physics	BSC	4	4	100	70	20	5	5
4	Applied Chemistry	BSC	4	4	100	70	20	5	5
	Practical								
5.	Engineering Workshop Practice	ESC	2	4	50	35	5	5	5
6.	Applied Physics Lab	BSC	1	2	50	35	5	5	5
7.	Applied Chemistry Lab	BSC	1	2	50	35	5	5	5
8.	Communication Skills in English Lab	HSC	1	2	50	35	5	5	5
	Total		**20**	**25**	**600**	**420**	**100**	**40**	**40**

SEMESTER I (Group-B)

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Mathematics -I	BSC	4	4	100	70	20	5	5
2	Fundamentals of Electrical & Electronics Engg.	ESC	4	4	100	70	20	5	5
3	Introduction to IT system	ESC	3	3	100	70	20	5	5
4	Engineering Mechanics	ESC	4	4	100	70	20	5	5
5	Environmental Science	AC	0	2	50	35	10	2.5	2.5
	Practical								
6	Fundamentals of electrical & electronics Engg. Lab	ESC	1	2	50	35	5	5	5
7	Introduction to IT system Lab	ESC	1	2	50	35	5	5	5
8	Engineering Mechanics Lab	ESC	1	2	50	35	5	5	5
9	Engineering Graphics	ESC	2	4	50	35	5	5	5
	Total		**20**	**27**	**650**	**455**	**110**	**42.5**	**42.5**

SEMESTER II (Group-A)

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Mathematics -II	BSC	4	4	100	70	20	5	5
2	Fundamentals of Electrical & Electronics Engg.	ESC	4	4	100	70	20	5	5
3	Introduction to IT system	ESC	3	3	100	70	20	5	5
4	Engineering Mechanics	ESC	4	4	100	70	20	5	5
5	Environmental Science	AC	0	2	50	35	10	2.5	2.5
	Practical								
6	Fundamentals of electrical & electronics Engg. Lab	ESC	1	2	50	35	5	5	5
7	Introduction to IT system Lab	ESC	1	2	50	35	5	5	5
8	Engineering Mechanics Lab	ESC	1	2	50	35	5	5	5
9	Engineering Graphics	ESC	2	4	50	35	5	5	5
	Total		**20**	**27**	**650**	**455**	**110**	**42.5**	**42.5**

SEMESTER –II(Group-B)

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Communication Skills in English	HSC	3	3	100	70	20	5	5
2	Mathematics-II	BSC	4	4	100	70	20	5	5
3	Applied Physics	BSC	4	4	100	70	20	5	5
4	Applied Chemistry	BSC	4	4	100	70	20	5	5
	Practical								
5.	Engineering Workshop Practice	ESC	2	4	50	35	5	5	5
6.	Applied Physics Lab	BSC	1	2	50	35	5	5	5
7.	Applied Chemistry Lab	BSC	1	2	50	35	5	5	5
8.	Communication Skills in English Lab	HSC	1	2	50	35	5	5	5
	Total		**20**	**25**	**600**	**420**	**100**	**40**	**40**

SEMESTER-III

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Introduction to Electric Generation Systems	PCC	3	3	100	70	20	5	5
2	Electrical Circuits	PCC	3	3	100	70	20	5	5
3	Electrical and Electronic Measurements	PCC	3	3	100	70	20	5	5
4	Electric Motors and Transformers	PCC	3	3	100	70	20	5	5
5	Applied Electronics	PCC	3	3	100	70	20	5	5
	PRACTICAL								
6	Electrical Circuits Lab	PCC	1	2	50	35	5	5	5
7	Electrical and Electronic Measurements Lab	PCC	1	2	50	35	5	5	5
8	Electric Motors and Transformers Lab	PCC	1	2	50	35	5	5	5
9	Applied Electronics lab	PCC	1	2	50	35	5	5	5
10	Summer Internship-I (3-4 Weeks)	PROJ	2	0	50	35	15	0	0
	TOTAL		**21**	**23**	**750**	**525**	**135**	**45**	**45**

SEMESTER-IV

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Digital Electronics	PCC	3	3	100	70	20	5	5
2	Electric Power Transmission and Distribution	PCC	4	4	100	70	20	5	5
3	Induction, Synchronous and Special Electrical Machines	PCC	4	4	100	70	20	5	5
4	Elective I Industrial Instrumentation and ConditionMonitoring Electrical Testing & Commissioning Illumination Practices	PEC	3	3	100	70	20	5	5
5	Elective II Industrial Drives Electrical Estimation & Contracting Biomass and Micro-hydro Power plants	PEC	3	3	100	70	20	5	5
6	Essence of Indian Knowledge Tradition	AC	0	2	50	35	10	2.5	2.5
	PRACTICAL								
7	Digital Electronics Lab	PCC	1	2	50	35	5	5	5
8	Electrical& Electronics Engg. Drawing	PCC	2	4	50	35	5	5	5
9	Induction, Synchronous and Special Electrical Machines Lab	PCC	1	2	50	35	5	5	5
10	Minor Project	PROJ	2	4	50	35	15	0	0
	TOTAL		**23**	**31**	**750**	**525**	**140**	**42.5**	**42.5**

SEMESTER V

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA	Attendance
1	Microprocessor & Microcontroller	PCC	4	4	100	70	20	5	5
2	Fundamentals of Power Electronics	PCC	4	4	100	70	20	5	5
3	Elective III Switchgear and Protection Wind Power Technologies Electric Vehicles	PEC	3	3	100	70	20	5	5
4	Elective IV Industrial Automation & Control Communication Technologies Electric Traction	PEC	3	3	100	70	20	5	5
5	Open Elective I Artificial Intelligence & Machine Learning Introduction to E-Governance Robotics	OEC	3	3	100	70	20	5	5
	PRACTICAL								
6	Microprocessor & Microcontroller Lab	PCC	1	2	100	70	20	5	5
7	Fundamentals of Power Electronics Lab	PCC	1	2	50	35	5	5	5
8	Summer Internship-II(4-6 Weeks)	PROJ	3	0	100	70	30	0	0
9	Major Project-I (Project to be carried over to next semester)	PROJ	1	2	50	35	15	0	0
	TOTAL		**23**	**23**	**800**	**560**	**170**	**35**	**35**

SEMESTER VI

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Building Electrification	PCC	4	4	100	70	20	5	5
2	Entrepreneurship and Start –ups	HSC	4	4	100	70	20	5	5
3	Open Elective II Internet of Things Project Management Operations Research	OEC	3	3	100	70	20	5	5
4	Open Elective III Economic Policies in India Energy Efficiency and Audit	OEC	3	3	100	70	20	5	5
5	Indian constitution	AC	0	2	50	35	10	2.5	2.5
	PRACTICAL								
6	Seminar	PROJ	1	2	50	35	15	0	0
7	Major Project-II	PROJ	3	6	100	70	30	0	0
	TOTAL		**18**	**24**	**600**	**455**	**135**	**22.5**	**22.5**

Distribution of Credit across 6 semesters:

Sl. No	Type of Paper	No. of Paper	Total Credit
1	Humanities and Social Sciences Courses **(HSC)**	3	8
2	Basic Science courses**(BSC)**	6	18
3	Engineering Science courses **(ESC)**	8	18
4	Professional core courses (**PCC)**	20	48
5	Professional Elective courses**(PEC)**	4	12
6	Open Electives Courses (**OEC)**	3	9
7	Project work, seminar and internship in industry or elsewhere**(PROJ)**	6	12
8	Audit Courses [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Knowledge Tradition]**(AC)**	3	(non-credit)
	Total	53	125

CIA – Continuous Internal Assessment – Based on Projects / Assignment during the semester

Note:

AICTE Activity Points to be earned by students admitted to Diploma program (For more details refer to Chapter 6, AICTE, Activity Point Program, Model Internship Guidelines):

Every regular student, who is admitted to the 3 year Diploma program, is required to earn 75 activity points in addition to the total credits earned for the program. Students entering 3 years Diploma Program through lateral entry are required to earn 50 activity points in addition to the total credits earned for the program.
The activity points earned by the student shall be reflected on the students 6th Semester grade card.
The activities to earn the points can be spread over the duration of the course. However, minimum prescribed duration should be fulfilled.
Activity Points (non-credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression.
Incase student fail to earn the prescribed activity points, Sixth semester Grade Card shall be issued only after earning the required activity Points.
Students shall be eligible for the award of degree only after the release of the Six Semester grade card.

There are two groups (A & B) in semester 1 & 2. The Group division will be decided by The Dean SoE& IT before commencement of classes*

ARKAJAIN University, Jharkhand
School of Engineering & IT
Department of Engineering
Faculty – Diploma in Electrical & Electronics Engineering (DEEE)
Scheme of Study (w.e.f Batch 2020-23)

PROGRAM OUTCOMES

After completing this undergraduate program, a learner:

[PO.1]. Basic knowledge: An ability to apply knowledge of basic mathematics, science and engineering to solve the engineering problems

[PO.2]. Discipline knowledge: An ability to apply discipline - specific knowledge to solve core and/or applied engineering problems.

[PO.3]. Experiments and practice: An ability to plan and perform experiments and practices and to use the results to solve engineering problems.

[PO.4]. Engineering Tools: Apply appropriate technologies and tools with an understanding of the limitation.

[PO.5]. The engineer and society: Demonstrate knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering practice.

[PO.6]. Environment and sustainability: Understand the impact of the engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development..

[PO.7]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

[PO.8]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse/multidisciplinary teams.

[PO.9]. Communication: An ability to communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

[PO.10]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the context of technological changes.

PROGRAM SPECIFIC OUTCOMES

[PSO.1]. Students will able to design, test and trouble shoot of electrical & electronics circuits, equipment and appliances.

[PSO.2]. Apply latest techniques, skills and modern engineering tools of industrial and system engineering throughout their professional careers in the fields of Electrical & Electronics.

Subject: Mathematics- II

Code:DIP12008

4 Credits | Semester II

A. Introduction:

- To study the functions and this course enables the students to understand the calculus in engineering problems.
- To learn solve system of linear equation by using matrix and determinants.
- To gain profiency in calculus computations.
- for analyzing and describing the behavior of functions limits derivatives and integrals

B. Course Outcomes: At the end of the course, students will be able to

[CO1] Remembering several areas of mathematics beyond calculus

[CO2] Understand to solve differential equations using appropriate methods.

[CO3] Analyzing theConcepts of differentiation in physics & engineering courses

[CO4] Evaluating the ODE of first degree, first order in engineering field

[CO5] Creating interest in mathematics

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

MATRICES AND DETERMINANTS: Matrices: Basic concepts of matrices: Definition, types of matrices and mathematical operations on matrices (addition, subtraction and multiplication of matrices).**Determinant:** Definition, problems on finding the determinant value of 2^{nd} and 3^{rd} order. Problems on finding unknown quantity in a 2^{nd} and 3^{rd} order determinants using expansion. Solving simultaneous linear equations using matrix method (Cramer's rule up to 3rd order).Inverse and applications of matrices: Minors and Cofactors of elements of matrix. Adjoin and Inverse of matrices of order 2ndand 3rd order. Elementary row and column operations on matrices. Characteristic equation and characteristic roots (Eigen values) of 2x2 matrix. Statement of Cayley-Hamilton theorem and its verification for 2x2 matrixes.

DIFFERENTIAL CALCULUS: Constants and variables. Definition of function. Types of functions: Explicit and implicit function, odd and even functions-2. Concept of $x \to a$.Definition of limit of a function. Indeterminate forms. Evaluation of limit of functions by factorization, rationalization. Algebraic limitStatement of $\lim_{x\to a} \frac{x^n - a^n}{x-a} = na^{n-1}$ where n is any rational number. Proof of $\lim_{\theta\to 0} \frac{\sin\theta}{\theta} = 1$where$\theta$ is in radian. Related problems.Derivatives of functions ofx^n, $\sin x$, $\cos x$&$\tan x$with respect to 'x' from first principle method Rules of differentiation: Sum, product, quotient rule & problems on rules.Derivatives of function of a function (Chain rule) & problems. Inverse trigonometric functions & their derivatives. Implicit functions, Parametric functions & problems, differentiation of exponential and Logarithmic, second order differentiation.

APPLICATION OF DIFFERENTIATION: Geometrical meaning of derivative. Derivative as slope. Equations of tangent & normal to the curve y = f(x) at a given point- (statement only)
Derivative as a rate measure i.e.to find the rate of change of displacement, velocity, radius, area, volume-using differentiationDefinition of increasing & decreasing functionMaxima& minima of a function

INTEGRAL CALCULUS, DEFINITE INTEGRAL & ITS APPLICATIONS: Definition of Integration. List of standard integrals. Rules of integration (only statement)problems.-1, Integration by substitution method. Problems. Standard integrals. Integration by parts definite integration &problemsArea, volume, centers of gravity & moment of inertia by integration method. Simple problems

DIFFERENTIAL EQUATION: Definition, example, order & degree of differential equation with examples Formation of differential equation by eliminating arbitrary constants up to second order.Solution of O. D. E of first degree & first order by variable separable method
Linear differential equations & its solution using integrating factor.

E. TEXT BOOKS

F. REFERENCE BOOKS

R1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 40th Edition, 2007.
R2. G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edition, 1999.
R3. NCERT Mathematics Text books of class XI and XII.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES		CORRELATION WITH PROGRAM SPECIFIC OUTCOMES									
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Remembering several areas of mathematics beyond calculus	1			1								
[CO2]	Understand to solve differential equations using appropriate methods		1			1							
[CO3]	Analyzing the Concepts of differentiation in physics & engineering courses	1		1									
[CO4]	Evaluating the ODE of first degree, first order in engineering field	1				1							
[CO5]	Creating interest in mathematics					1					1		

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Fundamentals of Electrical and Electronics Engineering

Code:

4 Credits |Semester II

A. Introduction:

- To provide basic knowledge of the different elements and concepts of electrical engineering field.
- To learn basic concepts of various active and passive electronic components, Signals, Op-Amp and their applications, Digital Electronics and their applications to help students deal with electrical and electronics engineering principles and applications in industrial processes of different fields.
- To impart knowledge of electrical quantities such as current, voltage, power, energy and frequency to understand the impact of technology in a global and societal context.
- To provide working knowledge for the analysis of basic DC and AC circuits used in electrical and electronic devices.
- To explain the working principle, construction, applications of DC machines, AC machines & measuring instruments.
- To highlight the importance of transformers in transmission and distribution of electric power.

B. Course Outcomes: At the end of the course,

[CO1] Remembering the basic terminology/definitions of electrical component & Signals

[CO2] Understanding the Analog electronic Specially Op-Amp & Digital Electronics and their applications

[CO3] Applying the knowledge of theorems/laws for Predict the behavior of any electrical and magnetic circuitsand Use the principles of electromagnetic induction in electrical applications

[CO4] Analyzing the formulation and solution of simple and complex AC, Dc circuits

[CO5] Evaluatingthe requirement of transformers and the type of electrical machine used for that particular application

C. Assessment Plan:

Criteria	**Description**	**Maximum Marks**
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

OVERVIEW OF ELECTRONIC COMPONENTS & SIGNALS: Passive Active Components: Resistances, Capacitors, Inductors, Diodes, Transistors, FET, MOS andCMOS and their Applications. Signals: DC/AC, voltage/current, periodic/non-periodic signals, average,Rms, peak values, different types of signal waveforms, Ideal/non-ideal voltage/current sources Independent/dependent voltage current sources. Overview of electrical & electronics engineering field

OVERVIEW OF ANALOG CIRCUITS AND DIGITAL ELECTRONICS: Operational Amplifiers-Ideal Op-Amp, Practical op amp, Open loop and closed loop configurations, Application of Op-Amp as amplifier, adder, differentiator and integrator. Introduction to Boolean Algebra, Electronic Implementation of Boolean Operations, Gates-Functional Block Approach, Storage elements-Flip Flops-A Functional block approach, Counters: Ripple, Up/down and decade, Introduction to digital IC Gates (of TTL Type).

ELECTRIC AND MAGNETIC CIRCUITS: EMF, Current, Potential Difference, Power and Energy; M.M.F, magnetic force, permeability, hysteresis loop, reluctance, leakage factor and BH curve;Electromagnetic induction, Faraday's laws of electromagnetic induction, Lenz's law; Dynamically induced emf; Statically induced emf; Equationsof self and mutual inductanceAnalogy between electric and magnetic circuits.

A.C. CIRCUITS: Cycle, Frequency, Periodic time, Amplitude, Angular velocity, RMS value, Average value, Form Factor Peak Factor, impedance, phase angle, and power factor; Mathematical and phasor representation of alternating emf and currentVoltage and Current relationship in Star and Delta connections; A.C in resistors, inductors and capacitors; A.C in R-L series, R-C series, R-L-C series and parallel circuits; Power in A. C. Circuits, power triangle.

TRANSFORMER AND MACHINES: Classification: Static & dynamic (rotary) machines, examples. Transformer: Definition, study of principle of operation of transformer, derivation of EMF equation, turns ratio, voltage transformation ratio, step-up & step-down transformers, losses, efficiency, regulation, & simple problemsClassification Transformers: Based on cores, frequency, power and application, & their featuresDC machines: Principle of operation & features of DC motors &generatorsACmachines:Features of AC motors & alternators

E. TEXT BOOKS

T1. Basic Electrical Engineering, V. K. Mehta and Rohit Mehta, S. Chand and Company Publishers, RE 2012, ISBN 81219087

T2. Theraja, B. L., Electrical Technology Vol – I, S. Chand Publications, New Delhi, 2015, ISBN:9788121924405

T3. Theraja, B. L., Electrical Technology Vol – II, S. Chand Publications, New Delhi, 2015, ISBN:9788121924375
T4. Electronic Components, Dr. K. Padmanabhan and P. Swaminathan, Lakshmi Publications, 2006.

F. REFERENCE BOOKS

R1. Fundamentals Of Electric Circuits, 5Th Edn Edition-5, Charles K. Alexander And Matthew N.O. Sadiku, Publisher McGraw Hill India.

R2. Circuit Theory Analysis and Synthesis Paperback – 2018 by AbhijitChakrabarti (Author), publisher DhanpatRai and Co.

R3. Electronics: Fundamentals and Applications by D. Chattopadhyay and P. C. Rakshit, publication - new age international publishers.

R4. RituSahdev, Basic Electrical Engineering, Khanna Publishing House

R5. Mittle and Mittal, Basic Electrical Engineering, McGraw Education, New Delhi, 2015, ISBN :978-0-07-0088572-5

R6. Saxena, S. B. Lal, Fundamentals of Electrical Engineering, Cambridge University Press, latesteditionISBN : 9781107464353

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Remembering the basic terminology/definitions of electrical component & Signals	2	1										
[CO2]	Understanding the Analog electronic Specially Op-Amp & Digital Electronics and their applications			2	3								
[CO3]	Applying the knowledge of theorems/laws for Predict the behavior of any electrical and magnetic circuitsand Use the principles of electromagnetic induction in electrical applications					2		2					
[CO4]	Analyzing the formulation and solution of simple and complex AC, Dc circuits						2		1				
[CO5]	Evaluatingthe requirement of transformers and the type of electrical machine used for that particular application									1	2		

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Introduction to IT Systems

Code: DIP12157

Credits - 3 | Semester II

A. Introduction:

- This course is intended to make new students understand computing environment - Learning basic computer skills, learning basic application software tools, understanding computer hardware, cyber security awareness

B. Course Outcomes: At the end of the course, students will be able to

[CO1] Comfortably work on computer, install and configure OS

[CO2] Assemble a PC

[CO3] Connect it to external devices, write documents,

[CO4] Create worksheets, prepare presentations

[CO5] Protect information and computers from basic abuses/ attacks.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

INTRODUCTION: Computer, Functional part of computers, history and evolution of computersBasic internet skills: understanding browser, efficient use of search engines, awareness about Digital India portals (state and national portals), college portals Hardware and software, Advantages and disadvantages of computers.Memory: primary memory (RAM and ROM) and secondary memory, HDD and other peripheral devices

INTRODUCTION TO OPERATING SYSTEM: My computer, recycle bin, status bar, Start and Menu Selection, Creating and rename of files and folders, Copy, paste, moving files , opening and closing of different windows.Introduction to DOS, DOS commands, OS Installation (Linux and MS Windows)Unix Shell and Commands, vi editor.

INTRODUCTION TO OFFICE TOOLS: Open Office writer, Open Office spreadsheet, Open Office Impressworking with MS-Word-inserting text, word art, table, images, adding

background**Powerpoint:-** Difference between presentation and documents, Title, Text Creation: Fonts and size, Bullets ,moving to next slides, Presentation of slides: Selection of types of slides, slide show and presentation

INTRODUCTION TO INTERNET: Introduction to Internet, WWW and Web Browsers: Basic of Computer networks; LAN, WAN; Applications of Internet; World Wide Web; Web Browsing software, Search Engines; Understanding URL; Domain name; IP Address; Using e-governance websiteHTML4, CSS, making personal webpages

INFORMATION SECURITY BEST PRACTICES: Information security, Hacking, cryptography and its applications

E. TEXT BOOKS

T1. Online Resources, Linux man pages, Wikipedia
T2. Mastering Linux Shell Scripting: A practical guide to Linux command-line, Bash scripting, and Shell programming, by Mokhtar Ebrahim, Andrew Mallett

F. REFERENCE BOOKS

R1. R. S. Salaria, Computer fundamentals, Khanna publication house
R2. Computer Fundamentals Concepts, Systems, Application, D.P.Nagapal, S.Chand Publication
R3. Ramesh Bangia, PC Software Made Easy – The PC Course Kit, Khanna Publishing House

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Comfortably work on computer, install and configure OS	1			3								
[CO2]	Assemble a PC			2									
[CO3]	Connect it to external devices, write documents,										2		
[CO4]	Create worksheets, prepare presentations									1			
[CO5]	Protect information and computers from basic abuses/ attacks.						1						

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Engineering Mechanics

Code: DIP12153

Credits- 3 | Semester II

A. Introduction:

- To obtain resultant of various forces
- To obtain resultant of various forces
- To understand role of friction in equilibrium problems
- To know fundamental laws of machines and their applications to various engineering problems

B. Course Outcomes: At the end of the course, students will be able

[CO1] Identify the force systems for given conditions by applying the basics of mechanics.
[CO2] Determine unknown force(s) of different engineering systems.
[CO3] Apply the principles of friction in various conditions for useful purposes.
[CO4] Find the centroid and centre of gravity of various components in engineering systems.
[CO5]Select the relevant simple lifting machine(s) for given purposes.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

BASICS OF MECHANICS AND FORCE SYSTEM: Basic concepts, applied mechanics, Statics, Dynamics.Space, time, mass, particle, flexible body and rigid body.Scalar and vector quantity, Units of measurement (SI units) - Fundamental units and derived units.Force – unit, representation as a vector and by Bow's notation, characteristics and effects of a force, Principle of transmissibility of force, Force system and its classification.Resolution of a force - Orthogonal components of a force, moment of a force, Varignon'sTheorem.Composition of forces – Resultant, analytical method for determination of resultant for concurrent, non-concurrent and parallel co-planar force systems – Law of triangle, parallelogram and polygon of forces.

EQUILIBRIUM: Equilibrium and Equilibrant, Free body and Free body diagram, Analytical and graphical methods of analyzing equilibrium**,** Lami's Theorem – statement and explanation, Application for various engineering problems.Types of beam, supports (simple, hinged, roller and fixed) and loads acting on beam (vertical and inclined point load, uniformly distributed load,

couple),Beam reaction for cantilever, simply supported beam with or without overhang – subjected to combination of Point load and uniformly distributed load, Beam reaction graphically for simply supported beam subjected to vertical point loads only

FRICTION & VIRTUAL WORK: Friction and its relevance in engineering, types and laws of friction, limiting equilibrium, limiting friction, co-efficient of friction, angle of friction, angle of repose, relation between co-efficient of friction and angle of friction.Introduction, laws of coulomb friction, simple contact friction problems, belt friction, the square crew thread rolling resistance, Equilibrium of bodies on level surface subjected to force parallel and inclined to plane. Equilibrium of bodies on inclined plane subjected to force parallel to the plane only.Work of a force, Principle of Virtual work and its application.

CENTROID AND CENTRE OF GRAVITY& TRUSS: Centroid of geometrical plane figures (square, rectangle, triangle, circle, semi-circle, quarter circle),Centroid of composite figures composed of not more than three geometrical figures, Centre of Gravity of simple solids (Cube, cuboid, cone, cylinder, sphere, hemisphere) Centre ofGravity of composite solids composed of not more than two simple solids.The structural model, simple trusses, analysis of simple trusses: method of joints, Method of sections, graphical method.

SIMPLE LIFTING MACHINE: Simple lifting machine, load, effort, mechanical advantage, applications and advantages. Velocity ratio, efficiency of machines, law of machine.Ideal machine, friction in machine, maximum Mechanical advantage and efficiency, reversible and non-reversible machines, conditions for reversibility, Velocity ratios of Simple axle and wheel, Differential axle and wheel, Worm and worm wheel, Single purchase and double purchase crab winch, Simple screw jack, Weston's differential pulleyblock, geared pulley block.

E. TEXT BOOKS

T1.D.S. Bedi, Engineering Mechanics, Khanna Publications, New Delhi (2008)
T2.Khurmi, R.S., Applied Mechanics, S. Chand & Co. New Delhi.
T3.Bansal R K, A text book of Engineering Mechanics, Laxmi Publications.
T4.Ramamrutham, Engineering Mechanics, S. Chand & Co. New Delhi.
T5.Dhade, Jamadar&Walawelkar, Fundamental of Applied Mechanics, Pune Vidhyarthi Gruh.

F. REFERENCE BOOKS

R1. Ram, H. D.; Chauhan, A. K., Foundations and Applications of Applied Mechanics, CambridgeUniversity Press.
R2. Meriam, J. L., Kraige, L.G., Engineering Mechanics- Statics, Vol. I, Wiley Publication, New Delhi.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Identify the force systems for given conditions by applying the basics of mechanics.	3	3								3		2
[CO2]	Determine unknown force(s) of different engineering systems.		3								3		3
[CO3]	Apply the principles of friction in various conditions for useful purposes.		3								3		1
[CO4]	Find the centroid and centre of gravity of various components in engineering systems.	3			3								2
[CO5]	Select the relevant simple lifting machine(s) for given purposes.	3									3		

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Environmental Sciences

Code:DIP12155

0 Credits | Semester II

A. Introduction:

- Solve various engineering problems applying ecosystem to produce eco – friendly products.
- Use relevant air and noise control method to solve domestic and industrial problems.
- Use relevant water and soil control method to solve domestic and industrial problems.
- To recognize relevant energy sources required for domestic and industrial applications.
- Solve local solid and e-waste problems.

B. Course Outcomes: At the end of the course, students will be able to

[CO1] Understand the ecosystem and terminology and solve various engineering problems applying

[CO2] Ecosystem knowledge to produce eco – friendly products.

[CO3] Understand the suitable air, extent of noise pollution, and control measures and acts.

[CO4] Understand the water and soil pollution, and control measures and acts.

[CO5] Understand different renewable energy resources and efficient process of harvesting.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	10
	Attendance	2.5
	Assignment	2.5
End Semester Examination(ESE)	End Semester Examination	35
Total		50
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

ECOSYSTEM: Structure of ecosystem, Biotic & Abiotic components, Food chain and food web Aquatic (Lentic and Lotic) and terrestrial ecosystem Carbon, Nitrogen, Sulphur, Phosphorus cycle.Global warming -Causes, effects, process, Green House Effect, Ozone depletion

AIR AND NOISE POLLUTION: Definition of pollution and pollutant, Natural and manmade sources of air pollution (Refrigerants, I.C., Boiler)Air Pollutants: Types, Particulate Pollutants: Effects and control (Bag filter, Cyclone separator, Electrostatic Precipitator) Gaseous Pollution Control:Absorber, Catalytic Converter, Effects of air pollution due to Refrigerants, I.C., Boiler

Noise pollution: sources of pollution, measurement of pollution level,Effects of Noise pollution, Noise pollution (Regulation and Control) Rules, 2000

WATER AND SOIL POLLUTION: Sources of water pollution, Types of water pollutants, Characteristics of water pollutants Turbidity, pH, total suspended solids, total solids BOD and COD: Definition, calculationWaste Water Treatment: Primary methods: sedimentation, froth floatation, Secondary methods: Activated sludge treatment, Trickling filter, Bioreactor, Tertiary Method: Membrane separation technology, RO (reverse osmosis). Causes, Effects and Preventive measures of Soil Pollution: Causes-Excessive use of Fertilizers, Pesticides and Insecticides, Irrigation, E-Waste.

RENEWABLE SOURCES OF ENERGY: Solar Energy: Basics of Solar energy. Flat plate collector (Liquid & Air). Theory of flat plate collector. Importance of coating. Advanced collector. Solar pond. Solar water heater, solar dryer. Solar stills.Biomass: Overview of biomass as energy source. Thermal characteristics of biomass as fuel. Anaerobic digestion. Biogas production mechanism. Utilizationand storage of biogas.Wind energy: Current status and future prospects of wind energy. Wind energy in India. Environmental benefits and problem of wind energy. New Energy Sources: Need of new sources. Different types new energy sources. Applications of (Hydrogen energy, Ocean energy resources, Tidal energy conversion.) Concept, origin andpower plants of geothermal energy.

SOLID WASTE MANAGEMENT, ISO 14000 & ENVIRONMENTAL MANAGEMENT: Solid waste generation- Sources and characteristics of: Municipal solid waste, E- waste, biomedical waste. Metallic wastes and Non-Metallic wastes (lubricants, plastics, rubber) from industries. Collection and disposal: MSW (3R, principles, energy recovery, sanitary landfill), Hazardous waste Air quality act 2004, air pollution control act 1981, water pollution, and control act1996. Structure and role of Central and state pollution control board. Concept of Carbon Credit, Carbon Footprint. Environmental management in fabrication industryISO14000: Implementation in industries, Benefits.

E. TEXT BOOKS

T1. Metcalf & Eddy, Waste Water Engineering, Mc-Graw Hill, New York, 2013, ISBN: 077441206.
T2. Keshav Kant, Air Pollution & Control, Khanna Publishing House, New Delhi (Edition 2018)

F. REFERENCE BOOKS

R1. S.C. Sharma & M.P. Poonia, Environmental Studies,Khanna Publishing House,NewDelhi
R2. C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.
First Year Curriculum Structure Common to All Branches 52
R3. Arceivala, Soli Asolekar, Shyam, Waste Water Treatment for Pollution Control and

R4. Reuse, Mc-Graw Hill Education India Pvt. Ltd., New York, 2007, ISBN:978-07-062099-
R5. Nazaroff, William, Cohen, Lisa, Environmental Engineering Science, Willy, New York, 2000,ISBN 10: 0471144940.
R6. O.P. Gupta, Elements of Environmental Pollution Control, Khanna Publishing House, New Delhi
R7. Rao, C. S., Environmental Pollution Control and Engineering, New Age International Publication,2007, ISBN: 81-224-1835-X.
R8. Rao, M. N.Rao, H.V.N, Air Pollution, Tata Mc-Graw Hill Publication, New delhi, 1988, ISBN: 0-07-451871-8.
R9. Frank Kreith, Jan F Kreider, Principles of Solar Engineering, McGraw-Hill, New York ; 1978,ISBN: 9780070354760.
R10. Aldo Vieira, Da Rosa, Fundamentals of renewable energy processes, Academic Press Oxford,UK; 2013. ISBN: 9780123978257.
R11. Patvardhan, A.D, Industrial Solid Waste, Teri Press, New Delhi, 2013, ISBN:978-81-7993-502-6

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Understand the ecosystem and terminology and solve various engineering problems applying						3						
[CO2]	Ecosystem knowledge to produce eco – friendly products.					2	2						
[CO3]	Understand the suitable air, extent of noise pollution, and control measures and acts.						2						
[CO4]	Understand the water and soil pollution, and control measures and acts.						2						
[CO5]	Understand different renewable energy resources and efficient process of harvesting.										2		

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Engineering Graphics

Code: DIP13100

Credits2 | Semester II

A. Introduction:

- To understand the language of graphics, which is used to express ideas, convey instructions while carrying out engineering jobs.
- To develop drafting and sketching skills, to know the applications of drawing equipment and get familiarize with Indian Standards related to engineering drawings.
- To develop skills to visualize actual object or a part of it based on drawings.
- To develop skills to translate ideas into sketches and to draw and read various engineering curves, projections and dimensioning styles.

B. Course Outcomes: At the end of the course, students will be able to

[CO1] Understand the language of graphics and familiarize with Indian Standards related to engineering drawings

[CO2] Develop drafting and sketching skills, application of drawing equipment's.

[CO3] Read various engineering curves, projections and dimensioning styles.

[CO4] Develop skills to translate ideas into sketches and draw.

[CO5] Develop skills to visualize actual object or a part of it, based on drawings.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	5
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	35
Total		50
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

BASIC ELEMENTS OF DRAWING: Drawing Instruments and supporting materials, Convention of lines and their applications.Dimensioning techniques as per SP-46:2003 – types and applications of chain, parallel and coordinate dimensioning.Representative Fractions – reduced, enlarged and full size scales; Engineering Scales such as plain and diagonal scale.Geometrical and Tangency constructions.

ORTHOGRAPHIC PROJECTIONS OF POINTS AND LINES: Introduction to orthographic projection, First angle and Third angle method, their symbols.Conversion of pictorial view into Orthographic Views – object containing plain surfaces, slanting surfaces,

slots, ribs, cylindrical surfaces.Projections of points Projections of lines in different quadrants, inclinations, True lengths of the lines projections on auxiliary planes

PROJECTIONS OF PLANE FIGURES: Different cases of plane figures (of different shapes) making different angles with one or both reference planes and lines lying in the plane figures making different given angles (with one or both reference planes).

PROJECTION OF SOLIDS: Types of Solid. Projection of Cone, Cylinder, Prism &pyramids.Simple cases when solid are placed in different positions Axis faces and tines lying in the faces of the solid making given angles.

ISOMETRIC PROJECTION: Introduction to isometric projections. Isometric scale and Natural scale.Isometric view and isometric projection. Illustrative problems related to objects containing lines, circles and arcs shape only

E. TEXT BOOKS

T1. Engineering Graphics, Agrawal B. & Agrawal C. M, TMH Publication
T2. Textbook on Engineering Drawing, Narayana, K.L. & P Kannaiah, Scitech Publishers

F. REFERENCE BOOKS

R1. Engineering Graphics, N.D Bhatt, Charotar Publishing House Pvt. Limited
R2. Principle of Engineering Graphics and Drawing, R.K Dhawan, S. Chand Publishing
R3. Engineering Graphics and Drafting, P.S GILL, S. K. Kataria& Sons
R4. Engineering Drawing and Computer Graphics, Shah, M.B. &Rana B.C. PearsonEducation

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Understand the language of graphics and familiarize with Indian Standards related to engineering drawings	2	1		1								
[CO2]	Develop drafting and sketching skills, application of drawing equipment's.				1								2
[CO3]	Read various engineering curves, projections and dimensioning styles.												
[CO4]	Develop skills to translate ideas into sketches and draw.	1											
[CO5]	Develop skills to visualize actual object or a part of it, based on drawings.											2	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Fundamentals of Electrical and Electronics EngineeringLab

Code: DIP12156

Credits- 1 | Semester II

A. Introduction:

- To provide basic knowledge of the different elements and concepts of electrical engineering field.
- To learn basic concepts of various active and passive electronic components applications in industrial processes of different fields

B. Course Outcomes: At the end of the course, students will be able to

[CO1] Remembering basic problems related to electrical circuits

[CO2] Understanding operation of different electrical technologies.

[CO3] Analyzing different types of signal waveforms.

[CO4] Evaluating a various electronic circuits.

[CO5] Use relevant electric/electronic protective devices safely.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	5
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	35
Total		50
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

LIST OF PRACTICALS	
1	Determine the resistance of a given unknown resistor experimentally and compare it with its colour coded value.
2.	Determine voltage, current and power in R-L series circuit.
3.	Demonstrate the verification of Ohm's law.
4	Compute the effective resistance experimentally for the following combinations: Three resistors are connected in (a) series and (b) parallel.
5	Connect capacitors in series and parallel combination on bread board and measure its value using multimeter.
6.	Demonstrate the verification of Kirchhoff's Current Law (KCL).

7	Demonstrate the verification of Kirchhoff's Voltage Law (KVL).
8	Demonstrate the characteristics of Half Wave Rectifier.
9	Test the PN-junction diodes using digital multimeter and measure the performance of PN-junction diode.
10	Demonstrate the characteristics of full Wave Rectifier.
11	Verify experimentally Thevenin's theorem
12	Verify experimentally Norton's theorem

E. TEXT BOOKS

T1. RituSahdev, Basic Electrical Engineering, Khanna Publishing House, 2018
T2. Mittle and Mittal, Basic Electrical Engineering, McGraw Education, New Delhi, 2015, ISBN : 978-0-07-0088572-5
T3. Saxena, S. B. Lal, Fundamentals of Electrical Engineering, Cambridge University Press, latest edition ISBN : 9781107464353
T4. Theraja, B. L., Electrical Technology Vol – I, S. Chand publications, New Delhi, 2015, ISBN: 9788121924405

F. REFERENCE BOOKS

R1. Theraja, B. L., Electrical Technology Vol – II, S. Chand publications, New Delhi, 2015, ISBN:9788121924375
R2. Jegathesan, V., Basic Electrical and Electronics Engineering, Wiley India, New Delhi, 2015, ISBN : 97881236529513
R3. Sedha, R.S., A text book of Applied Electronics, S.Chand ,New Delhi, 2008, ISBN-13: 978-8121927833
R4. Mehta, V.K., Mehta, Rohit, Principles of Electronics, S. Chand and Company, New Delhi, 2014,ISBN-13-9788121924504
R5. Bell Devid, Fundamental of Electronic Devices and Circuits, Oxford University Press, NewDelhi 2015 ISBN : 9780195425239

F. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Remembering basic problems related to electrical circuits	1		2									
[CO2]	Understanding operation of different electrical technologies.		1		3								
[CO3]	Analyzing different types of signal waveforms.					2							
[CO4]	Evaluating a various electronic circuits.		2										
[CO5]	Use relevant electric/electronic protective devices safely.							2					

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Introduction toIT System Lab

Code:

Credits- 1 | Semester II

A. Introduction:

- This Lab course is intended to practice whatever is taught in theory class of 'Introduction of IT Systems'and become proficient in using computing environment - basic computer skills, basic application software tools, Computer Hardware, cyber security features, etc.

B. Course Outcomes: At the end of the course, students will be able to

[CO1] Comfortably work on computer, install and configure OS
[CO2] Assemble a PC
[CO3] Connect it to external devices, write documents,
[CO4] Create worksheets, prepare presentations
[CO5] Protect information and computers from basic abuses/ attacks.

C. Assessment Plan:

Criteria	**Description**	**Maximum Marks**
Continuous Internal Assessment (CIA)	Internal Examination	5
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	35
Total		50
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

LIST OF PRACTICALS	
1	Introduction to various hardware components of a computer.
2.	Introduction to various e-governance/ Digital India portals, understanding their features
3.	Installing Linux/DOS and performing commands
4	HTML program to create a web page
5	HTML program to create a List of items and table
6.	HTML program to create a bio data using CSS
7	Creating a text file using Open Office/ MS-word
8	Creating a text file and adding borders, tables, word art etc

9	Creating a PPt using Open Office/ MS Powerpoint
10	Creating a slide show for the powerpoint presentation

E. TEXT BOOKS

T1. IT Essentials PC Hardware and Software Companion Guide, Davis Anfinson and Ken Quamme, CISC Press, Pearson Education.

T2. PC Hardware and A+ Handbook, Kate J. Chase PHI (Microsoft).

F. REFERENCE BOOKS

R1. Online resources, Linux man pages, Wikipedia.

R2. R.S. Salaria, Computer Fundamentals, Khanna Publishing House.

R3. Ramesh Bangia, PC Software Made Easy – The PC Course Kit, Khanna Publishing House.

R4. Mastering Linux Shell Scripting: A practical guide to Linux command-line, Bash scripting, and Shell programming, by Mokhtar Ebrahim, Andrew Mallett.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES			CORRELATION WITH PROGRAM SPECIFIC OUTCOMES								
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Comfortably work on computer, install and configure OS	1			3								
[CO2]	Assemble a PC			2									
[CO3]	Connect it to external devices, write documents,										2		
[CO4]	Create worksheets, prepare presentations									1			
[CO5]	Protect information and computers from basic abuses/ attacks.						1						

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Engineering Mechanics Lab

Code: DIP12154

Credits- 1 | Semester II

A. Introduction:

- To obtain resultant of various forces.
- To calculate support reactions through conditions of equilibrium for various structures
- To understand role of friction in equilibrium problems
- To know fundamental laws of machines and their applications to various engineering problems

B. Course Outcomes: At the end of the course, students will be able to

[CO1] Identify the force systems for given conditions by applying the basics of mechanics.
[CO2] Determine unknown force(s) of different engineering systems.
[CO3] Apply the principles of friction in various conditions for useful purposes.
[CO4] Find the centroid and center of gravity of various components in engineering systems.
[CO5] Select the relevant simple lifting machine(s) for given purposes..

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	5
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	35
Total		50
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

LIST OF PRACTICALS	
1.	To study various equipment is relate to Engineering Mechanics.
2.	To find the M.A., V.R., Efficiency and law of machine for Differential Axle and Wheel.
3.	To find the M.A., V.R., Efficiency and law of machine for Simple Screw Jack.
4.	Derive Law of machine using Worm and worm wheel.
5.	Derive Law of machine using Single purchase crab.
6.	Derive Law of machine using double purchase crab.
7.	Derive Law of machine using Weston's differential or wormed geared pulley block.
8.	Determine resultant of concurrent force system applying Law of Polygon of forces using forcetable.
9.	Determine resultant of concurrent force system graphically.
10.	Determine resultant of parallel force system graphically.

11.	Verify Lami's theorem
12.	Study forces in various members of Jib crane.
13.	Obtain support reactions of beam using graphical method.
14.	Determine coefficient of friction for motion on horizontal and inclined plane.
15.	Determine centroid of geometrical plane figures.
16.	Determine support reactions for simply supported beam.

E. TEXT BOOKS

T1. Ram, H. D.; Chauhan, A. K. Foundations and Applications of Applied Mechanics, Cambridge UniversityPress.

T2. Meriam, J. L., Kraige, L.G. , Engineering Mechanics- Statics, Vol. I, Wiley Publication, New Delhi.

F. REFERENCE BOOKS

R1. Bedi D.S., Engineering Mechanics, Khanna Publishing House

R2. Khurmi, R.S., Applied Mechanics, S.Chand& Co. New Delhi.

R3. Bansal R K, A text book of Engineering Mechanics, Laxmi Publications.

R4. Ramamrutham, Engineering Mechanics, S.,S Chand & Co. New Delhi.

R5. Dhade, Jamadar&Walawelkar, Fundamental of Applied Mechanics, Pune VidhyarthiGruh.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Identify the force systems for given conditions by applying the basics of mechanics.	1		2									
[CO2]	Determine unknown force(s) of different engineering systems.		1		3								
[CO3]	Apply the principles of friction in various conditions for useful purposes.					2							
[CO4]	Find the centroid and center of gravity of various components in engineering systems.		2										
[CO5]	Select the relevant simple lifting machine(s) for given purposes..							2					

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

ARKA JAIN University
Jharkhand

Syllabus of

Diploma in Electrical & Electronics Engineering

Semester-III

ARKAJAIN University, Jharkhand
School of Engineering & IT
Department of Engineering
Faculty – Diploma in Electrical & Electronics Engineering (DEEE)
Scheme of Study (w.e.f Batch 2020-23)

SEMESTER –I(Group-A)

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Communication Skills in English	HSC	3	3	100	70	20	5	5
2	Mathematics-I	BSC	4	4	100	70	20	5	5
3	Applied Physics	BSC	4	4	100	70	20	5	5
4	Applied Chemistry	BSC	4	4	100	70	20	5	5
	Practical								
5.	Engineering Workshop Practice	ESC	2	4	50	35	5	5	5
6.	Applied Physics Lab	BSC	1	2	50	35	5	5	5
7.	Applied Chemistry Lab	BSC	1	2	50	35	5	5	5
8.	Communication Skills in English Lab	HSC	1	2	50	35	5	5	5
	Total		**20**	**25**	**600**	**420**	**100**	**40**	**40**

SEMESTER I (Group-B)

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Mathematics -I	BSC	4	4	100	70	20	5	5
2	Fundamentals of Electrical & Electronics Engg.	ESC	4	4	100	70	20	5	5
3	Introduction to IT system	ESC	3	3	100	70	20	5	5
4	Engineering Mechanics	ESC	4	4	100	70	20	5	5
5	Environmental Science	AC	0	2	50	35	10	2.5	2.5
	Practical								
6	Fundamentals of electrical & electronics Engg. Lab	ESC	1	2	50	35	5	5	5
7	Introduction to IT system Lab	ESC	1	2	50	35	5	5	5
8	Engineering Mechanics Lab	ESC	1	2	50	35	5	5	5
9	Engineering Graphics	ESC	2	4	50	35	5	5	5
	Total		**20**	**27**	**650**	**455**	**110**	**42.5**	**42.5**

SEMESTER II (Group-A)

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Mathematics -II	BSC	4	4	100	70	20	5	5
2	Fundamentals of Electrical & Electronics Engg.	ESC	4	4	100	70	20	5	5
3	Introduction to IT system	ESC	3	3	100	70	20	5	5
4	Engineering Mechanics	ESC	4	4	100	70	20	5	5
5	Environmental Science	AC	0	2	50	35	10	2.5	2.5
	Practical								
6	Fundamentals of electrical & electronics Engg. Lab	ESC	1	2	50	35	5	5	5
7	Introduction to IT system Lab	ESC	1	2	50	35	5	5	5
8	Engineering Mechanics Lab	ESC	1	2	50	35	5	5	5
9	Engineering Graphics	ESC	2	4	50	35	5	5	5
	Total		**20**	**27**	**650**	**455**	**110**	**42.5**	**42.5**

SEMESTER –II(Group-B)

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Communication Skills in English	HSC	3	3	100	70	20	5	5
2	Mathematics-II	BSC	4	4	100	70	20	5	5
3	Applied Physics	BSC	4	4	100	70	20	5	5
4	Applied Chemistry	BSC	4	4	100	70	20	5	5
	Practical								
5.	Engineering Workshop Practice	ESC	2	4	50	35	5	5	5
6.	Applied Physics Lab	BSC	1	2	50	35	5	5	5
7.	Applied Chemistry Lab	BSC	1	2	50	35	5	5	5
8.	Communication Skills in English Lab	HSC	1	2	50	35	5	5	5
	Total		**20**	**25**	**600**	**420**	**100**	**40**	**40**

SEMESTER-III

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Introduction to Electric Generation Systems	PCC	3	3	100	70	20	5	5
2	Electrical Circuits	PCC	3	3	100	70	20	5	5
3	Electrical and Electronic Measurements	PCC	3	3	100	70	20	5	5
4	Electric Motors and Transformers	PCC	3	3	100	70	20	5	5
5	Applied Electronics	PCC	3	3	100	70	20	5	5
	PRACTICAL								
6	Electrical Circuits Lab	PCC	1	2	50	35	5	5	5
7	Electrical and Electronic Measurements Lab	PCC	1	2	50	35	5	5	5
8	Electric Motors and Transformers Lab	PCC	1	2	50	35	5	5	5
9	Applied Electronics lab	PCC	1	2	50	35	5	5	5
10	Summer Internship-I (3-4 Weeks)	PROJ	2	0	50	35	15	0	0
	TOTAL		**21**	**23**	**750**	**525**	**135**	**45**	**45**

SEMESTER-IV

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Digital Electronics	PCC	3	3	100	70	20	5	5
2	Electric Power Transmission and Distribution	PCC	4	4	100	70	20	5	5
3	Induction, Synchronous and Special Electrical Machines	PCC	4	4	100	70	20	5	5
4	Elective I Industrial Instrumentation and ConditionMonitoring Electrical Testing & Commissioning Illumination Practices	PEC	3	3	100	70	20	5	5
5	Elective II Industrial Drives Electrical Estimation & Contracting Biomass and Micro-hydro Power plants	PEC	3	3	100	70	20	5	5
6	Essence of Indian Knowledge Tradition	AC	0	2	50	35	10	2.5	2.5
	PRACTICAL								
7	Digital Electronics Lab	PCC	1	2	50	35	5	5	5
8	Electrical& Electronics Engg. Drawing	PCC	2	4	50	35	5	5	5
9	Induction, Synchronous and Special Electrical Machines Lab	PCC	1	2	50	35	5	5	5
10	Minor Project	PROJ	2	4	50	35	15	0	0
	TOTAL		**23**	**31**	**750**	**525**	**140**	**42.5**	**42.5**

SEMESTER V

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA	Attendance
1	Microprocessor & Microcontroller	PCC	4	4	100	70	20	5	5
2	Fundamentals of Power Electronics	PCC	4	4	100	70	20	5	5
3	Elective III Switchgear and Protection Wind Power Technologies Electric Vehicles	PEC	3	3	100	70	20	5	5
4	Elective IV Industrial Automation & Control Communication Technologies Electric Traction	PEC	3	3	100	70	20	5	5
5	Open Elective I Artificial Intelligence & Machine Learning Introduction to E-Governance Robotics	OEC	3	3	100	70	20	5	5
	PRACTICAL								
6	Microprocessor & Microcontroller Lab	PCC	1	2	100	70	20	5	5
7	Fundamentals of Power Electronics Lab	PCC	1	2	50	35	5	5	5
8	Summer Internship-II(4-6 Weeks)	PROJ	3	0	100	70	30	0	0
9	Major Project-I (Project to be carried over to next semester)	PROJ	1	2	50	35	15	0	0
	TOTAL		**23**	**23**	**800**	**560**	**170**	**35**	**35**

SEMESTER VI

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Building Electrification	PCC	4	4	100	70	20	5	5
2	Entrepreneurship and Start –ups	HSC	4	4	100	70	20	5	5
3	Open Elective II Internet of Things Project Management Operations Research	OEC	3	3	100	70	20	5	5
4	Open Elective III Economic Policies in India Energy Efficiency and Audit	OEC	3	3	100	70	20	5	5
5	Indian constitution	AC	0	2	50	35	10	2.5	2.5
	PRACTICAL								
6	Seminar	PROJ	1	2	50	35	15	0	0
7	Major Project-II	PROJ	3	6	100	70	30	0	0
	TOTAL		**18**	**24**	**600**	**455**	**135**	**22.5**	**22.5**

Distribution of Credit across 6 semesters:

Sl. No	Type of Paper	No. of Paper	Total Credit
1	Humanities and Social Sciences Courses **(HSC)**	3	8
2	Basic Science courses**(BSC)**	6	18
3	Engineering Science courses **(ESC)**	8	18
4	Professional core courses (**PCC)**	20	48
5	Professional Elective courses**(PEC)**	4	12
6	Open Electives Courses (**OEC)**	3	9
7	Project work, seminar and internship in industry or elsewhere**(PROJ)**	6	12
8	Audit Courses [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Knowledge Tradition]**(AC)**	3	(non-credit)
	Total	53	125

CIA – Continuous Internal Assessment – Based on Projects / Assignment during the semester

Note:

AICTE Activity Points to be earned by students admitted to Diploma program (For more details refer to Chapter 6, AICTE, Activity Point Program, Model Internship Guidelines):

Every regular student, who is admitted to the 3 year Diploma program, is required to earn 75 activity points in addition to the total credits earned for the program. Students entering 3 years Diploma Program through lateral entry are required to earn 50 activity points in addition to the total credits earned for the program.
The activity points earned by the student shall be reflected on the students 6th Semester grade card.
The activities to earn the points can be spread over the duration of the course. However, minimum prescribed duration should be fulfilled.
Activity Points (non-credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression.
Incase student fail to earn the prescribed activity points, Sixth semester Grade Card shall be issued only after earning the required activity Points.
Students shall be eligible for the award of degree only after the release of the Six Semester grade card.

There are two groups (A & B) in semester 1 & 2. The Group division will be decided by The Dean SoE& IT before commencement of classes*

School of Engineering & IT
Department of Engineering
Faculty – Diploma in Electrical & Electronics Engineering (DEEE)
PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

PROGRAM OUTCOMES

After completing this undergraduate program, a learner:

[PO.1]. Basic knowledge: An ability to apply knowledge of basic mathematics, science and engineering to solve the engineering problems

[PO.2]. Discipline knowledge: An ability to apply discipline - specific knowledge to solve core and/or applied engineering problems.

[PO.3]. Experiments and practice: An ability to plan and perform experiments and practices and to use the results to solve engineering problems.

[PO.4]. Engineering Tools: Apply appropriate technologies and tools with an understanding of the limitation.

[PO.5]. The engineer and society: Demonstrate knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering practice.

[PO.6]. Environment and sustainability: Understand the impact of the engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development..

[PO.7]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

[PO.8]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse/multidisciplinary teams.

[PO.9]. Communication: An ability to communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

[PO.10]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the context of technological changes.

PROGRAM SPECIFIC OUTCOMES

[PSO.1]. Students will able to design, test and trouble shoot of electrical & electronics circuits, equipment and appliances.

[PSO.2]. Apply latest techniques, skills and modern engineering tools of industrial and system engineering throughout their professional careers in the fields of Electrical & Electronics.

Subject: Introduction to Electric Power Generation Systems

Code: DIP13173

3 Credits | Semester III

A. Introduction:

- Explanation and Maintenance of various electric power generating plants for efficient operation.
- Identification of different components important Terminology for various systems in power stations.
- Selection of suitable sites for establishment of power stations.
- Selection of alternative energy sources for given conditions.
- Explanation of working of windmills and solar systems, domestic & commercial D. G. Set.

B. **Course Outcomes**: At the end of the course, students will be able to

[CO1] Label the block diagrams of energy conversion process.

[CO2]Compare the basic abstractions of electrical power generations from conventional and nonconventional sources of energy.

[CO3]Usethe knowledge of electrical power generation in other field of science, engineering and economics.

[CO4]Discoverthe impact of various systems on environment and economics aspects of energy generation.

[CO5]Estimate generation control on a power system using simulation tools.

[CO6]Designa Electric power generation system, components or process to meet desired needs within realistic constraints such as economic, environmental and safety.

C. Assessment Plan:

Criteria	**Description**	**Maximum Marks**
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

THERMAL POWER PLANTS: COAL, GAS/ DIESEL AND NUCLEAR-BASED:

Electrical power, important terminology, overall applications Introduction of Various sources of energy, Layout and working of a typical thermal power plant with steam turbines and electric generators, Properties of conventional fuels used in the energy conversion equipment used in thermal power plants: Coal, Gas/ diesel, Nuclear fuels, Safe Practices and working of various thermal power plants: coal-based, gas-based, diesel-based, and nuclear-based.

LARGE AND MICRO-HYDRO POWER PLANT:

Energy conversion process of hydro power plant. Classification of hydro power plant: High, medium and low head. Construction and working of hydro turbines used in different types of hydro power plant: a. High head – Pelton turbine, b. Medium head – Francis turbine, c. Low head – Kaplan turbine., Safe Practices for hydro power plants. Different types of micro- hydro turbines for different heads: Pelton, Francis and Kaplan turbines

SOLAR AND BIOMASS BASED POWER PLANT :

Solar Map of India: Global solar power radiation. Solar Power Technology: Concentrated Solar Power (CSP) plants, construction and working of Power Tower, Parabolic Trough, Parabolic Dish, Fresnel Reflectors, Solar Photovoltaic (PV) power plant: layout, construction, working. Biomass-based Power Plants, a. Layout of a Bio-chemical based (e.g. biogas) power plant:, b. Layout of a Thermo-chemical based (e.g. Municipal waste) power plant, c. Layout of an Agro-chemical based (e.g. bio-diesel) power plantFeatures of the solid, liquid and gas biomasses as fuel for biomass power plant,

WIND POWER PLANTS:

Wind Map of India**:** Wind power density in watts per square meter, Layout of Horizontal axis large wind power plant: Geared wind power plant, Salient Features of electric generators used in large wind power plants, Constant Speed Electric Generators: Squirrel Cage Induction Generators (SCIG), Wound Rotor Induction Generator (WRIG), Variable Speed Electric Generators: Doubly-fed induction generator (DFIG), wound rotor synchronous generator (WRSG), permanent magnet synchronous generator (PMSG)

ECONOMICS OF POWER GENERATION & INTERCONNECTED POWER SYSTEM:

Related terms: connected load, firm power, cold reserve, hot reserve, Base load and peak load plants; Load curve, load duration curve, Cost of generation: Average demand, maximum demand, demand factor, plant capacity factor, diversity factor, load factor , Choice of size and number of generator units, Causes and Impact and reasons of Grid system fault: State grid, national grid, brownout and black out; sample blackouts at national and international level

E. TEXT BOOKS

T1. Electrical Power by Dr.S.L.Uppal.
T2. A course in Electrical Power by Soni – Gupta - Bhatnagar.
T3. Non-conventional Energy sources by Prof. G. D. Rai.
T4. A course in Power Plant Engineering by Prof. Arrora and Dr. V. M. Domkundwar.

F. REFERENCE BOOKS

R1. Nag. P. K.Power Plant Engineering, McGraw Hill, New Delhi, ISBN: 978-9339204044
R2.Tanmoy Deb, Electrical Power Generation, Khanna Publishing House, Delhi (Ed. 2018)
R3. Gupta, B.R., Generation of Electrical Energy, S. Chand& Co. New Delhi,
R4. Rachel, Sthuthi; Earnest, Joshua – Wind Power Technologies, PHI Learning, New Delhi,
R5. ISBN: 978-93-88028-49- 3; E-book 978-93-88028-50-9
R6. Solanki, Chetan Singh, – Solar Photovoltaic: Fundamentals, Technologies and Applications,
R7. PHI Learning, New Delhi, ISBN: 9788120351110

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Label the block diagrams of energy conversion process.	2	2									1	1
[CO2]	Compare the basic abstractions of electrical power generations from conventional and nonconventional sources of energy.	2	2				2					2	1
[CO3]	Use the knowledge of electrical power generation in other field of science, engineering and economics.					3	2				2		2
[CO4]	Discover the impact of various systems on environment and economics aspects of energy generation.					2	3	2					2
[CO5]	Estimate generation control on a power system using simulation tools	2	2		3							2	
[CO6]	Design a Electric power generation system, components or process to meet desired needs within realistic constraints such as economic, environmental and safety.					3		2			2	2	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject:Electrical Circuits

Code: DIP13170

3 Credits | Semester III

A. Introduction:

- Maintain electrical systems applying AC and DC circuit fundamentals Know and define the basic elements; electric circuit terminology; energy sources used in electric circuit and also AC wave form and its various quantities.
- To Interprettheresponseof R.L.C elements to AC supply
- To calculate various parameters of AC Circuits and interpret performance of AC Series and Parallel Circuits.
- Phase & line values of various quantities in three phase circuits.
- To study network theorems for solutions of DC Networks.

B. Course Outcomes: At the end of the course, students will be able to

[CO1] Recognize basic electrical DC concepts and theorems

[CO2] Extent the concepts of mathematics, science, and engineering to the analysis and design of electrical circuits

[CO3] Utilize the techniques, skills, and modern engineering tools such as pspice, workbench, necessary for engineering practice.

[CO4] Analyze function on multi-disciplinary teams through the electric circuits experiments and projects.

[CO5] Interpret engineering problems in the area circuits and systems

[CO6] Design an electric system, components or process to meet desired needs within realistic constraints.

C. Assessment Plan:

Criteria	**Description**	**Maximum Marks**
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

SINGLE PHASE A.C SERIES CIRCUITS: Generation of alternating voltage, Phasor representation of sinusoidal quantities R, L, C circuit elements its voltage and current response, R-L, R-C, R-L-C combination of A.C series circuit, impedance, reactance, impedance triangle, Power factor, active power, reactive power, apparent power, power triangle and vector diagram , Resonance, Bandwidth, Quality factor and voltage magnification in series R-L, R-C, R-L-C circuit

SINGLE PHASE A.C PARALLEL CIRCUITS: R-L, R-C and R-L-C parallel combination of A.C. circuits. Impedance, reactance, phasor diagram, impedance triangle, R-L, R-C, R-L-C parallel A.C. circuits power factor, active power, apparent power, reactive power, power triangle, Resonance in parallel R-L, R-C, R-L-C circuit, Bandwidth, Quality factor and voltage magnification

THREE PHASE CIRCUITS: Phasor and complex representation of three phase supply Phase sequence and polarity, Types of three-phase connections, Phase and line quantities in three phase star and delta system, Balanced and unbalanced load, neutral shift in unbalanced load, Three phase power, active, reactive and apparent power in star and delta system

NETWORK REDUCTION AND PRINCIPLES OF CIRCUIT ANALYSIS: Source transformation, Star/delta and delta/star transformation, Mesh Analysis, Node Analysis

NETWORK THEOREMS: Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem, Duality in electric circuits

E. TEXT BOOKS

T1. Introductory circuit Analysis byBoylested R.L., Wheeler, New Delhi.
T2. Schaum online series Theory and problems of Electric circuits by Edminister, T. M. G. H., Newyork Publication.
T3. Circuit and network by A. Sudhakar, TataMcGrawHill.
T4. Basic Electrical Engineering by V.N. Mittle, TataMcGrawHill.
T5. Electrical Technology Volume-I by B. L. Theraja, S. Chand & Co.

F. REFERENCE BOOKS

R1. Ashfaq Husain, Networks & Systems, Khanna Book Publishing, New Delhi.
R2. Gupta, B.R; Singhal, Vandana;, Fundamentals of Electrical Network, S.Chand and Co., New Delhi, ISBN: 978-81-219-2318-7
R3. Saxena, S.B Lal; Dasgupta, K; Fundamentals of Electrical Engineering, Cambridge University
R4. Press Pvt. Ltd., New Delhi, ISBN: 978-11-0746-435-3
R5. Bell, David A., Electric Circuits, Oxford University Press New Delhi, ISBN: 978-01-954-2524-6
R6. Sivanandam, S.N, Electric Circuit Analysis, Vikas Publishing House Pvt. Ltd, Noida, ISBN: 978-81259-1364-1
R7. Salivahanan, S.; Pravinkumar, S; Circuit theory, Vikas Publishing House Pvt. Ltd, Noida;ISBN: 978-93259-7418

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Recognize basic electrical DC concepts and theorems	2	2									1	1
[CO2]	Extent the concepts of mathematics, science, and engineering to the analysis and design of electrical circuits	3	2									1	2
[CO3]	Utilize the techniques, skills, and modern engineering tools such as pspice, workbench, necessary for engineering practice.	2	2		3							2	1
[CO4]	Analyze function on multi-disciplinary teams through the electric circuits experiments and projects.		2		2		2					1	2
[CO5]	Interpret engineering problems in the area circuits and systems	2	3	2	2							2	
[CO6]	Design an electric system, components or process to meet desired needs within realistic constraints.						2	2		2		2	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject:Electrical and Electronic Measurements

Code:DIP13168

3 Credits | Semester III

A. Introduction:

- Use relevant measuring instrument in different electrical applications.
- To identify the measuring instruments used for measuring electrical quantities.
- To Select appropriate measuring instrument with range for measurement of various electrical quantities.
- To classify measuring instruments based on construction, principle of operation and quantity to be measured, types of errors.
- To calibrate various types of instruments as per instruction.

B. Course Outcomes: At the end of the course, students will be able to

[CO1] Recall the evolution and history of units and standards in Measurements
[CO2] Understand the various parameters that are measurable in electrical and electronic instrumentation..
[CO3] Use the complete knowledge of various electronics instruments/ transducers to measure the physical quantities in the field of science, engineering and technology.
[CO4] Inspect the performance characteristics of electrical and electronic instruments
[CO5] Assess the basic meters such as voltmeters and ammeters
[CO6] Generate novel electronic and electrical products and solutions for real life problems.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS:

FUNDAMENTALS OF MEASUREMENTS: Measurement: Significance, units, fundamental quantities and standards Classification of Instrument Systems: Null and deflection type instruments, Absolute and secondary instruments Analog and digital instruments, Static and dynamic characteristics, types of errors, Calibration: need and procedure, Classification of measuring instruments: indicating, recording and integrating instruments. Essential requirements of an indicating instrument

MEASUREMENT OF VOLTAGE AND CURRENT: DC Ammeter: Basic, Multi range, Universal shunt, DC Voltmeter: Basic, Multi-range, concept of loading effect and sensitivity, AC voltmeter: Rectifier type (half wave and full wave), CT and PT: construction, working and applications. Clamp-on meter.

MEASUREMENT OF ELECTRIC POWER: Analog meters: Permanent magnet moving coil (PMMC) and Permanent magnet moving iron(PMMI) meter, their construction, working, salient features, merits and demerits, Dynamometer type wattmeter: Construction and working, Range: Multiplying factor and extension of range using CT and PT, Errors and compensations, Active and reactive power measurement: One, two and three wattmeter method. Effect of Power factor on wattmeter reading in two wattmeter method. Maximum Demand indicator

MEASUREMENT OF ELECTRIC ENERGY:

Single and three phase electronic energy meter: Constructional features and working principle. Errors and their compensations. Calibration of single phase electronic energy meter using direct loading.

CIRCUIT PARAMETER MEASUREMENT, CRO AND OTHER METERS:

Measurement of resistance: Low resistance: Kelvin's double bridge,Medium Resistance: Voltmeter and ammeter method, High resistance: Megger and Ohm meter: Series and shunt, Measurement of inductance using Anderson bridge (no derivation and phasor diagram)Measurement of capacitance using Schering bridge (no derivation and phasor diagram), Single beam/single trace CRO, Digital storage Oscilloscope: Basic block diagram, working, Cathode ray tube Other meters: Earth tester, Digital Millimeter; L-C-R meter, Frequency meter (ferromagnetic and Weston type), Phase sequence indicator, power factor meter(single phase and three phase dynamometer type), Synchro scope, Tri-vector meter, Signal generator: need, working and basic block diagram., Function generator: need, working and basic block diagram, function of symmetry.

E. TEXT BOOKS

T1. Electric & Electronic Measurement and Instrumentation by A.K.Sawhney, Dhanpatrai&Sons Publications.
T2. Electronic Instrumentation &measurement Techniques by Copper &Heltrick, Prentice Hall of India Publication.
T3. Instrumentation Device sand System by RanganMani, TataMcGrawHill.
T4. Electronic Instrumentation by H S Kalsi, TataMcGrawHill.
T5. Industrial Instrumentation &control by SK Singh, Tata McGraw Hill.

F. REFERENCE BOOKS

R1. Electrical Measurement &measuring Instrument by Golding, TataMcGrawHill.
R2. Electrical Measurement &measuring Instrument by N.V. Suryanaryan, S.Chand&Co Publication.
R3. Fundamental of Electrical measurement by C.T.Baldwin.

A. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Recall the evolution and history of units and standards in Measurements	**3**	**2**									**2**	
[CO2]	Understand the various parameters that are measurable in electrical and electronic instrumentation.	**2**	**2**		**2**							**1**	**2**
[CO3]	Use the complete knowledge of various electronics instruments/ transducers to measure the physical quantities in the field of science, engineering and technology.	**3**	**2**	**2**								**2**	**3**
[CO4]	Inspect the performance characteristics of electrical and electronic instruments	**2**	**2**	**1**	**2**							**1**	**2**
[CO5]	Assess the basic meters such as voltmeters and ammeters			**3**	**2**							**2**	**1**
[CO6]	Generate novel electronic and electrical products and solutions for real life problems.					**2**	**2**				**2**	**2**	**3**

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Electric Motors and Transformers

Code: DIP13166
3 Credits | Semester III

A. INTRODUCTION:

- The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:
- To maintain electric motors and transformers
- Understand the basic principles of operation of a DC motor and Transformer
- Understand the operation and basic characteristics of simple DC machine and transformer
- Compute electrical and mechanical quantities using the equivalent circuit.
- Use motor nameplate data.
- Study some applications of DC motors and transformer.

B. COURSE OUTCOMES: By the end of this course, students will be able to:

[CO1] Recall the fundamental principles and classification of electromagnetic machines.
[CO2] Relate the working of dc machines as generators and motors
[CO3] Explain the efficiency and voltage regulationsof dc machines.
[CO4] Analyze the performance characteristics of different DC machines using different equivalent circuit
[CO5] Compare the different types of testing methods used to determine the performance characteristics of DC machines and Transformers
[CO6] Predict the equivalent circuit and phasor diagram of DC different machines

C. ASSESSMENT PLAN:

Criteria	**Description**	**Maximum Marks**
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS:

DC GENERATORS: DC generator: construction, parts, materials and their functions. Principle of operation of DC generator: Fleming's right hand rule, schematic diagrams, e.m.f. equation of generator, armature reaction, commutation and. Applications of DC generators. Classification of measuring instruments: indicating, recording and integrating instruments.

D.C. MOTORS: DC motor: Types of DC motors. Fleming's left hand rule, Principle of operation of, Backe.m.f. and its significance, Voltage equation of DC motor. Torque and Speed; Armature torque, Shaft torque, BHP, Brake test, losses, efficiency. DC motor starters: Necessity, two point and three point starters. Speed control of DC shunt and series motor: Flux and Armature control. Brushless DC Motor: Construction and working.

SINGLE PHASE TRANSFORMERS: Types of transformers: Shell type and core type; Construction: Parts and functions, materials used for different parts: CRGO, CRNGO, HRGO, amorphous cores, Transformer: Principle of operation, EMF equation of transformer: Derivation, Voltage transformation ratio, Significance of transformer ratings, Transformer No-load and on-load phasor diagram, Leakage reactance, Equivalent circuit of transformer: Equivalent resistance and reactance. Voltage regulation and Efficiency: Direct loading, OC/SC method, All day efficiency.

THREE PHASE TRANSFORMERS: Three single phase transformers, Single unit of three phase transformer Distribution and Power transformers. Construction, cooling, Three phase transformers connections as per IS: 2026 (part IV)-1977. Selection of transformer as per IS: 10028 (Part I)-1985, Criteria for selection of distribution transformer, and power transformer, Amorphous Core type Distribution Transformer. Need of parallel operation of three phase transformer, Conditions for Parallel operation. Polarity tests on mutually inductive coils and single phase transformers; Polarity test, Phasing out test on Three-phase transformer

SPECIAL PURPOSE TRANSFORMERS: Single phase and three phase auto transformers: Construction, working and applications. Instrument Transformers: Construction, working and applications of Current transformer and Potential transformer. Isolation transformer: Constructional Features and applications. Single phase welding transformer: constructional features and applications. Pulse transformer: constructional features and applications. 'K' factor of transformers: overheating due to non-linear loads and harmonics

E. TEXT BOOKS

T1. Electric Motors and Transformers Paperback – 2019 by B. H. Deshmukh (Author)

T2. Murugesh Kumar, K., DC Machines and Transformers, ISBN: 9788125916055

T3. A Text Book of Electrical Machines R.K Rajput, 4thedison

T4. Theory & performances of electrical machines, J.B.Gupta, kataria& sons

F. REFERENCE BOOKS

R1. G.C. Garg & P.S. Bimbhra, Electrical Machines, Vol-I, II, Khanna Book Publishing House (ISBN:978-9386173-447, 978-93-86173-607), New Delhi

R2. Mittle, V.N. and Mittle, Arvind, Basic Electrical Engineering, McGraw Hill Education, New Delhi,ISBN: 9780070593572

R3. Kothari, D. P. and Nagrath, I. J., Electrical Machines, McGraw Hill Education. New Delhi,ISBN:9780070699670

R4. Bhattacharya, S. K., Electrical Machines, McGraw Hill Education, New Delhi, ISBN: 9789332902855

R5. Mehta, V. K. and Mehta, Rohit, Principles of Electrical Machines, S. Chand and Co. Ltd., New Delhi,ISBN: 9788121930888

R6. Theraja, B.L., Electrical Technology Vol-II (AC and DC machines), S. Chand and Co. Ltd., New Delhi,ISBN: 9788121924375

R7. Bandyopadhyay, M. N., Electrical Machines Theory and Practice, PHI Learning Pvt. Ltd., NewDelhi, ISBN: 9788120329973 VI

G.Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Recall the fundamental principles and classification of electromagnetic machines.	2	2		2							1	2
[CO2]	Relate the working of dc machines as generators and motors	2	2	1	2							2	2
[CO3]	Explain the efficiency and voltage regulations of dc machines.	2	2		2							2	2
[CO4]	Analyze the performance characteristics of different DC machines using different equivalent circuit	2	2	2	2							1	2
[CO5]	Compare the different types of testing methods used to determine the performance characteristics of DC machines and Transformers	1	2		2						2	2	2
[CO6]	Predict the equivalent circuit and phasor diagram of DC different machines	3	2		2							1	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Applied Electronics

Code:DIP14082

3 Credits | Semester III

A. INTRODUCTION:

- To understand operation of semiconductor devices.
- To understand DC analysis and AC models of semiconductor devices.
- To apply concepts for the design of Regulators and Amplifiers
- To verify the theoretical concepts through laboratory and simulation experiments.
- To implement mini projects based on concept of electronics circuit concepts

B. COURSE OUTCOMES: By the end of this course, students will be able to:

[CO1] List the fundamental concepts of various electronic devices.
[CO2] Classify various electronics components and their uses in practical circuits.
[CO3] Apply the basic knowledge of different power amplifier circuits, their design and their use in electronics and communication circuits.
[CO4] Analyze dc circuits and relate ac models of semiconductor devices with their physical Operation,
[CO5] Evaluate frequency response and understand behavior of Electronics circuits.
[CO6] Create projects and models of different oscillator circuits for various frequencies.

C. ASSESSMENT PLAN:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS:

SEMICONDUCTOR AND DIODES: Semiconductor and Diodes Definition, Extrinsic/Intrinsic, N-type & p-type PN Junction Diode , Forward and Reverse Bias Characteristics Zener Diode – Principle, characteristics, construction, working Diode Rectifiers – Half Wave and Full Wave Filters – C, LC and PI Filters

BIPOLAR JUNCTION TRANSISTOR (BJT): NPN and PNP Transistor – Operation and characteristics Common Base Configuration – characteristics and working, Common Emitter

Configuration – characteristics and working Common Base Configuration – characteristics and working, High frequency model of BJT Classification of amplifiers, negative feedback

FIELD EFFECT TRANSISTORS: FET – Working Principle, Classification MOSFET Small Signal modelN-Channel/ P-Channel , MOSFETs – characteristics, enhancement and depletion mode, MOSFET as a Switch ,Common Source Amplifiers, Uni-Junction Transistor – equivalent circuit and operation

SCR DIAC & TRIAC: SCR – Construction, operation, working, characteristics , DIAC - Construction, operation, working, characteristics ,TRIAC - Construction, operation, working, characteristics, SCR and DIAC as bidirectional switch Comparison of SCR, DIAC, TRIAC

AMPLIFIERS AND OSCILLATORS: Feedback Amplifiers – Properties of negative Feedback, impact of feedback on different parameters, Basic Feedback Amplifier Topologies: Voltage Series, Voltage Shunt Current Series, Current Shunt, Oscillator – Basic Principles, Crystal Oscillator, Non-linear/ Pulse Oscillator

E. TEXT BOOKS

T1. A Textbook of Applied Electronics Paperback – 2 Feb 2008 by RS Sedha
T2.Principle of electronics V.K Mehta, Rohit Mehta
T3.Principles of Electronics, Ganguly, partha Kumar
T4. Principles of Electronic Devices and Circuits

F. REFERENCE BOOKS

R1. Analog Circuits A.K. Maini Khanna Publishing House Ed. 2018 (ISBN: 978-93-86173-584)
R2. Electronic Devices and Circuits S. Salivahanan and N. Suresh Kumar McGraw Hill Education; Fourth edition (1 July 2017) ISBN: 978-9339219505
R3. Electronics Devices and circuit theory Boyestad&Nashelsky Pearson Education India; 11 editions (2015) ISBN: 978-9332542600
R4. Electronic Principles Albert Malvino& David Bates Tata McGraw Hill Publication 2010 ISBN: 978-0070634244
R5. Electronics Devices & Circuits Jacob Millman McGraw Hill Education; 4 editions (2015) ISBN: 978-9339219543

B. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	List the fundamental concepts of various electronic devices.	2	3									1	1
[CO2]	Classify various electronics components and their uses in practical circuits.	1	2		2							2	1
[CO3]	Apply the basic knowledge of different power amplifier circuits, their design and their use in electronics and communication circuits		3	2	2	2						1	2
[CO4]	Analyze dc circuits and relate ac models of semiconductor devices with their physical Operation,	2	2		2							2	2
[CO5]	Evaluate frequency response and understand behavior of Electronics circuits.	1	3		1							2	1
[CO6]	Create projects and models of different oscillator circuits for various frequencies.			2	2				2	2		2	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject:Electrical Circuits Lab

Code: DIP13171

1 Credits | Semester III

A. Introduction:

- The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:
- Maintain electrical systems applying AC and DC circuit fundamentals.
- understanding of circuit theory and measurements concepts
- to understand the relation of theoretical circuit elements, circuit components and theoretical laws
- Understanding of circuit and meters functioning is the main objective of the Circuits & measurement lab

B. **Course Outcomes:** At the end of the course, students will be able to

[CO1] Recallfundamentals of Ohm's law, Kirchhoff's current and voltage laws

[CO2] Describe accurate measurement of voltage, current, power and impedance of anycircuit

[CO3] Apply DC analysis, Transient analysis and Frequency analysis of a given circuit depending on types of elements

[CO4] Analyze DSO to measure the frequency, and amplitude of any signal

[CO5] Assess the Practical implementation of the fundamental electrical theorems and modeling of simple electrical systems

[CO6]Construct a Engineering system, components or process to meet desired needs within realistic constraints such as economic, environmental and safety, manufacturability and sustainability

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	5
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	35
Total		50
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

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D.SYLLABUS

S.No.	Name of Experiment
1	Use dual trace oscilloscope to determine A.C voltage and current response in given R, L, C circuit.
2	Use voltmeter, ammeter, wattmeter to determine active, reactive and apparent power consumed

3	Use voltmeter, ammeter to determine active, reactive and apparent power consumed in given R-C series circuit. Draw phasor diagram
4	Use voltmeter, ammeter, wattmeter to determine active, reactive and apparent power consumed in given R-L-C series circuit. Draw phasor diagram.
5	Use variable frequency supply to create resonance in given series R-L-C circuit or by using variable inductor or variable capacitor
6	Use voltmeter, ammeter, wattmeter to determine current, p.f. , active, reactive and apparent power in R-C parallel A.C. circuit
7	Use voltmeter, ammeter, wattmeter, p.f meter to determine current, p.f., active, reactive and apparent power for given R-L-C parallel circuit with series connection of resistor and inductor in parallel with capacitor.
8	Use variable frequency supply create resonance in given parallel R-L-C circuit or by using variable inductor or capacitor.
9	Use voltmeter, ammeter, wattmeter, p.f meter to determine line and phase quantities of voltage and current for balanced three phase star and delta connected load and calculate active, reactive, and apparent power. Draw phasor diagram.
10	Use voltmeter, ammeter, wattmeter, p.f meter to determine line and phase quantities of voltage and current for unbalanced three phase star and delta connected load and calculate active, reactive, and apparent power. Draw phasor diagram.
11	Use voltmeter, ammeter to determine current through the given branch of a electric network by applying mesh analysis.
12	Use voltmeter, ammeter to determine current through the given branch of a electric network by applying node analysis

E. Text Book:

T1.Experiments for Electric Circuits Laboratory Paperback – 1 June 1974by William E. Long (Author), Albert Paul Malvino (Author)

T2.Laboratory Courses in Electrical Engineering, 5/eP K Kharbanda, S B Bodkhe, S D Naik& S G Tarnekar

F. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Recall fundamentals of Ohm's law, Kirchhoff's current and voltage laws	2	2	1								2	1
[CO2]	Describe accurate measurement of voltage, current, power and impedance of any		1	3					2	2		2	2
[CO3]	Apply DC analysis, Transient analysis and Frequency analysis of a given circuit depending on types of elements	2	1	2					2	2		1	2
[CO4]	Analyze DSO to measure the frequency, and amplitude of any signal		2	3						2		2	1
[CO5]	Assess the Practical implementation of the fundamental electrical theorems and modeling of simple electrical systems			2					2	3		2	1
[CO6]	Construct a Engineering system, components or process to meet desired needs within realistic constraints such as economic, environmental and safety, manufacturability and sustainability				2	2	2				2	2	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject:Electrical and Electronic Measurements Lab

Code:DIP13169
1 Credits | Semester III

A. Introduction:

- The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:
- Use relevant measuring instrument in different electrical applications.
- To know the procedures for measuring Resistance, Inductance and Capacitance of different ranges.
- To perform experiments to measure three phase power, frequency, core losses.
- To design experiments for calibration of energy meter.
- To know the industrial practices of Measuring earth resistance, dielectric strength of transformer oil & Testing of underground cables.

B. **Course Outcomes:** At the end of the course, students will be able to

[CO1]Recall relevant information to supplement to Electrical and electronics measurement course.
[CO2] Explain various techniques to measure resistance, inductance and capacitance.
[CO3] Use equipment for measuring 3-Φ active power and reactive power,
[CO4] Analyze techniques to calibrate and test single phase energy meter, calibrate PMMC voltmeter and calibrate LPF wattmeter
[CO5] Estimate factors affecting in measurement of electrical and electronics quantities.
[CO6]Construct sensors based on various transducers like LVDT and resistance strain gauge.

C. Assessment Plan:

Criteria	**Description**	**Maximum Marks**
Continuous Internal Assessment (CIA)	Internal Examination	5
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	35
Total		50
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

C. SYLLABUS

S.No.	**Name of Experiment**
1	Identify measuring instruments on the basis of symbols on dial, type, accuracy, class position and scale

2	Identify the components of PMMC and MI instruments.
3	Troubleshoot PMMC and MI instruments.
4	Measure AC and DC quantities in a working circuit.
5	Extend range of ammeter and voltmeter by using (i) shunt and multiplier (ii) CT and PT.
6	Use Clamp-on meter for measurement of AC/DC current, AC/DC voltage.
7	Use electro-dynamic watt-meter for measurement of power in a single phase circuit
8	Troubleshoot electro dynamic watt-meter for measurement of power in a single phase circuit
9	Use single wattmeter for measurement of active and reactive power of three phase balanced
10	Use two watt-meters for measuring active power of three-phase balanced load.
11	Calibrate single phase electronic energy meter by direct loading.
12	Troubleshoot single phase electronic energy meter.

E. Text Book:

T1. Guide to Electronic Measurements and Laboratory Practice (Electrical Engineering) Hard cover – 1 September 1973 by Stanley Wolf
T2. Electrical & Electronic Measurement Lab (EE-392) Paperback – 1 January 2007, S. bagchi

F. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Recall relevant information to supplement to Electrical and electronics measurement course.	2	2	2					2	2		2	1
[CO2]	Explain various techniques to measure resistance, inductance and capacitance	2	1	2					2	2		2	1
[CO3]	Use equipment for measuring 3-Φ active power and reactive power,	2		2						2		1	2
[CO4]	Analyze techniques to calibrate and test single phase energy meter, calibrate PMMC voltmeter and calibrate LPF wattmeter	2		2						2		2	1
[CO5]	Estimate factors affecting in measurement of electrical and electronics quantities.		2	2						2		2	2
[CO6]	Construct sensors based on various transducers like LVDT and resistance strain gauge.			2	2					2	2	2	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject:Electric Motors and Transformers Lab

Code: DIP13167

1 Credits | Semester III

A. Introduction:

- To The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:
- To Use electric motors and transformers.
- To prepare the students to have a basic knowledge of transformers.
- To prepare the students to have a basic knowledge of induction motors.
- To prepare the students to have a basic knowledge of alternators.
- To design a practical transformer.
- To know about an induction generator

B. Course Outcomes: At the end of the course, students will be able to

[CO1] Recall knowledge of various parts of an electrical machine.

[CO2]Describe open circuit/ short circuit test on transformer.

[CO3] Apply techniques to conduct experiments on Ac Machines to find its characteristics.

[CO4] Analyze performance test of synchronous Machine to find Direct and quadrature axis reactance.

[CO5] Estimate torque and speed of given Machine.

[CO6] Construct a practical machine like transformer, alternator etc.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	5
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	35
Total		50
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

C. SYLLABUS

S.No.	Name of Experiment
1	Dismantle a DC machine.
2	Reverse the direction of rotation of the DC shunt motor.
3	Perform brake test on DC shunt motor.
4	Control the speed of DC shunt motor by different methods.
5	Control the speed of DC series motor by different methods.

6	Perform the brake test on DC series motor.
7	Check the functioning of single phase transformer.
8	Determine regulation and efficiency of single phase transformer by direct loading.
9	Perform open circuit and short circuit test on single phase transformer to determine equivalent
10	Perform parallel operation of two single phase transformers to determine the load current sharing.
11	Perform parallel operation of two single phase transformers and determine the apparent and real power load sharing
12	Perform polarity test on a single phase transformer whose polarity markings are masked.

E. TEXT BOOKS.

T1. Ashfaq Husain, Electrical Machines, Dhanpat Rai & Co.
T2. M V Deshpande, Electrical Machines, Prentice Hall of India

F. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Recall knowledge of various parts of an electrical machine.	2		2					1	2		2	2
[CO2]	Describe open circuit/ short circuit test on transformer		2	2					2	2		1	2
[CO3]	Apply techniques to conduct experiments on Ac Machines to find its characteristics	2	2	2	1				1	1		1	2
[CO4]	Analyze performance test of synchronous Machine to find Direct and quadrature axis reactance	3	2	1						2		2	2
[CO5]	Estimate torque and speed of given Machine.	2	2	2	2					2		2	2
[CO6]	Construct a practical machine like transformer, alternator etc.	2	2		2		2				2	2	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject:Applied Electronics Lab

Code: DIP14085

1Credits | Semester III

A. Introduction:

- The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:
- To Basic components and their operation.
- To understand the concepts, working and characteristics of Different Diodes, BJT and FET Transistors,
- To understand the practical concept of amplifiers and compensation techniques of transistors

B. Course Outcomes: At the end of the course, students will be able to

[CO1] Recallbasic knowledge of physical and electrical conducting properties of Semiconductors.

[CO2] Interpret the design and working of BJT / FET amplifiers

[CO3] Apply the knowledge to design amplifier circuits using BJT s And FET's.

[CO4] Analyze the effect of negative feedback on different parameters of an Amplifier and Different types of negative feedback topologies.

[CO5] Assess the skill to build, and troubleshoot Analog circuits

[CO6]Constructa Electronics system, components or process to meet desired needs within realistic constraints such as economic, environmental, social , health and safety.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	5
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	35
Total		50
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D.SYLLABUS

S.No.	Name of Experiment
1	study of CRO
2	V-I characteristics of pn junction diode
3	V-I characteristics of Zener diode
4	V-I characteristics of LED
5	half-wave rectifier with and without filter
6	full-wave rectifier with and without filter

7	measurement of h-parameters of CB configuration
8	Bridge rectifier with and without filter
9	Measurement of h-parameters of CE configuration
10	Drain and transfer characteristics of JFET
11	Frequency response of CE FET amplifier
12	Frequency response of CS FET amplifier

E. TEXT BOOKS.

T1. Electricity Electronics Fundamentals, A TEXT - LAB MANUAL - Fourth Edition Paul B.Zbas.Joseph Sloop, TMH.
T2. Electronic components, D.V.Prasad, PPH Publications.
T3. Practical's in basic electronics, G.K. Mithal, G.K. Publication

F. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Recall basic knowledge of physical and electrical conducting properties of Semiconductors.	1	3	2						2		2	2
[CO2]	Interpret the design and working of BJT / FET amplifiers		2	2					2	2		1	2
[CO3]	Apply the knowledge to design amplifier circuits using BJT s And FET's.		3	2						2	2	2	1
[CO4]	Analyze the effect of negative feedback on different parameters of an Amplifier andDifferent types of negative feedback topologies.		3	2					2	1	2	2	2
[CO5]	Assess the skill to build, and troubleshoot Analog circuits	2	2	2	2					2	2	1	2
[CO6]	Construct a Electronics system, components or process to meet desired needs within		2				2				2	2	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject:Summer Internship-1(3-4 Weeks)

Code: DIP13177

2 Credits | Semester III

A. Introduction:

- Following are the intended objectives of internship training:
- Will expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
- Provide possible opportunities to learn understand and sharpen the real time technical / managerial skills required at the job.
- Exposure to the current technological developments relevant to the subject area of training.
- Experience gained from the 'Industrial Internship' in classroom will be use in classroom discussions.
- Create conditions conducive to quest for knowledge and its applicability on the job

GUIDELINES FOR INTERNSHIP

Summer Internship -1 should be undertaken in an industry/Govt. or Pvt. Certified Agencies which are in social sector/ Govt. Skill Centres/Institutes/Schemes.

S.No.	Suggested Schedule	Suggested Duration (In weeks)	Activities
1	Summer/winter vacation after 2nd/3rd Semester	3-4	Inter/Intra Institutional Activities

ARKA JAIN University
Jharkhand

Syllabus of

Diploma in Electrical & Electronics Engineering

Semester-IV

ARKAJAIN University, Jharkhand
School of Engineering & IT
Department of Engineering
Faculty – Diploma in Electrical & Electronics Engineering (DEEE)
Scheme of Study (w.e.f Batch 2020-21)

SEMESTER –I(Group-A)

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Communication Skills in English	HSC	3	3	100	70	20	5	5
2	Mathematics-I	BSC	4	4	100	70	20	5	5
3	Applied Physics	BSC	4	4	100	70	20	5	5
4	Applied Chemistry	BSC	4	4	100	70	20	5	5
	Practical								
5.	Engineering Workshop Practice	ESC	2	4	50	35	5	5	5
6.	Applied Physics Lab	BSC	1	2	50	35	5	5	5
7.	Applied Chemistry Lab	BSC	1	2	50	35	5	5	5
8.	Communication Skills in English Lab	HSC	1	2	50	35	5	5	5
	Total		**20**	**25**	**600**	**420**	**100**	**40**	**40**

SEMESTER I (Group-B)

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Mathematics -I	BSC	4	4	100	70	20	5	5
2	Fundamentals of Electrical & Electronics Engg.	ESC	4	4	100	70	20	5	5
3	Introduction to IT system	ESC	3	3	100	70	20	5	5
4	Engineering Mechanics	ESC	4	4	100	70	20	5	5
5	Environmental Science	AC	0	2	50	35	10	2.5	2.5
	Practical								
6	Fundamentals of electrical & electronics Engg. Lab	ESC	1	2	50	35	5	5	5
7	Introduction to IT system Lab	ESC	1	2	50	35	5	5	5
8	Engineering Mechanics Lab	ESC	1	2	50	35	5	5	5
9	Engineering Graphics	ESC	2	4	50	35	5	5	5
	Total		**20**	**27**	**650**	**455**	**110**	**42.5**	**42.5**

SEMESTER II (Group-A)

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Mathematics -II	BSC	4	4	100	70	20	5	5
2	Fundamentals of Electrical & Electronics Engg.	ESC	4	4	100	70	20	5	5
3	Introduction to IT system	ESC	3	3	100	70	20	5	5
4	Engineering Mechanics	ESC	4	4	100	70	20	5	5
5	Environmental Science	AC	0	2	50	35	10	2.5	2.5
	Practical								
6	Fundamentals of electrical & electronics Engg. Lab	ESC	1	2	50	35	5	5	5
7	Introduction to IT system Lab	ESC	1	2	50	35	5	5	5
8	Engineering Mechanics Lab	ESC	1	2	50	35	5	5	5
9	Engineering Graphics	ESC	2	4	50	35	5	5	5
	Total		**20**	**27**	**650**	**455**	**110**	**42.5**	**42.5**

SEMESTER –II(Group-B)

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Communication Skills in English	HSC	3	3	100	70	20	5	5
2	Mathematics-II	BSC	4	4	100	70	20	5	5
3	Applied Physics	BSC	4	4	100	70	20	5	5
4	Applied Chemistry	BSC	4	4	100	70	20	5	5
	Practical								
5.	Engineering Workshop Practice	ESC	2	4	50	35	5	5	5
6.	Applied Physics Lab	BSC	1	2	50	35	5	5	5
7.	Applied Chemistry Lab	BSC	1	2	50	35	5	5	5
8.	Communication Skills in English Lab	HSC	1	2	50	35	5	5	5
	Total		**20**	**25**	**600**	**420**	**100**	**40**	**40**

SEMESTER-III

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Introduction to Electric Generation Systems	PCC	3	3	100	70	20	5	5
2	Electrical Circuits	PCC	3	3	100	70	20	5	5
3	Electrical and Electronic Measurements	PCC	3	3	100	70	20	5	5
4	Electric Motors and Transformers	PCC	3	3	100	70	20	5	5
5	Applied Electronics	PCC	3	3	100	70	20	5	5
	PRACTICAL								
6	Electrical Circuits Lab	PCC	1	2	50	35	5	5	5
7	Electrical and Electronic Measurements Lab	PCC	1	2	50	35	5	5	5
8	Electric Motors and Transformers Lab	PCC	1	2	50	35	5	5	5
9	Applied Electronics lab	PCC	1	2	50	35	5	5	5
10	Summer Internship-I (3-4 Weeks)	PROJ	2	0	50	35	15	0	0
	TOTAL		**21**	**23**	**750**	**525**	**135**	**45**	**45**

SEMESTER-IV

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Digital Electronics	PCC	3	3	100	70	20	5	5
2	Electric Power Transmission and Distribution	PCC	4	4	100	70	20	5	5
3	Induction, Synchronous and Special Electrical Machines	PCC	4	4	100	70	20	5	5
4	Elective I Industrial Instrumentation and ConditionMonitoring Electrical Testing & Commissioning Illumination Practices	PEC	3	3	100	70	20	5	5
5	Elective II Industrial Drives Electrical Estimation & Contracting Biomass and Micro-hydro Power plants	PEC	3	3	100	70	20	5	5
6	Essence of Indian Knowledge Tradition	AC	0	2	50	35	10	2.5	2.5
	PRACTICAL								
7	Digital Electronics Lab	PCC	1	2	50	35	5	5	5
8	Electrical& Electronics Engg. Drawing	PCC	2	4	50	35	5	5	5
9	Induction, Synchronous and Special Electrical Machines Lab	PCC	1	2	50	35	5	5	5
10	Minor Project	PROJ	2	4	50	35	15	0	0
	TOTAL		**23**	**31**	**750**	**525**	**140**	**42.5**	**42.5**

SEMESTER V

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA	Attendance
1	Microprocessor & Microcontroller	PCC	4	4	100	70	20	5	5
2	Fundamentals of Power Electronics	PCC	4	4	100	70	20	5	5
3	Elective III Switchgear and Protection Wind Power Technologies Electric Vehicles	PEC	3	3	100	70	20	5	5
4	Elective IV Industrial Automation & Control Communication Technologies Electric Traction	PEC	3	3	100	70	20	5	5
5	Open Elective I Artificial Intelligence & Machine Learning Introduction to E-Governance Robotics	OEC	3	3	100	70	20	5	5
	PRACTICAL								
6	Microprocessor & Microcontroller Lab	PCC	1	2	100	70	20	5	5
7	Fundamentals of Power Electronics Lab	PCC	1	2	50	35	5	5	5
8	Summer Internship-II(4-6 Weeks)	PROJ	3	0	100	70	30	0	0
9	Major Project-I (Project to be carried over to next semester)	PROJ	1	2	50	35	15	0	0
	TOTAL		**23**	**23**	**800**	**560**	**170**	**35**	**35**

SEMESTER VI

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Building Electrification	PCC	4	4	100	70	20	5	5
2	Entrepreneurship and Start –ups	HSC	4	4	100	70	20	5	5
3	Open Elective II Internet of Things Project Management Operations Research	OEC	3	3	100	70	20	5	5
4	Open Elective III Economic Policies in India Energy Efficiency and Audit	OEC	3	3	100	70	20	5	5
5	Indian constitution	AC	0	2	50	35	10	2.5	2.5
	PRACTICAL								
6	Seminar	PROJ	1	2	50	35	15	0	0
7	Major Project-II	PROJ	3	6	100	70	30	0	0
	TOTAL		**18**	**24**	**600**	**455**	**135**	**22.5**	**22.5**

Distribution of Credit across 6 semesters:

Sl. No	Type of Paper	No. of Paper	Total Credit
1	Humanities and Social Sciences Courses **(HSC)**	3	8
2	Basic Science courses**(BSC)**	6	18
3	Engineering Science courses **(ESC)**	8	18
4	Professional core courses (**PCC)**	20	48
5	Professional Elective courses**(PEC)**	4	12
6	Open Electives Courses (**OEC)**	3	9
7	Project work, seminar and internship in industry or elsewhere**(PROJ)**	6	12
8	Audit Courses [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Knowledge Tradition]**(AC)**	3	(non-credit)
	Total	53	125

CIA – Continuous Internal Assessment – Based on Projects / Assignment during the semester

Note:

AICTE Activity Points to be earned by students admitted to Diploma program (For more details refer to Chapter 6, AICTE, Activity Point Program, Model Internship Guidelines):

Every regular student, who is admitted to the 3 year Diploma program, is required to earn 75 activity points in addition to the total credits earned for the program. Students entering 3 years Diploma Program through lateral entry are required to earn 50 activity points in addition to the total credits earned for the program.
The activity points earned by the student shall be reflected on the students 6th Semester grade card.
The activities to earn the points can be spread over the duration of the course. However, minimum prescribed duration should be fulfilled.
Activity Points (non-credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression.
Incase student fail to earn the prescribed activity points, Sixth semester Grade Card shall be issued only after earning the required activity Points.
Students shall be eligible for the award of degree only after the release of the Six Semester grade card.

There are two groups (A & B) in semester 1 & 2. The Group division will be decided by The Dean SoE& IT before commencement of classes*

ARKAJAIN University, Jharkhand
School of Engineering & IT
Department of Engineering
Faculty – Diploma in Electrical & Electronics Engineering (DEEE)
PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

PROGRAM OUTCOMES

After completing this undergraduate program, a learner:

[PO.1]. Basic knowledge: An ability to apply knowledge of basic mathematics, science and engineering to solve the engineering problems

[PO.2]. Discipline knowledge: An ability to apply discipline - specific knowledge to solve core and/or applied engineering problems.

[PO.3]. Experiments and practice: An ability to plan and perform experiments and practices and to use the results to solve engineering problems.

[PO.4]. Engineering Tools: Apply appropriate technologies and tools with an understanding of the limitation.

[PO.5]. The engineer and society: Demonstrate knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering practice.

[PO.6]. Environment and sustainability: Understand the impact of the engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development..

[PO.7]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

[PO.8]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse/multidisciplinary teams.

[PO.9]. Communication: An ability to communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

[PO.10]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the context of technological changes.

PROGRAM SPECIFIC OUTCOMES

[PSO.1]. Students will able to design, test and trouble shoot of electrical & electronics circuits, equipment and appliances.

[PSO.2]. Apply latest techniques, skills and modern engineering tools of industrial and system engineering throughout their professional careers in the fields of Electrical & Electronics.

Subject: Digital Electronics

Code: DIP14187

3 Credits | Semester IV

A. Introduction:

- To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
- To prepare students to perform the analysis and design of various digital electronic circuits.

B. Course Outcomes: At the end of the course, students will be able to

[CO1] Identify the fundamental concepts and techniques used in digital electronics.

[CO2] Understand and relate the various number systems and its application in logical and sequential circuit.

[CO3] Applying the knowledge for solving problems related to number systems, Boolean algebra and to reduce Boolean expression using K Maps.

[CO4] Analyze and distinguish the combinational and sequential circuits of digital electronics.

[CO5] Evaluate the basic differences of combinational and sequential circuits, interpret flip flops as SR,JK,D flip flop, Prepare different conversion techniques from digital domain to analog domain and vice versa.

[CO6] Design various synchronous, asynchronous, sequential circuits and memory device.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

NUMBER SYSTEMS & BOOLEAN ALGEBRA: Introduction to different number systems – Binary, Octal, Decimal, Hexadecimal, Conversion from one number system to another. Boolean variables – Rules and laws of Boolean algebra, De-Morgan's Theorem Karnaugh Maps and their use for simplification of Boolean expressions

LOGIC GATES: Logic Gates – AND, OR, NOT, NAND, NOR , XOR, XNOR: Symbolic representation and truth table, Implementation of Boolean expressions and Logic Functions using gates Simplification of expressions .Implementation of Boolean expressions and Logic Functions using gates Simplification of expressions

COMBINATIONAL LOGIC CIRCUITS: Arithmetic Circuits – Addition, Subtraction, 1's 2's Complement, Half Adder, Full Adder, Half Subtractor, Full Sub tractor, Parallel and Series Adders, Encoder, Decoder

Multiplexer – 2 to 1 MUX, 4 to 1 MUX, 8 to 1 MUX. Applications

Demultiplexer – 1 to 2 DEMUX, 1- 4 DEMUX, 1- 8 DEMUX

SEQUENTIAL LOGIC CIRCUITS: Flip Flops – SR,JK, T, D, FF, JK-MS, Triggering, Counters – 4 bit Up – Down Counters, Asynchronous/ Ripple Counter, Decade Counter- Mod 3, Mod 7 Counter, Johnson Counter, Ring Counter, Registers – 4bit Shift Register: Serial In Serial Out, Serial in Parallel Out, Parallel In Serial Out, Parallel In Parallel Out

MEMORY DEVICES: Classification of Memories – RAM Organization, Address Lines and Memory Size, Static RAM, Bipolar RAM, cell Dynamic RAM, D RAM, DDR RAM, Read Only memory – ROM organization, Expanding memory, PROM, EPROM, EEPROM, Flash memory, Data Converters – Digital to Analog converters, Analog to Digital Converters

E. TEXT BOOKS

T1.Digital Electronics: An Introduction to Theory and Practice by William Gothmann H – USA.
T2.Digital Electronics by John Morris – USA.
T3.Digital Electronics by John Morris – UK.
T4.Fundamentals of Digital Circuits by Anand Kumar – USA.
T5.DigitalElectronics: Principles and Integrated Circuit by Anil K. Maini – USA
T6.M. Morris Mano. "Digital Logic and Computer Design",
T7.M. Morris Mano, "Digital Design", Pearson Education Asia,.

F. REFERENCE BOOKS

R1. Digital principles & Applications Albert Paul Malvino& Donald P. Leach McGraw Hill Education; Eighth edition ISBN: 978-9339203405
R2. Digital Electronics Roger L. TokheimMacmillian McGraw-Hill Education (ISE Editions); International 2 Revised ed edition ISBN: 978-0071167963
R3. Digital Electronics R. Anand Khanna Publications, New Delhi (Edition 2018) ISBN: 978-93 82609445
R4. Fundamentals of Logic Design Charles H. Roth Jr. Jaico Publishing House; First edition ISBN: 978-8172247744
R5.Digital Electronics – an introduction to theory and practice William H. Gothmann Prentice Hall India Learning Private Limited; 2 edition ISBN: 978-8120303485

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G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Identify the fundamental concepts and techniques used in digital electronics	**2**	**2**										**2**
[CO2]	Understand and relate the various number systems and its application in logical and sequential circuit.				**3**		**2**					**2**	
[CO3]	Applying the knowledge for solving problems related to number systems, Boolean algebra and to reduce Boolean expression using K Maps	**2**	**3**		**2**								**2**
[CO4]	Analyze and distinguish the combinational and sequential circuits of digital electronics.			**3**		**2**							**2**
[CO5]	Evaluate the basic differences of combinational and sequential circuits, interpret flip flops as SR,JK,D flip flop, Prepare different conversion techniques from digital domain to analog domain and vice versa.			**2**	**3**								**2**
[CO6]	Design various synchronous, asynchronous, sequential circuits and memory device.		**3**	**2**								**3**	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject:Electric Power Transmission and Distribution

Code: DIP14079
4 Credits | Semester IV

A. Introduction:

- To The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:
- Maintain the proper functioning of the electrical transmission and distribution systems.
- The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

B. **Course Outcomes:** At the end of the course, students will be able to

[CO1] Identify the various method of transmission and distribution of electrical power.
[CO2] Understand the process of transmission and distributionof electrical power,also term like insulator, sag, corona, voltage regulation in transmission line.
[CO3] Apply different method of distribution system to obtain performance characteristics.
[CO4] Analyze the mechanical and electrical characteristics of transmission and distribution lines.
[CO5] Evaluate the voltage drop, efficiency and voltage regulation of transmission line.
[CO6] Design transmission and distribution line in context with voltage drop, efficiency, voltage regulation, sag, corona etc.

C. Assessment Plan:

Criteria	**Description**	**Maximum Marks**
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D.SYLLABUS

BASICS OF TRANSMISSION AND DISTRIBUTION: Single line diagrams with components of the electric supply transmission and distribution systems. Classification of transmission lines: Primary and secondary transmission; standard voltage level used in India. Classification of transmission lines: based on type of voltage, voltage level, length and others Characteristics of high voltage for power transmission. Method of construction of electric supply transmission system – 110 kV, 220 kV, 400 kV. Method of construction of electric supply distribution systems – 220 V, 400V, 11 kV, 33 kV

TRANSMISSION LINE PARAMETERS AND PERFORMANCE: Line Parameters: Concepts of R, L and C of line parameters and types of lines. Performance of short line: Efficiency, regulation and its derivation, effect of power factor, vector diagram for different power factor. Performance of medium line:

representation, nominal 'T', nominal 'π' and end condenser methods. Transposition of conductors and its necessity. Skin effect and proximity effect.

EXTRA HIGH VOLTAGE TRANSMISSION: Extra High Voltage AC (EHVAC) transmission line**:** Necessity, high voltage substation components such as transformers and other switchgears, advantages, limitations and applications and lines in India. Ferranti and Corona effect. High Voltage DC (HVDC) Transmission Line**:** Necessity, components, advantages, limitations and applications. Layout of monopolar, bi-Polar and homo-polar transmission lines. Lines in India. Features of EHVAC and HVDC transmission line. Flexible AC Transmission line: Features, d types of FACTS controller. New trends in wireless transmission of electrical power.

A.C DISTRIBUTION SYSTEM: AC distribution: Components classification, requirements of an ideal distribution system, primary and secondary distribution system. Feeder and distributor, factors to be considered in design of feeder and distributor. Types of different distribution schemes: radial, ring, and grid, layout, advantages, disadvantages and applications. Voltage drop, sending end and receiving end voltage. Distribution Sub-Station: Classification, site selection, advantages, disadvantages and applications. Single Line diagram (layout) of 33/11KV Sub-Station, 11KV/400V sub-station, Symbols and functions of their components.

COMPONENTS OF TRANSMISSION AND DISTRIBUTION LINE: Overhead Conductors**:** Properties of material, types of conductor with trade names, significance of sag. Line supports: Requirements, types of line structures and their specifications, methods of erection. Line Insulators**:** Properties of insulating material, selection of material, types of insulators and their applications, causes of insulator failure, derivation of equation of string efficiency for string of three suspension insulator, methods of improving string efficiency. Underground Cables**:** Requirements, classification, construction, comparison with overhead lines, cable laying and cable jointing.

E. TEXT BOOKS

T1. Power system Engineering -by Kothari &Nagrath
T2. Electrical Power — C.L. Wadhwa
T3.Transmission and Distribution -by Cotton & Barber
T4. Electric Power Transmission and DistributionbyS. Satyanarayana, S. Sivanagaraju

F. REFERENCE BOOKS

R1. G.C. Garg, Utilization of Electric Power & Electric Traction, Khanna Book Publishing Co., New Delhi (ISBN: 978-93-86173-355)
R2. Mehta, V.K., Principles of Power System, S. Chand and Co. New Delhi, ISBN: 9788121924962
R3. Soni;Gupta; Bhatnagar, A Course in Electrical Power, Dhanpat Rai and Sons New Delhi, ISBN: 9788177000207
R4. Gupta,J.B., A Course in Power Systems, S.K. Kataria and sons, New Delhi, ISBN: 9788188458523
R5. Theraja, B.L.; Theraja, A.K., A Textbook of Electrical Technology Vol. III, S.Chand and Co. New Delhi, ISBN : 9788121924900
R6. Uppal,S.L., A Course in Electrical Power, S.K.Khanna Publisher New Delhi, ISBN : 9788174092380
R7. Sivanagaraju S.; Satyanarayana S., Electrical Power Transmission and Distribution, Pearson Education,New Delhi, , ISBN:9788131707913
R8. Ned Mohan, Electrical Power System: A First Course, Wiley India Pvt. Ltd. New Delhi,

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Identify the various method of transmission and distribution of electrical power.				2					2	2		
[CO2]	Understand the process of transmission and distributionof electrical power,also term like insulator, sag, corona, voltage regulation in transmission line.		2		2								2
[CO3]	Apply different method of distribution system to obtain performance characteristics.		2		3								2
[CO4]	Analyze the mechanical and electrical characteristics of transmission and distribution lines.	2	2	3								2	
[CO5]	Evaluate the voltage drop, efficiency and voltage regulation of transmission line.			2			3						2
[CO6]	Design transmission and distribution line in context with voltage drop, efficiency, voltage regulation, sag, corona etc.		3		2					2		3	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject:Induction, Synchronous and Special Electric Machines

Code:DIP14196
4 Credits | Semester IV

A. Introduction:

- To Maintain Induction, Synchronous and FHP Machines used in different applications.

B. Course Outcomes: At the end of the course, students will be able to

[CO1] Define the constructional details and principle of operation of synchronous machine, induction motors & fractional horse power motor.

[CO2] Describe working and equivalent circuit and phasor diagram of synchronous machine and induction machine and there classification.

[CO3] Developedbasic knowledge to determine the parameters of various machine.

[CO4] Analyze the Starting, Breaking and speed control of three phase induction motor.

[CO5] Conclude the votage regulation of alternator, and performance of various motors.

[CO6] Construct winding of various machine (stator and rotor), dimension & can assemble there parts**.**

Assessment Plan:

Criteria	**Description**	**Maximum Marks**
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

THREE PHASE INDUCTION MOTOR: Working principle: production of rotating magnetic field, Synchronous speed, rotor speed and slip. Constructional details of 3 phase induction motors: Squirrel cage induction motor and Slip ring induction motor.

Rotor quantities: frequency, induced emf, power factor at starting and running condition. Characteristics of torque versus slip (speed), Torques: starting, full load and maximum with relations among them. Induction motor as a generalized transformer with phasor diagram.

Four quadrant operation, Power flow diagram Starters: need and types; stator resistance, auto transformer, star delta, rotor resistance and soft starters.

Speed control methods: stator voltage, pole changing, rotor resistance and VVVF. Motor selection for different applications as per the load torque-speed requirements. Maintenance of three phase induction motors.

SINGLE PHASE INDUCTION MOTORS: Double field revolving theory, principle of making these motors self-start. Construction and working: Resistance start induction run, capacitor start induction run, capacitor start capacitor run, shaded pole, repulsion type, series motor, universal motor, hysteresis motor. Torque-speed characteristics for all of the above motors. Motor selection for different applications as per the load torque-speed requirements. Maintenance of single phase induction motors

THREE PHASE ALTERNATORS: Principle of working, moving and stationary armatures. Constructional details: parts and their functions, rotor constructions. Windings: Single and Double layer. E.M.F. equation of an Alternator with numerical by considering short pitch factor and distribution factor. Alternator loading: Factors affecting the terminal voltage of alternator; Armature resistance and leakage reactance drops. Armature reaction at various power factors and synchronous impedance. Voltage regulation: direct loading and synchronous impedance methods. Maintenance of alternators

SYNCHRONOUS MOTORS: Principle of working /operation, significance of load angle. Torques: starting torque, running torque, pull in torque, pull out torque. Synchronous motor on load with constant excitation (numerical), effect of excitation at constant load (numerical). V-Curves and Inverted V-Curves. Hunting and Phase swinging. Methods of Starting of Synchronous Motor. Losses in synchronous motors and efficiency (no numerical). Applications areas

FRACTIONAL HORSE POWER (FHP) MOTORS: Construction and working: Synchronous Reluctance Motor, Switched Reluctance Motor, BLDC, Permanent Magnet Synchronous Motors stepper motors, AC and DC servomotors. Torque speed characteristics of above motors. Applications of above motors.

E. TEXT BOOKS

T1. Electrical Machine by Dr. P. S. Bhimbra (Highly Recommended for GATE / IES)
T2. Electric Machines by Ashfaq Husain and HarroonAshfaq.
T3.Electric Machinery Fundamentals by Stephen Chapman

F. REFERENCE BOOKS

R1.P.S. Bimbhra, Electric Machines, Khanna Book Publishing Co., New Delhi (ISBN: 978-93-86173-294)
R2.Mittle, V.N. and Mittle, Arvind., Basic Electrical Engineering, McGraw Hill Education New Delhi, ISBN :9780070593572

R3. Kothari, D. P. and Nagrath, I. J., Electrical Machines, McGraw Hill Education. New Delhi, ISBN:9780070699670
R4. Bhattacharya, S. K., Electrical Machines, McGraw Hill Education, New Delhi, ISBN:9789332902855
R5.Theraja, B.L., Electrical Technology Vol-II (AC and DC machines), S.Chand and Co. Ltd., New Delhi, ISBN : 9788121924375
R6. Sen, S. K., Special Purpose Electrical Machines, Khanna Publishers, New Delhi, ISBN: 9788174091529

R7.Janardanan E. G, Special Electrical Machines, Prentice Hall India, New Delhi ISBN: 9788120348806

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Define the constructional details and principle of operation of synchronous machine, induction motors & fractional horse power motor.	2	2										1
[CO2]	Describe working and equivalent circuit and phasor diagram of synchronous machine and induction machine and there classification.		2	3									
[CO3]	Develope basic knowledge to determine the parameters of various machine.	2			2								2
[CO4]	Analyze the Starting, Breaking and speed control of three phase induction motor			3	2							2	
[CO5]	Conclude the votage regulation of alternator, and performance of various motors.		2	2								2	2
[CO6]	Construct winding of various machine (stator and rotor), dimension & can assemble there parts.		2		3							3	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Industrial Instrumentation and Condition Monitoring

Code:DIP14198

3 Credits | Semester IV

A. Introduction:

- Use instrumentation equipment for condition monitoring and control.

B. Course Outcomes: At the end of the course, students will be able to

[CO1] Identify relevant instruments used for measuring electrical and non-electrical quantities, relevant transducers/sensors for various applications.

[CO2] Understanding the knowledge to use instrument for specific application to record or monitor.

[CO3] Apply and recognize the physics of pressure, temperature level and flow measurement used to control dynamics of processes.

[CO4] Analyze the signal conditioning and telemetry system for their proper functioning.

[CO5] Evaluate commonly used process variable measurement devices through proper selection, identification, design, installation and principle of operation in industries.

[CO6] Create critical and creative thinking to bring thetechnology of trouble shooting problemswith the measurement and control of industrial instrumentation work.

C. Assessment Plan:

Criteria	**Description**	**Maximum Marks**
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D.SYLLABUS

FUNDAMENTALS OF INSTRUMENTATION: Basic purpose of instrumentation., Basic block diagram (transduction, signal conditioning, signal presentation) and their function., Construction, working and application of switching devices- Push button, limit switch, float switch, pressure switch, thermostat, electromagnetic relay.

TRANSDUCERS: Distinguish between Primary and Secondary, Electrical and Mechanical, Analog and Digital, Active and Passive. Mechanical devices pry. And sec. transducers Advantages of electric transducers, required characteristics of transducers, Factors affecting the choice of transducers, Construction and principle of resistive transducer-Potentiometer –variac and strain gauges-No derivation. Only definition and formula for gauge factor

Types of strain gauges like unbonded, bonded and semiconductor. Construction and principle of Inductive transducers-L.V.D.T. and R.V.D.T, their applications. Construction, principle and applications of transducers – Piezo-Electric transducer, photoconductive cells, photo voltaic cells.

MEASUREMENT OF NON-ELECTRICAL QUANTITIES: Temperature measurement - Construction and Working of RTD, Thermistor and Thermocouple, radiation pyrometer, technical specifications and ranges. Pressure measurement – Construction and working of bourdon tube, bellow diaphragm and strain gauge, Combination of diaphragm and inductive transducer, Bourdon tube and LVDT, bellow and LVDT, diaphragm capacitance and bridge Circuit. Construction and Working of Speed Measurement by contacting and non-Contact Type- DC tachometer, photo- electric tachometer, toothed rotor tachometer Generator - magnetic pickup and Stroboscope, Construction and Working of Vibration measurement by accelerometer-LVDT accelerometer, Piezo electric type. Construction and Working of Flow measurement by electromagnetic and Turbine Flow meter. Construction and Working of Liquid level measurement by resistive, inductive, capacitive gamma rays and Ultrasonic methods. Construction and Working of Thickness measurement by resistive, inductive, capacitive, ultrasonic and nuclear methods.

SIGNAL CONDITIONING: Basic Concept of signal conditioning System. Draw pin configuration of IC 741.Define Ideal OP-AMP and Electrical Characteristics of OP-AMP. Different Parameters of op-amp:-Input offset voltage, Input offset current, Input bias current, Differential input resistance, CMMR, SVRR, voltage gain, output voltage, slew rate, gain bandwidth. Output, short circuit current.Use of op-amp as inverting, non- inverting mode, adder, subtractor, and Working of Differential amplifier and instrumentation amplifier. Filters: Types of RC filters and frequency response -no derivation. Sample and hold circuits - operation and its application.

DATA ACQUISITION SYSTEM&CONDITION MONITORING AND DIAGNOSTIC ANALYSIS: Generalized DAS- Block diagram and description of Transducer, signal conditioner, multiplexer, converter and recorder. Draw Single Channel and Multi-channel DAS- Block diagram only. Difference between Signal, Channel and Multi-Channel DAS. Data conversion- Construction and Working of Analog to digital conversion- successive approximation, method, ramp type method. Digital to Analog conversion- Construction and, Working of binary weighted resistance method. Concept and methods of data transmission of electrical and electronic transmission., Construction and principle of telemetry system and its type - Electrical telemetering system- Digital display device- operation and its application of seven segment display, dot matrix display and concept of 3½, 4½ digits, LED and LCD applications. Definition of condition monitoring Insulation deterioration Mechanism- factors affecting occurrence and rate of deterioration, types of stresses responsible for deterioration. Different tests on transformer, their purpose, and the necessary condition of machine. Tests on Circuit breaker, purpose and required condition of machine Tests on CT, purpose, item to be tested and required condition of machine, Power factor, capacitance /tan delta test, Insulation and Polarization index, DC winding resistance test, Turns Ratio test Tools and equipment used in Condition monitoring.

E. TEXT BOOKS

T1 Sawhney, A.K. Electric and Electronic Measurement and instrumentation

T2. Mehta, V.K. Electronics and instrumentation

F. REFERENCE BOOKS

R1.Sawhney, A.K. Electric and Electronic Measurement and instrumentation, Dhanpat Rai and Co. Author, Nineteenth revised edition 2011 reprint, 2014, ISBN:10: 8177001000

R2.Rangan, C.S. G.R.Sharma. andV.S.V.Mani, Instrumentation devices and system, Pen ram International Publishing India Pvt. Ltd. Fifth edition, ISBN:10: 0074633503

R3.Mehta, V.K. Electronics and instrumentation, Third edition-S.Chand and company Pvt Ltd Reprint, 2010, ISBN:81-219-2729-3

R4.Singh, S.K. Industrial instrumentation and control, Tata McGraw-Hill, 1987. ISBN: 007451914X, 9780074519141.

R5.J.G. Joshi, Electronic Measurement and Instrumentation, Khanna Publishing House, New Delhi (ISBN: 978-93-86173-621)

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Identify relevant instruments used for measuring electrical and non-electrical quantities, relevant transducers/sensors for various applications		2		3								3
[CO2]	Understanding the knowledge to use instrument for specific application to record or monitor.				2	2							2
[CO3]	Apply and recognize the physics of pressure, temperature level and flow measurement used to control dynamics of processes.	2			3								2
[CO4]	Analyze the signal conditioning and telemetry system for their proper functioning.			3								2	
[CO5]	Evaluate commonly used process variable measurement devices through proper selection, identification, design, installation and principle of operation in industries.		2				2						2
[CO6]	Create critical and creative thinking to bring the technology of trouble shooting problems with the measurement and control of industrial instrumentation work.		2		3							3	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject:Electrical Testing And Commissioning

Code:DIP14189

3 Credits | Semester IV

A. INTRODUCTION:

- Follow standard safety procedures in testing and commissioning of electrical equipment.

B. COURSE OUTCOMES: At the end of the course, students will be able to

[CO1] Remembering safety procedures with respect to earthing and insulation of electrical equipment.
[CO2] Interpret the performance and specifications of electrical devices for testing and commissioning.
[CO3] Apply proper tools, equipment, for installation, testing, maintenance of electrical machines, electrical devices and transformers.
[CO4] Analyze the process to plan, control and implement commissioning of electrical equipment's, testing and commissioning of electrical equipment in accordance with IS codes.
[CO5] Evaluate the corrective and preventive maintenance of electrical equipment's and Make plans for troubleshooting electrical machines and undertake regular preventive and breakdown maintenance.
[CO6] Design and understand procedures for installation, testing and commissioning practices for various machine and devices.

C. ASSESSMENT PLAN:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS:

ELECTRICAL SAFETY AND INSULATION: Do's and don'ts regarding safety in domestic electrical appliances as well for substation/power station operators. Electrical safety in industry/power stations/ substations at the time of operation/ control/maintenance. Fire detection alarm, fire-fighting equipments, Factors affecting life of insulating materials, classifications of insulating materials as per IS:1271-1958. Measuring insulation resistance by different methods such as, i) Polarization, ii) Dielectric absorption, iii) Megger and to predict the condition of insulation. Reconditioning of insulation, Insulating oil - properties of insulating oil, causes of deterioration of oil, testing of transformer oil as per IS 1866-1961

INSTALLATION AND ERECTION: Concept of foundation for installation of machinery. Requirements of foundation for static and rotating electrical machinery. Concept of leveling and aligning Procedure for leveling and aligning alignment of direct coupled drive, effects of mis-alignment, Devices and tools required for loading, unloading, lifting, and carrying heavy equipment and precautions to be taken while handling them. Installation of transformer as per I.S.-1886-1967 and procedure of installation of transformer, Requirements of installation of pole mounted transformer, Requirements of installation of rotating electrical machines as per I.S. 900 – 1965. Devices and tools required for loading, unloading, lifting, and carrying heavy equipment and precautions to be taken while handling them.

TESTING AND COMMISSIONING: Concept of testing, Objectives of testing. Roles of I.S.S. in testing of electrical equipment, Types of tests and concepts, Routine tests, type tests, supplementary test, special tests, Methods of testing - Direct/Indirect/Regenerative testing. Tolerances for the various items for equipment –transformer, induction motor, dc motor, synchronous machines Commissioning, Tests before Commissioning for transformer, induction motor, alternator. Testing of transformer as per I.S.1886- 1967 and I.S.2026- 1962 Testing of three-phase Induction motor as per I.S.325 - 1970. Testing of single-phase induction motor as per I.S.990-1965.Testing of synchronous machines as per ISS, Testing of D.C. machines

TROUBLESHOOTING PLANS: Internal and external causes for failure abnormal operation of equipment. List of mechanical faults, electrical faults and magnetic faults in the electrical equipment, remedies, applicationsUse of tools like bearing puller filler gauges, dial indicator, spirit level, megger, earth tester, and growler. Common troubles in electrical equipment's and machines. Preparation of trouble shooting charts for D.C. Machines, AC Machines and transformers.

MAINTENANCE: Concept of maintenance, types of maintenance, Routine, preventive and breakdown maintenance. Causes of failure of electrical machines, Preventive maintenance-procedure or developing maintenance schedules for electrical machines. Factors affecting preventive maintenance schedules, Concept of TPM, Pillars of TPM. Identification of different types of faults developed such as mechanical/ electrical/ magnetic faults. Maintenance schedules of the following as per I.S.S.-a) Distribution transformer as per I.S.1886-1967, b) Single phase and three phase Induction motors as per I.S.900-1965., c) Batteries

E. TEXT BOOKS

T1. Installation, commissioning and maintenance of Electrical equipment Author : Singh TarlokPublisher : S.K. Kataria and Sons

T2. Testing, commissioning, operation and maintenance of electrical equipment Author : Rao, S Publisher : Khanna Publishers

F. REFERENCE BOOKS

R1.Deshpande.M. V. PHI Learning Pvt. Ltd., 2010, Design and Testing of Electrical Machines ISBN No 8120336453, 9788120336452.

R2.Rao, B V S Asia Club House, First Reprint, 2011, Operation and Maintenance of Electrical Equipment Vol-I, ISBN No 8185099022

R3. Rosenberg. Mc GRAW-HILL, 1st Edition, May 2003, Maintenance and Repairs, ISBN No 9780071396035

R4. Sharotri, S.K. Glencoe/ Mcgraw- Hill; 2nd Edition ,June 1969; Preventive Maintenance of Electrical Apparatus, ISBN No 10: 007030839X 13: 978-0070308398

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Remembering safety procedures with respect to earthing and insulation of electrical equipment.		2	3								2	
[CO2]	Interpret the performance and specifications of electrical devices for testing and commissioning		2	2	3							2	2
[CO3]	Apply proper tools, equipment, for installation, testing, maintenance of electrical machines, electrical devices and transformers.	2		3	2								2
[CO4]	Analyze the process to plan, control and implement commissioning of electrical equipment's, testing and commissioning of electrical equipment in accordance with IS codes.		2	3								2	
[CO5]	Evaluate the corrective and preventive maintenance of electrical equipment's and Make plans for troubleshooting electrical machines and undertake regular preventive and breakdown maintenance		2	2	3							3	2
[CO6]	Design and understand procedures for installation, testing and commissioning practices for various machine and devices.		3	2							2	3	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject:Illumination Practices

Code:DIP14194

3 Credits | Semester IV

A. Introduction:

- Design illumination schemes and associated electrification of buildings.

B. Course Outcomes: At the end of the course, students will be able to

[CO1] Identify relevant lamps for various applications considering illumination levels.

[CO2] Understand the terminology of illumination, laws of illumination, construction and working of electric lamps.

[CO3] Apply the lighting accessories required for selected wiring scheme for different places.

[CO4] Analyzing and solving the varieties of problems and issues in illumination.

[CO5] Evaluate the basics of Illumination and design of lighting schemes for Various applications.

[CO6] Design and plan of interior and exterior lighting systems for various purposes light fittings.

C. ASSESSMENT PLAN:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D.SYLLABUS:

FUNDAMENTALS OF ILLUMINATION: Basic illumination, Terminology, Laws of illumination, Polar curves, polar curve: its meaning and applications for designing the lamp. Concept of Photometry, Measurement of illumination Lighting calculation methods, Watt /m2 method, Lumens or light flux method, Point to point method, Standards for illumination

TYPES OF LAMPS: Incandescent lamp, ARC lamps – AC and DC arc lamps, Fluorescent lamp, Types of other lamps: Mercury vapour lamp, HPMV lamp, Mercury iodide lamp, Sodium vapour lamp, Halogen Lamps, Ultraviolet Lamps, Neon Lamps. Neon Sign Tubes. Metal halides, HID and Arc lamps, LED lamps, CFL, Lasers, Selection Criteria for lamps

ILLUMINATION CONTROL AND CONTROL CIRCUITS: Purpose of lighting control, and Dimmer, Resistance type Salt water Dimmer, Working principle and operation of Dimmer, Transformer and their types, Dimmer Transformer, Auto transformer dimmer, Two winding, transformer dimmer. Electronic Dimmer: working principle and operation, a). Thyristor operated dimmer, b). Triac operated

dimmer, Control of Enhance Lighting, Methods used for light control, Control circuits for lamps (refer):, ON/OFF control. Control circuits for lamps: single lamp controlled by single switch, two switches. Single Lamp control by two point method, three point method and four point method.

ILLUMINATION FOR INTERIOR APPLICATIONS: Standard for various locations of Interior Illumination**,** Design considerations for Interior location of residences (1/2/3/4 BHK), Commercial, Industrial premises

Illumination scheme for different Interior locations of Residential, Commercial, industrial unit

ILLUMINATION FOR INTERIOR APPLICATIONS: Factory Lighting, Street Lighting (Latest Technology), Flood Lighting, Railway Lighting, Lighting for advertisement /Hoardings/sports lighting, Agriculture and Horticulture lighting, Health Care Centres / Hospitals, Decorating Purposes, Stage Lighting, Aquariums and Shipyards, Special purpose lamps used in photography video films.

E.TEXT BOOKS

T1. Applied Illumination Engineering by Jack L. Lindsey FIES(Author), Scott C. Dunning PHD PE CEM

T2. Illumination Engineering by SM CHAUDHARI

F. REFERENCE BOOKS

R1.Lindsey, Jack L., Applied Illumination Engineering, The Fairmont Press Inc.
R2.Simons, R. H., Bean, Robert; Lighting Engineering: Applied Calculations, Architectural Press. ISBN: 0750650516.
R3.Casimer M Decusatis, Handbook of Applied Photometry, Springer, ISBN 1563964163.
R4.Butterworths, Lyons Stanley, Handbook of Industrial Lighting, Butterworths
R5.Simpson Robert S, Lighting Control Technology and Applications, Focal Press
R6.Kao Chen, Energy Management in Illuminating Systems, CRC Press

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Identify relevant lamps for various applications considering illumination levels.	1	2										2
[CO2]	Understand the terminology of illumination, laws of illumination, construction and working of electric lamps.		2				2					1	
[CO3]	Apply the lighting accessories required for selected wiring scheme for different places.	2	3		3								3
[CO4]	Analyzing and solving the varieties of problems and issues in illumination.	2		2									2
[CO5]	Evaluate the basics of Illumination and design of lighting schemes for Various applications.		2			2						2	
[CO6]	Design and plan of interior and exterior lighting systems for various purposes light fittings.			3	2							3	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject:Industrial Drives

Code: DIP14197

3 Credits | Semester IV

A. Introduction:

- Maintain electric AC and DC Drives.

B. Course Outcomes: At the end of the course, students will be able to

[CO1] Observe speed/ torque characteristics of common drive motor and recognize behavior of electric motor during starting, running, and breaking.

[CO2] Describe about the various control techniques employed to controlling the drives for ac and dc motors.

[CO3] Apply various converter to control the speed of the drives.

[CO4] Analyze the performance of AC and DC drives under different conditions.

[CO5] Evaluate the advantages and choice of electric drive and justify a suitable electrical drive for specific application in the industry.

[CO6] Design the speed control and current control loops fora industrial drive.

C. ASSESSMENT PLAN:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS:

ELECTRIC DRIVES: Need of Electric Drives, Functional Block diagrams of an electric drives .DC Motors, Motor Rating. Series, Shunt and compound DC motors. Universal motor. Permanent magnet motor. DC servo motor, Moving coil motor, Torque motor. Starting and Braking of DC Motors Brushless DC Motors for servo applications. Maintenance procedure.

AC MOTORS: Single phase AC Motors, a) Resistance split phase motors, b) Capacitor run motors, c) Capacitor start motors, d) Shaded pole motors
Three phase Induction Motors, a) Squirrel cage Induction motor, b) Slip ring Induction Motor, c) Starting methods of Induction Motor, d) Braking methods of Induction Motor
Determination of Motor Rating, Maintenance procedure.

DC DRIVES: Single phase SCR Drives, a) Half wave converter, b) Full wave converter, c) Semi converter, d) Dual converter
Three Phase SCR Drives, a) Half wave converter, b) Full wave converter, c) Semi converter, d) Dual converter
Reversible SCR Drives., Speed control methods of DC series Motor, Chopper Controlled DC Drives. Solar and battery powered vehicles Maintenance procedure.

AC DRIVES: Starting and Braking of Induction motors. Stator voltage control, Variable Frequency Control, Voltage Source Inverter Control. Current Source Inverter Control, Rotor Resistance Control. Slip Power Recovery, Solar powered pump drives, Maintenance procedure for AC drives. Sequences of stages & drives required in each stage for following applications: a) Textile mills, b) Steel rolling mills, c) Paper mills, d) Sugar mills

ADVANCED TECHNIQUES OF MOTOR CONTROL: Microcontroller/ Microprocessor based control for drives Phase locked loop control of DC motor. AC/DC motor drive using Microcomputer control Synchronous Motor drives. Ratings & specifications of stepper motor. Stepper motor drives employing microcontroller (No programming)

E. TEXT BOOKS

T1. "Advances in Systems, Control and Automation: ETAEERE-2016 (Lecture Notes in Electrical Engineering)" by Avinash Konkani and Rabindranath Bera

T2. "Digital Control of Electrical Drives (Power Electronics and Power Systems)" by Slobodan N Vukosavic

T3. "Advanced Control of Electrical Drives and Power Electronic Converters (Studies in Systems, Decision and Control)" by Jacek Kabziński

T4. "Microcomputer-Based Adaptive Control Applied to Thyristor-Driven DC-Motors (Advances in Industrial Control)" by Ulrich Keuchel and Richard M Stephan

F. REFERENCE BOOKS

R1. P.S. Bimbhra, Electric Machines, Khanna Book Publishing Co., New Delhi (ISBN: 978-93-86173-294)

R2. Saxena, S.B Lal ;Dasgupta, K., Fundamentals of Electrical Engineering, Cambridge university press pvt. Ltd., New Delhi, ISBN: 9781107464353

R3. Theraja, B. L. ;Theraja, A. K., A Text Book of Electrical Technology Vol-II, S. Chand and Co. Ramnagar,New Delhi, ISBN :9788121924405

R4. Mittle, V.N. ;Mittle, Arvind, Basic ElectricalEngineering, McGraw Hill Education, Noida, ISBN:9780070593572

R5. Sen P.C., Power Electronics, Mcgraw-Hill Publishing CompanyLimited, New Delhi. ISBN:9780074624005

R6. Dubey Gopal K., Fundamentals of Electrical Drives, Second Edition, Narosa Publishing House,NewDelhi.ISBN :9788173194283

R7. Subrahmanyam, Vedam, Electrical Drives Concepts and Applications, Mcgraw-HillPublishingCompanyLimited, New Delhi.ISBN:9780070701991

R8. Agrawal , Jai P., Power Electronic Systems Theory and Design, Pearson Education, Inc. ISBN 9788177588859.

R9. Deshpande M.V., Design and Testing of Electrical Machines, PHI Publication, ISBN: 9788120336452

R10. Pillai, S.K., A first course on Electrical Drives, Wiley Eastern Ltd. New Delhi, ISBN :13: 978-0470213995

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Observe speed/ torque characteristics of common drive motor and recognize behavior of electric motor during starting, running, and breaking.	2	3		2							3	2
[CO2]	Describe about the various control techniques employed to controlling the drives for ac and dc motors.		2		3								2
[CO3]	Apply various converter to control the speed of the drives.	2			2								2
[CO4]	Analyze the performance of AC and DC drives under different conditions.			2	3							2	
[CO5]	Evaluate the advantages and choice of electric drive and justify a suitable electrical drive for specific application in the industry.			2			2						2
[CO6]	Design the speed control and current control loops fora industrial drive.		2									2	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject:Electrical Estimation And Contracting

Code:

3 Credits | Semester IV

A. Introduction:

- Design electrical installation with costing for tendering

B. Course Outcomes: At the end of the course, students will be able to

[CO1] Identify national Electrical Code 2011 in electrical installations.
[CO2] Understand the electrical installation, safety, estimation and costing.
[CO3] Apply different methods for repairs and maintenance of electrical devices and equipment.
[CO4] Analyze the work of industrial and non industrial electrical installations.
[CO5] Evaluate abstract, tender, quotation of public lighting and other installations.
[CO6] Design electrical installation scheme of commercial complex and Design, estimation and costing of outdoor and indoor 11 KV substation.

C. ASSESSMENT PLAN:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS:

ELECTRIC INSTALLATION AND SAFETY: Scope and features of National electric code 2011, Types of electrical installation, Fundamental principles for electrical installation, Permit to work, safety instructions and safety practices, Purpose of estimating and costing.

ESTIMATION AND COSTING: Meaning and purpose of- Rough estimate, detailed estimate, supplementary estimate, annual maintenance estimate and revised estimate, Factors to be considered while preparation of detailed estimate and economical execution of work, Contracts- Concepts of contracts, types of contracts, contractor, role of contractor, Tenders and Quotations- Type of tender, tender notice, preparation of tender document, and method of opening of tender

Quotation, quotation format, comparison between tender and quotation, Comparative statement, format comparative statement. Order format, placing of purchasing order. Principles of execution of works, planning, organizing and completion of work, Billing of work

NON-INDUSTRIAL INSTALLATIONS: Types of Non-industrial installations-- Office buildings, shopping and commercial centre, residential installation, Electric service and supply, Design consideration of electrical installation in commercial buildings. Design procedure of installation- steps involved in detail, Estimating and costing of unit. Earthing of commercial installation. Design electrical installation scheme of commercial complex. Erection, Inspection and testing of installation as per NEC.

INDUSTRIAL INSTALLATION: Classification of industrial buildings Classification based on power consumption, Drawing of wiring diagram and single line diagram for single phase and three phase Motors, Design consideration in industrial installations Design procedure of installation-detailed steps, Design electrical installation scheme of factory/ small industrial unit, Preparation of material schedule and detailed estimation, Installation and estimation of agricultural pump and flourmill

PUBLIC LIGHTING INSTALLATION&DISTRIBUTION LINES AND LT SUBSTATION: Classification of outdoor installations streetlight/ public lighting installation, Street light pole structures. Selection of equipments, sources used in street light installations. Cables , recommended types and sizes of cable. Control of street light installation. Design, estimation and costing of streetlight Preparation of tenders and abstracts. Introduction to overhead and underground distribution line, Materials used for distribution line HT and LV, Cables used for distribution line, factors determining selection of LT/ HT power Cables, cable laying and cable termination method according to IS , Design, estimation and costing of HT LT overhead line and underground cabling. Types of 11 KV Distribution substations their line diagram, Estimation of load, Load factor, diversity factor and determination of rating of distribution, Transformer. Design, estimation and costing of outdoor and indoor 11 KV substation.

E. TEXT BOOKS

T1. “A Course in Electrical Installation Estimating and Costing” by J B Gupta

T2. “Construction Cost Estimating: Process and Practices” by Griffin Dennis and Holm Leonard

F. REFERENCE BOOKS

R1. Raina, K.B.; Dr. S. K. Bhattacharya New Age International Publisher First, Reprint 2010, ElectricalDesign Estimating and Costing ISBN: 978-81-224-0363-3

R2. Allagappan,, N. S. Ekambarram, Tata Mc-Graw Hill Publishing Co. Ltd, Electrical Estimating and Costing, ISBN 13: 9780074624784

R3. Singh, Surjit Ravi Deep Singh, Dhanpat Rai and Sons, Electrical Estimating and Costing, ISBN13:1234567150995

R4. Gupta, J.B. S.K. Katariaand Sons Reprint Edition, A Course in Electrical Installation Estimatingand Costing ISBN 10: 935014279113: 978-9350142790.

R5. Bureau of Indian Standard. IS: 732-1989, Code of Practice for Electrical Wiring Installation

R6. Bureau of Indian Standard. SP-30:2011, National Electrical Code 2011

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Identify national Electrical Code 2011 in electrical installations.		3		2								2
[CO2]	Understand the electrical installation, safety, estimation and costing.		2		2						2	2	
[CO3]	Apply different methods for repairs and maintenance of electrical devices and equipment	2			2								2
[CO4]	Analyze the work of industrial and non-industrial electrical installations			3	2								2
[CO5]	Evaluate abstract, tender, quotation of public lighting and other installations		2	2								2	
[CO6]	Design electrical installation scheme of commercial complex and Design, estimation and costing of outdoor and indoor 11 KV substation.			2	2							3	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject:Biomass and Micro-Hydro Power Plants

Code:DIP14182

3 Credits | Semester IV

A. Introduction:

- Maintain the efficient operation of various types of Biomass and Micro hydro power plants

B. Course Outcomes: At the end of the course, students will be able to

[CO1] Identify the relevant biomass power plant.

[CO2] Understanding the preventive maintenance and breakdown maintenance of different types of biomass gasifiers.

[CO3] Apply various scheme to extract bio energy from biomass.

[CO4] Analyze the different biomass and micro hydro power plant.

[CO5] Evaluate the working of small wind turbines, micro hydro power plants and large wind power plants etc.

[CO6] Design the layout of Biomass-based power plants and small hydro power plants

C. ASSESSMENT PLAN:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS:

BASICS OF BIOMASS-BASED POWER PLANTS: Properties of solid fuel for biomass power plants: bagasse, wood chips, rice husk, municipal waste, Properties of liquid and gaseous fuel for biomass power plants: Jatropha, bio-diesel gobar gas, Layout of a Bio-chemical based (e.g. biogas) power plant: Layout of a Thermo-chemical based (e.g. Municipal waste) power plant Layout of a Agro-chemical based (e.g. bio-diesel) power plant, Selection of biomass power plants.

BIOMASS GASIFICATION POWER PLANTS: The basic principle to convert Agriculture and forestry products and wood processing remains (including rick husks, wood powder, branches, off cuts, corn straws, rice straws, wheat, straws, cotton straws, fruit shells, coconut shells, palm shells, bagasse, corncobs) into combustible gas. General Construction and working of a typical gasifier, Power generating

in gas engine:, Strengths and limitations of Agriculture and forestry products gasifier Preventive maintenance steps different types of biomass gasifiers.

DIFFERENT TYPES OF GASIFIERS: Construction and working of the following types of gasifiers: Rice Husk Gasification Power Plant and their specifications

Straw Gasification Power Plant and their specifications Bamboo Waste, Bamboo Chips Gasification Power Plantand their specifications, Coconut shell, coconut peat, coconut husk, Gasification Power Plantand their specifications, Bagasse/Sugar Cane Trash Gasification Power Plantand their specifications, Gobar gas plant and its specifications, Breakdown maintenance of biomass power plant at the module level.

MICRO-HYDRO POWER PLANTS: Locations of micro hydro power plant, Energy conversion process of hydro power plant. Classification of hydro power plant: High, medium and low head. General Layouts of typical micro-hydro power plant. Strengths and limitations of micro hydro power plants

PUBLIC LIGHTING INSTALLATION & DISTRIBUTION LINES AND LT DIFFERENT TYPES OF MICROHYDOPOWER PLANTS: Construction and working of High head – Pelton turbine and their specifications, Construction and working of Medium head – Francis turbine and their specifications, Construction and working of Low head – Kaplan turbine and their specifications, Preventive and breakdown maintenance of micro hydro power plants, Safe Practices for micro hydro power plants.

E. TEXT BOOKS

T1. Khoiyangbam, R S Navindu; Gupta and Sushil Kumar; Biogas Technology :Towards Sustainable
T2. O.P. Gupta, Energy Technology, Khanna Publishing House
T3. Kothari, D.P. et aL: Renewable Energy Sources and Emerging Technologies, PHI

F. REFERENCE BOOKS

R1. Khoiyangbam, R S Navindu; Gupta and Sushil Kumar; Biogas Technology :Towards Sustainable Development; TERI, New Delhi; ISBN: 9788179934043
R2. David M. Buchla; Thomas E. Kissell; Thomas L. Floyd - Renewable Energy Systems, Pearson Education New Delhi , ISBN: 9789332586826,
R3. Kothari, D.P. et aL: Renewable Energy Sources and Emerging Technologies, PHI
R4. Rachel, Sthuthi, Earnest, Joshua; -Wind Power Technologies, PHI Learning
R5. O.P. Gupta, Energy Technology, Khanna Publishing House, ISBN: 978-93-86173-

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Identify the relevant biomass power plant.				3		2						2
[CO2]	Understanding the preventive maintenance and breakdown maintenance of different types of biomass gasifiers.		2	3									2
[CO3]	Apply various scheme to extract bio energy from biomass.	2			2								2
[CO4]	Analyze the different biomass and micro hydro power plant.		3		2								2
[CO5]	Evaluate the working of small wind turbines, micro hydro power plants and large wind power plants etc.	2	3								2	2	
[CO6]	Design the layout of Biomass-based power plants and small hydro power plants			3		2						2	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Essence of Indian Knowledge Tradition

Code:DIP13172

0 Credits | Semester IV

A. Introduction:

- The course aims at imparting basic principles of thought process, reasoning and differencing. Sustainability is at the core of Indian Traditional knowledge Systems connecting society and nature. Holistic life style of yogic science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions. Part-I focuses on introduction to Indian Knowledge Systems, Indian perspective of modern scientific world-view, and basic principles of Yoga and holistic health care system.

B. Course Outcomes: At the end of the course, students will be able to

[CO1] Basic principles of thought process, reasoning and differencing.

[CO2] Introduction to Indian Knowledge Systems, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care systems.

[CO3] Focuses on Indian philosophical traditions, Indian linguistic tradition and Indian artistic tradition.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	10
	Attendance	2.5
	Assignment	2.5
End Semester Examination(ESE)	End Semester Examination	35
Total		50
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

BASIC STRUCTURE OF INDIAN KNOWLEDGE SYSTEM: Basic structure of Indian Knowledge System. अष्टादशविद्या -४वेद,४उपवेद (आयुर्वेद, धनुर्वेद, गन्धर्ववेद, स्थापत्य आदि)

BASIC STRUCTURE OF INDIAN KNOWLEDGE SYSTEM: ६वेदांग (शिक्षा, कल्प, निरुक्त, व्याकरण, ज्योतिष, छंद) ४ उपाङ्ग (धर्मशास्त्र, मीमांसा, पुराण, तर्कशास्त्र)

MODERN SCIENCE AND INDIAN KNOWLEDGE SYSTEM: Modern Science and Indian Knowledge System.

YOGA AND HOLISTIC HEALTH CARE LAWS: Yoga and Holistic Health care.

CASE STUDIES: Case studies.

E. TEXT BOOKS

T1. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, Bharatiya.
T2.Vidya Bhavan, Mumbai. 5th Edition, 2014 SwamiJitatmanand, Modern Physics and Vedant, BharatiyaVidyaBhavan
T3Swami Jitatmanand, Holistic Science and Vedant, BharatiyaVidyaBhavan.
T4. Meena Rao (2006), Fundamental concepts in Law of Contract, 3rd Edn. Professional Offset
T5Fritzof Capra, The Wave of life .

F. REFERENCE BOOKS

R1. VN Jha (Eng. Trans.), Tarkasangraha of Annam Bhatta, International Chinmay
R2. Foundation, Velliarnad, Arnakulam Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata
R3. GN Jha (Eng. Trans.), Ed. RN Jha, Yoga-darshanam with Vyasa Bhashya
R4. VidyanidhiPrakashan, Delhi 2016 RNJha, Science of Consciousness Psychotherapyand Yoga Practices, Vidyanidhi
R5.Prakashan, Delhi 2016 P B Sharma (English translation), ShodashangHridayan

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES					CORRELATION WITH PROGRAM SPECIFIC OUTCOMES						
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Basic principles of thought process, reasoning and differencing.						2	1					
[CO2]	Introduction to Indian Knowledge Systems, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care systems.						1				1		
[CO3]	Focuses on Indian philosophical traditions, Indian linguistic tradition and Indian artistic tradition.										1		

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Digital Electronics Lab

Code:DIP14188

1 Credits | Semester IV

A. Introduction:

- To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
- To prepare students to perform the analysis and design of various digital electronic circuits.

B. Course Outcomes: At the end of the course, students will be able to

[CO1] Remembering the fundamental concepts and techniques used in digital electronics.

[CO2] Understanding various Electronic Devices like Cathode ray Oscilloscope, Signal generators, Digital Trainer Kit, Multimeters and components like Resistors, Capacitors, Op amp and Integrated Circuit.

[CO3] Applying the knowledge for solving problems related to number systems, Boolean algebra and to reduce Boolean expression using K Maps.

[CO4] Analyze basic requirements for a cost effective solution and develop skill to build, and troubleshoot digital circuits.

[CO5] Evaluate the basic differences of combinational and sequential circuits, interpret flip flops as SR,JK,D flip flop, Prepare different conversion techniques from digital domain to analog domain and vice versa.

[CO6] Design various synchronous counter, asynchronous counter, registers, ADC, DAC, sequential circuits and memory device using simulator.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	5
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	35
Total		50
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

S.No.	Name of Experiment
1	To verify the truth tables for all logic fates – NOT OR AND NAND NOR XOR

	XNOR using CMOS Logic gates and TTL Logic Gates
2	Implement and realize Boolean Expressions with Logic Gates
3	Implement Half Adder, Full Adder, Half Subtractor, Full subtractor using ICs
4	Implement parallel and serial full-adder using ICs
5	Design and development of Multiplexer and De-multiplexer using multiplexer ICs
6	Verification of the function of SR,D, JK and T Flip Flops
7	Design controlled shift registers
8	Construct a Single digit Decade Counter (0-9) with 7 segment display
9	To design a programmable Up-Down Counter with a 7 segment display.
10	Study of different memory ICs
11	Study Digital- to – Analog and Analog to Digital Converters
12	Simulate in Software (such as PSpice) an Analog to Digital Converter
13	Simulate in Software (such as PSpice) an Analog to Digital Converter

E. Text Book:

T1. Digital Electronics by John Morris – USA.
T2.Digital Electronics by John Morris – UK.
T3.Fundamentals of Digital Circuits by Anand Kumar – USA.

F. REFERENCE BOOKS

R1.Digital principles & Applications Albert Paul Malvino& Donald P. Leach McGraw Hill Education; Eighth edition ISBN: 978-9339203405
R2.Digital Electronics Roger L. TokheimMacmillian McGraw-Hill Education (ISE Editions); International 2 Revised ed edition ISBN: 978-0071167963
R3.Digital Electronics R. Anand Khanna Publications, New Delhi (Edition 2018) ISBN: 978-93 82609445
R4.Fundamentals of Logic Design Charles H. Roth Jr. Jaico Publishing House; First edition ISBN: 978-8172247744
R5.Digital Electronics – an introduction to theory and practice William H. GothmannPrentice Hall India Learning Private Limited; 2 edition ISBN: 978-8120303485

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Remembering the fundamental concepts and techniques used in digital electronics.	2	2								2		
[CO2]	Understanding various Electronic Devices like Cathode ray Oscilloscope, Signal generators, Digital Trainer Kit, Multimeters and components like Resistors, Capacitors, Op amp and Integrated Circuit.		2		2								2
[CO3]	Applying the knowledge for solving problems related to number systems, Boolean algebra and to reduce Boolean expression using K Maps.	2	3										2
[CO4]	Analyze basic requirements for a cost effective solution and develop skill to build, and troubleshoot digital circuits.	2			3							3	
[CO5]	Evaluate the basic differences of combinational and sequential circuits, interpret flip flops as SR,JK,D flip flop, Prepare different conversion techniques from digital domain to analog domain and vice versa.		2	3									
[CO6]	Design various synchronous counter, asynchronous counter, registers, ADC, DAC, sequential circuits and memory device using simulator.			2	2							2	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Electrical & Electronics Engineering Drawing

Code: DIP14083

2 Credits | Semester IV

A. Introduction:

- To understand the various structures of transmission towers & distribution poles.
- To know how to study Single line diagram.
- To learn various symbols related to Electrical & Electronics Engineering.

B. Course Outcomes: At the end of the course, students will be able to

[CO1] Identify the commonly used Electrical & Electronics Symbols.

[CO2] Understanding the operation of the electrical equipment using wiring and schematic diagrams.

[CO3] Apply the symbols in electrical drawings of generation, transmission, distribution, utilization and substation to draw single line diagram.

[CO4] Analyze different structures of various transmission towers & distribution poles and various electrical ladder drawings.

[CO5] Evaluate the operation of the electrical equipmentlike CT, PT relay and schematic diagram of substation.

[CO6] Design single line diagram of power system network and battery charging circuit.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	5
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	35
Total		50
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

S.No.	Name of Experiment
1	To study different Electrical & Electronics symbols.
2	To study different types of Overhead distribution & transmission insulators.
3	To Study single line diagram of a substation.

4	To study different types of structures of transmission towers.
5	To study different types of structures of distribution poles.
6	To study different types of Earthing.
7	To study C.T., P.T. and other Relays with feeders and distributors.
8	To study Battery Charging Circuit with Battery.
9	Collect the information on components of transmission line.

E. Text Book:

T1. Electrical Engineering Drawing by Dr S K Bhattacharya

T2. Electrical and Electronic Drawing by Charles J Baer

F. Reference Books:

R1. M. Maitra, Gitin (2000). Practical Engineering Drawing. 4835/24, Ansari Road, Daryaganj, New Delhi - 110002: New Age International (P) Limited, Publishers. pp. 2–5, 183. ISBN 81-224-1176-2.

R2. French, Thomas E. (1918), A manual of engineering drawing for students and draftsmen (2nd ed.), New York, New York, USA: McGraw-Hill, LCCN 30018430.

R3. French, Thomas E.; Vierck, Charles J. (1953), A manual of engineering drawing for students and draftsmen (8th ed.), New York, New York, USA: McGraw-Hill, LCCN 52013455.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Identify the commonly used Electrical & Electronics Symbols.	2	2								2		
[CO2]	Understanding the operation of the electrical equipment using wiring and schematic diagrams.		2			2							
[CO3]	Apply the symbols in electrical drawings of generation, transmission, distribution, utilization and substation to draw single line diagram.	2		2					2				2
[CO4]	Analyze different structures of various transmission towers & distribution poles and various electrical ladder drawings.		2		3							2	
[CO5]	Evaluate the operation of the electrical equipmentlike CT, PT relay and schematic diagram of substation.		2		2								2
[CO6]	Design single line diagram of power system network and battery charging circuit.		2	3								3	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Induction, Synchronous and Special Electrical Machines Lab

Code: DIP14195

1 Credits | Semester IV

A. Introduction:

- Maintain Induction, Synchronous and FHP Machines used in different applications.

B. Course Outcomes: At the end of the course, students will be able to

[CO1] Recognize different electrical machine, basic operation of synchronous, induction and special machines and have knowledge of its various part.

[CO2] Understand and perform various tests, find efficiency & voltage regulation of electrical machines

[CO3] Apply and deduce the principles of Electrical Machines through laboratory experimental work

[CO4] Analyze various parameters, characteristics and assess the performance of synchronous machines, induction machine and special machine.

[CO5] Evaluate reports based on performed experiments with effective demonstration of diagrams and characteristics/graphs.

[CO6] Prepare and connect the circuit to perform experiments, measure, analyze the observed data & come to a conclusion.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	5
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	35
Total		50
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

S.No.	Name of Experiment
1	Identify the different parts (along with function and materials) for the given single phase and three phase induction motor.
2	Connect and run the three phase squirrel cage induction motors (in both directions) using the DOL, star-delta, auto-transformer starters (any two)

3	Perform the direct load test on the three phase squirrel cage induction motor and plot thei) efficiency versus output, ii) power factor versus output, iii) power factor versus motor current and iv) torque – slip/speed characteristics.
4	Conduct the No-load and Blocked-rotor tests on given 3-f squirrel cage induction motor and determine the equivalent circuit parameters
5	Conduct the No-load and Blocked-rotor tests on given 3-f squirrel cage induction motor and plot the Circle diagram.
6	Control the speed of the given three phase squirrel cage/slip ring induction motor using the applicable methods: i) auto-transformer, ii) VVVF.
7	Measure the open circuit voltage ratio of the three phase slip ring induction motor
8	Conduct the direct load test to determine the efficiency and speed regulation for different loads on the given single phase induction motor; plot the efficiency and speed regulation curves with respect to the output power.
9	Perform the direct loading test on the given three phase alternator and determine the regulation and efficiency.
10	Determine the regulation and efficiency of the given three phase alternator from OC and SC tests (Synchronous impedance method).
11	Conduct the test on load or no load to plot the ‘V’ curves and inverted ‘V’ curves (at no-load) of 3-f synchronous motor
12	Dismantling and reassembling of single phase motors used for ceiling fans, universal motor for mixer
13	Control the speed and reverse the direction of stepper motor
14	Control the speed and reverse the direction of the AC servo motor
15	Control the speed and reverse the direction of the DC servo motor

E. Text Book:

T1. P. S. Bimbhra, “Electrical Machinery”, Khanna Publishers, 2011.
T2. I. J. Nagrath and D. P. Kothari, “Electric Machines”, McGraw Hill Education, 2010.

F. Reference Books:

R1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery”, McGraw Hill Education, 2013.
R2. M. G. Say, “Performance and design of AC machines”, CBS Publishers, 2002.

R3. A. S. Langsdorf, “Alternating current machines”, McGraw Hill Education, 1984.
R4. P. C. Sen, “Principles of Electric Machines and Power Electronics”, John Wiley & Sons, 2007.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Recognize different electrical machine, basic operation of synchronous, induction and special machines and have knowledge of its various part.	2	2			2							
[CO2]	Understand and perform various tests, find efficiency & voltage regulation of electrical machines			3	2								2
[CO3]	Apply and deduce the principles of Electrical Machines through laboratory experimental work			3	2								2
[CO4]	Analyze various parameters, characteristics and assess the performance of synchronous machines, induction machine and special machine.			2	2							2	
[CO5]	Evaluate reports based on performed experiments with effective demonstration of diagrams and characteristics/graphs.		2	2								2	
[CO6]	Prepare and connect the circuit to perform experiments, measure, analyze the observed data & come to a conclusion.		3	3	2							2	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Minor Project

Code: DIP14193

2 Credits | Semester IV

A. Introduction: The objective of this course is to prepare students to use applications of the theory and practical learned during the course. It will also help students to develop an industry or research oriented project. This course helps students how to carry out project/studies in the field of interest of the student or as given by the industry.

B. Assessment Plan:

Criteria	**Description**	**Maximum Marks**
Continuous Internal Assessment (CIA)	Internal Examination	15
	Attendance	
	Assignment	
End Semester Examination(ESE)	End Semester Examination	35
Total		50
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

ARKA JAIN University
Jharkhand

Syllabus of

Diploma in Electrical & Electronics Engineering

Semester-V

ARKAJAIN University, Jharkhand
School of Engineering & IT
Department of Engineering
Faculty – Diploma in Electrical & Electronics Engineering (DEEE)
Scheme of Study (w.e.f Batch 2020-21)

SEMESTER –I(Group-A)

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Communication Skills in English	HSC	3	3	100	70	20	5	5
2	Mathematics-I	BSC	4	4	100	70	20	5	5
3	Applied Physics	BSC	4	4	100	70	20	5	5
4	Applied Chemistry	BSC	4	4	100	70	20	5	5
	Practical								
5.	Engineering Workshop Practice	ESC	2	4	50	35	5	5	5
6.	Applied Physics Lab	BSC	1	2	50	35	5	5	5
7.	Applied Chemistry Lab	BSC	1	2	50	35	5	5	5
8.	Communication Skills in English Lab	HSC	1	2	50	35	5	5	5
	Total		**20**	**25**	**600**	**420**	**100**	**40**	**40**

SEMESTER I (Group-B)

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Mathematics -I	BSC	4	4	100	70	20	5	5
2	Fundamentals of Electrical & Electronics Engg.	ESC	4	4	100	70	20	5	5
3	Introduction to IT system	ESC	3	3	100	70	20	5	5
4	Engineering Mechanics	ESC	4	4	100	70	20	5	5
5	Environmental Science	AC	0	2	50	35	10	2.5	2.5
	Practical								
6	Fundamentals of electrical & electronics Engg. Lab	ESC	1	2	50	35	5	5	5
7	Introduction to IT system Lab	ESC	1	2	50	35	5	5	5
8	Engineering Mechanics Lab	ESC	1	2	50	35	5	5	5
9	Engineering Graphics	ESC	2	4	50	35	5	5	5
	Total		**20**	**27**	**650**	**455**	**110**	**42.5**	**42.5**

SEMESTER II (Group-A)

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Mathematics -II	BSC	4	4	100	70	20	5	5
2	Fundamentals of Electrical & Electronics Engg.	ESC	4	4	100	70	20	5	5
3	Introduction to IT system	ESC	3	3	100	70	20	5	5
4	Engineering Mechanics	ESC	4	4	100	70	20	5	5
5	Environmental Science	AC	0	2	50	35	10	2.5	2.5
	Practical								
6	Fundamentals of electrical & electronics Engg. Lab	ESC	1	2	50	35	5	5	5
7	Introduction to IT system Lab	ESC	1	2	50	35	5	5	5
8	Engineering Mechanics Lab	ESC	1	2	50	35	5	5	5
9	Engineering Graphics	ESC	2	4	50	35	5	5	5
	Total		**20**	**27**	**650**	**455**	**110**	**42.5**	**42.5**

SEMESTER –II(Group-B)

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Communication Skills in English	HSC	3	3	100	70	20	5	5
2	Mathematics-II	BSC	4	4	100	70	20	5	5
3	Applied Physics	BSC	4	4	100	70	20	5	5
4	Applied Chemistry	BSC	4	4	100	70	20	5	5
	Practical								
5.	Engineering Workshop Practice	ESC	2	4	50	35	5	5	5
6.	Applied Physics Lab	BSC	1	2	50	35	5	5	5
7.	Applied Chemistry Lab	BSC	1	2	50	35	5	5	5
8.	Communication Skills in English Lab	HSC	1	2	50	35	5	5	5
	Total		**20**	**25**	**600**	**420**	**100**	**40**	**40**

SEMESTER-III

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Introduction to Electric Generation Systems	PCC	3	3	100	70	20	5	5
2	Electrical Circuits	PCC	3	3	100	70	20	5	5
3	Electrical and Electronic Measurements	PCC	3	3	100	70	20	5	5
4	Electric Motors and Transformers	PCC	3	3	100	70	20	5	5
5	Applied Electronics	PCC	3	3	100	70	20	5	5
	PRACTICAL								
6	Electrical Circuits Lab	PCC	1	2	50	35	5	5	5
7	Electrical and Electronic Measurements Lab	PCC	1	2	50	35	5	5	5
8	Electric Motors and Transformers Lab	PCC	1	2	50	35	5	5	5
9	Applied Electronics lab	PCC	1	2	50	35	5	5	5
10	Summer Internship-I (3-4 Weeks)	PROJ	2	0	50	35	15	0	0
	TOTAL		**21**	**23**	**750**	**525**	**135**	**45**	**45**

SEMESTER-IV

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Digital Electronics	PCC	3	3	100	70	20	5	5
2	Electric Power Transmission and Distribution	PCC	4	4	100	70	20	5	5
3	Induction, Synchronous and Special Electrical Machines	PCC	4	4	100	70	20	5	5
4	Elective I Industrial Instrumentation and ConditionMonitoring Electrical Testing & Commissioning Illumination Practices	PEC	3	3	100	70	20	5	5
5	Elective II Industrial Drives Electrical Estimation & Contracting Biomass and Micro-hydro Power plants	PEC	3	3	100	70	20	5	5
6	Essence of Indian Knowledge Tradition	AC	0	2	50	35	10	2.5	2.5
	PRACTICAL								
7	Digital Electronics Lab	PCC	1	2	50	35	5	5	5
8	Electrical& Electronics Engg. Drawing	PCC	2	4	50	35	5	5	5
9	Induction, Synchronous and Special Electrical Machines Lab	PCC	1	2	50	35	5	5	5
10	Minor Project	PROJ	2	4	50	35	15	0	0
	TOTAL		**23**	**31**	**750**	**525**	**140**	**42.5**	**42.5**

SEMESTER V

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA	Attendance
1	Microprocessor & Microcontroller	PCC	4	4	100	70	20	5	5
2	Fundamentals of Power Electronics	PCC	4	4	100	70	20	5	5
3	Elective III Switchgear and Protection Wind Power Technologies Electric Vehicles	PEC	3	3	100	70	20	5	5
4	Elective IV Industrial Automation & Control Communication Technologies Electric Traction	PEC	3	3	100	70	20	5	5
5	Open Elective I Artificial Intelligence & Machine Learning Introduction to E-Governance Robotics	OEC	3	3	100	70	20	5	5
	PRACTICAL								
6	Microprocessor & Microcontroller Lab	PCC	1	2	100	70	20	5	5
7	Fundamentals of Power Electronics Lab	PCC	1	2	50	35	5	5	5
8	Summer Internship-II(4-6 Weeks)	PROJ	3	0	100	70	30	0	0
9	Major Project-I (Project to be carried over to next semester)	PROJ	1	2	50	35	15	0	0
	TOTAL		**23**	**23**	**800**	**560**	**170**	**35**	**35**

SEMESTER VI

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Building Electrification	PCC	4	4	100	70	20	5	5
2	Entrepreneurship and Start –ups	HSC	4	4	100	70	20	5	5
3	Open Elective II Internet of Things Project Management Operations Research	OEC	3	3	100	70	20	5	5
4	Open Elective III Economic Policies in India Energy Efficiency and Audit	OEC	3	3	100	70	20	5	5
5	Indian constitution	AC	0	2	50	35	10	2.5	2.5
	PRACTICAL								
6	Seminar	PROJ	1	2	50	35	15	0	0
7	Major Project-II	PROJ	3	6	100	70	30	0	0
	TOTAL		**18**	**24**	**600**	**455**	**135**	**22.5**	**22.5**

Distribution of Credit across 6 semesters:

Sl. No	Type of Paper	No. of Paper	Total Credit
1	Humanities and Social Sciences Courses **(HSC)**	3	8
2	Basic Science courses**(BSC)**	6	18
3	Engineering Science courses **(ESC)**	8	18
4	Professional core courses (**PCC)**	20	48
5	Professional Elective courses**(PEC)**	4	12
6	Open Electives Courses (**OEC)**	3	9
7	Project work, seminar and internship in industry or elsewhere**(PROJ)**	6	12
8	Audit Courses [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Knowledge Tradition]**(AC)**	3	(non-credit)
	Total	53	125

CIA – Continuous Internal Assessment – Based on Projects / Assignment during the semester

Note:

AICTE Activity Points to be earned by students admitted to Diploma program (For more details refer to Chapter 6, AICTE, Activity Point Program, Model Internship Guidelines):

Every regular student, who is admitted to the 3 year Diploma program, is required to earn 75 activity points in addition to the total credits earned for the program. Students entering 3 years Diploma Program through lateral entry are required to earn 50 activity points in addition to the total credits earned for the program.
The activity points earned by the student shall be reflected on the students 6th Semester grade card.
The activities to earn the points can be spread over the duration of the course. However, minimum prescribed duration should be fulfilled.
Activity Points (non-credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression.
Incase student fail to earn the prescribed activity points, Sixth semester Grade Card shall be issued only after earning the required activity Points.
Students shall be eligible for the award of degree only after the release of the Six Semester grade card.

There are two groups (A & B) in semester 1 & 2. The Group division will be decided by The Dean SoE& IT before commencement of classes*

ARKAJAIN University, Jharkhand
School of Engineering & IT
Department of Engineering
Faculty – Diploma in Electrical & Electronics Engineering (DEEE)
PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

PROGRAM OUTCOMES

After completing this undergraduate program, a learner:

[PO.1]. Basic knowledge: An ability to apply knowledge of basic mathematics, science and engineering to solve the engineering problems

[PO.2]. Discipline knowledge: An ability to apply discipline - specific knowledge to solve core and/or applied engineering problems.

[PO.3]. Experiments and practice: An ability to plan and perform experiments and practices and to use the results to solve engineering problems.

[PO.4]. Engineering Tools: Apply appropriate technologies and tools with an understanding of the limitation.

[PO.5]. The engineer and society: Demonstrate knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering practice.

[PO.6]. Environment and sustainability: Understand the impact of the engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development..

[PO.7]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

[PO.8]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse/multidisciplinary teams.

[PO.9]. Communication: An ability to communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

[PO.10]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the context of technological changes.

PROGRAM SPECIFIC OUTCOMES

[PSO.1]. Students will able to design, test and trouble shoot of electrical & electronics circuits, equipment and appliances.

[PSO.2]. Apply latest techniques, skills and modern engineering tools of industrial and system engineering throughout their professional careers in the fields of Electrical & Electronics.

Subject: Microprocessor & Microcontroller

Code:DIP15133

4 Credits | Semester V

A. Introduction:

- To understand & maintain different types of microprocessor & microcontroller based systems.
- To emphasis on the hardware features of Microprocessor 8085, 8086 and Microcontroller 8051 with their functions
- To understand commonly used peripheral / interfacing

B. Course Outcomes: At the end of the course, students will be able to

[CO1]Tell the feature of the 8085 microprocessor, Hardware Architecture and PIN diagram.

[CO2] Demonstrate programming proficiency using the various addressing modes and data transfer instructions of 8085 microprocessor.

[CO3]Develop the knowledge on architecture and programming of Microcontroller 8051.

[CO4] Analyze the interrupts handling and demonstrate peripherals applications in different IC.

[CO5] Interpret the programming concepts to interface the hardware units with Microprocessor and Microcontroller

[CO6]Design microcontrollers based equipments/projects and interface them with various modules

C. Assessment Plan:

Criteria	**Description**	**Maximum Marks**
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

INTRODUCTION TO COMPUTER ARCHITECTURE: Architecture of a typical Microprocessor**,** Bus configuration, The CPU module, ROM & RAM families, Introduction to assembly language & machine language programming, Instructionset of typical microprocessor (e.g. 8085).

PERIPHERAL OF 8085: Subroutine & stack, Timing diagram, Memory Interfacing, Interfacing input output- port, Interrupt & interrupt handling, Serial & parallel data transfer scheme, Direct memory access, Programmable interval timer

INTRODUCTION TO MICROCONTROLLERS & ITS ARCHITECTURE: Evolution of Microcontrollers, Block diagram of Microcomputer, elements of Microcomputer, types of buses, Von Neuman and Harward Architecture, Compare Microprocessor and Microcontrollers, Need of Microcontroller, Family of Microcontrollers and their specifications Versions of Microcontroller 8951, 89C1051, 89C2051, 89C4051 with their specifications and comparison, Block diagram of 8051, function of each block, Pin diagram, function of each pin, Internal RAM structure, Reset and clock circuit, Various registers and SFRs of 8051

8051 INSTRUCTION SET AND PROGRAMS: Overview of 8051 instruction set, Various addressing modes, Classification of instructions, Data transfer instructions, Arithmetic instructions, Logical instructions, Branching instructions, Bit manipulation instructionsStack, subroutine and interrupt related instructions, Software development tools like Editor, Assembler, Linker, Loader and Hex converters, Role of various files created at various levels in running an, Assembly program using simulators like RIDE or KEIL, Various directives of Assembly language programming, Introduction to C language Programming, comparison between Assembly language & C-language programming

8051 INTERNAL PERIPHERALS AND RELATED PROGRAMS: I/O ports- List, diagram, read write operation, instructions and related SFRs, Timers/counters – list, related SFRs, programming modes, operations with diagram. Serial communication- Basics of serial communication, baud rate, related SFRs, programming modes, operations with diagram. Interrupts- related SFRs, types, operations with diagram. Power saving operation- modes, related SFR. Introduction to PIC16F877 microcontroller.

E. TEXT BOOKS

T1.Deshmukh, Ajay, Microcontroller Theory and Application, McGraw Hill., New Delhi, ISBN-9780070585959

T2.Kamal, Raj, Microcontroller Architecture Programming, Interfacing and System Design, Pearson Education India, Delhi, ISBN: 9788131759905

T3.Mathur; Panda, Microprocessors and Microcontrollers, PHI Learning, New Delhi, ISBN:978-81-203-5231-5

T4.Krishna Kant, Microprocessors and Microcontrollers: Architecture programming and System Design, PHI Learning, New Delhi, ISBN:978-81-203-4853-0

F. REFERENCE BOOKS

R1.Microprocessor architecture, programming & application with 8085, R. Gaonker, Penram International.

R2.Microprocessor & Interfacing, D.V. Hall, Mc Graw Hill.

R3.An introduction to the Intel family of Microprocessors, James L. Antonakos, Pearson Education.

R4.Advanced Microprocessors and Peripheral, Ajay Kumar Ray, Koshor M Bhurchandi, Tata MC Graw hill Publishing Company.
R5.Kenneth, Ayala, 8051 Microcontroller Architecture Programming and Application, PHI Learning, New Delhi,ISBN: 978-1401861582
R6.Mazidi, Mohmad Ali; Mazidi, Janice Gelispe; MckinlayRoline D., The 8051 Microcontroller and Embedded system, Pearson Education, Delhi, ISBN 978-8177589030
R7.Pal, Ajit, Microcontroller Principle and Application, PHI Learning, New Delhi, ISBN13: 978-81-203-4392-4

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Tell the feature of the 8085 microprocessor, Hardware Architecture and PIN diagram.	2	2		2							2	1
[CO2]	Demonstrate programming proficiency using the various addressing modes and data transfer instructions of 8085 microprocessor.			2	2	3						2	
[CO3]	Develop the knowledge on architecture and programming of Microcontroller 8051.	2										2	
[CO4]	Analyze the interrupts handling and demonstrate peripherals applications in different IC.	2		2	2	2							2
[CO5]	Interpret the programming concepts to interface the hardware units with Microprocessor and Microcontroller	2	2	1	2							2	
[CO6]	Design microcontrollers based equipments/projects and interface them with various modules			2					2	2			3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Fundamentals of Power Electronics

Code: DIP15226

4 Credits | Semester V

A. Introduction:

- To understand & maintain the proper functioning of power electronic devices.
- To understand application based different power electronics based circuits.
- To understand functioning of various types of rectifiers & converters.

B. Course Outcomes: At the end of the course, students will be able to

[CO1]Select power electronic devices for specific applications.

[CO2] Understand how to maintain the performance of Thyristors.

[CO3]Develop methods for troubleshoot turn-on and turn-off circuits of Thyristors.

[CO4]Analyze& maintain phase controlled rectifiers.

[CO5]Assess different power semiconductor switches.

[CO6]Design & maintain different industrial control circuits.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

POWER ELECTRONIC DEVICES: Introduction to Power electronic devices, Power transistor: construction, working principle, V-I characteristics and uses. IGBT: Construction, working principle, V-I characteristics and uses. Concept of single electron transistor (SET) - aspects of Nano- technology.

THYRISTOR FAMILY DEVICES: SCR: construction, two transistor analogy, types, working and characteristics.SCR mounting and cooling. Types of Thyristors: SCR, LASCR, SCS, GTO, UJT, PUT, DIAC and TRIAC. Thyristor family devices: symbol, construction, operating principle and V-I characteristics. Protection circuits: over-voltage, over-current, Snubbed, Crowbar.

TURN-ON AND TURN-OFF METHODS OF THYRISTORS: SCR Turn-On methods: High Voltage thermal triggering, Illumination triggering, dv/dt triggering, Gate triggering.Gate trigger circuits – Resistance and Resistance-Capacitance circuits. SCR triggering using UJT, PUT: Relaxation Oscillator and Synchronized , Pulse transformer and opto-coupler based triggering. SCR Turn-Off methods: Class

A- Series resonant commutation circuit, Class B-Shunt Resonant commutation circuit, Class C-Complimentary Symmetry commutation circuit, Class D –Auxiliary commutation, Class E- External pulse commutation, Class F- Line or natural commutation.

PHASE CONTROLLED RECTIFIERS: Phase control: firing angle, conduction angle, Single phase half controlled, full controlled and midpoint controlled rectifier with R, RL load: Circuit diagram, working, input- output waveforms, equations for DC output and effect of freewheeling diode. Different configurations of bridge controlled rectifiers: Full bridge, half bridge with common anode, common cathode, SCRs in one arm and diodes in another arm.

INDUSTRIAL CONTROL CIRCUITS: Applications: Burglar's alarm system, Battery charger using SCR, Emergency light system, Temperature controller using SCR and; Illumination control / fan speed control TRIAC. SMPS. UPS: Offline and Online, SCR based AC and DC circuit breakers.

E. TEXT BOOKS

T1.Rashid , Muhammad, Power Electronics Circuits Devices and Applications, Pearson Education India, Noida, ISBN: 978-0133125900.
T2. Singh, M. D. and Khanchandani, K.B., Power Electronics, Tata McGraw Hill Publishing Co. Ltd, New Delhi, 2008 ISBN: 9780070583894.
T3. Zbar, Paul B., Industrial Electronics: A Text –Lab Manual, McGraw Hill Publishing Co. Ltd., New Delhi, ISBN: 978-0070728226.

F. REFERENCE BOOKS

R1. P.S. Bhimra, Power Electronics, Khanna Publication pvt ltd, ISBN-9788174092793.
R2. Ramamurthy M., An Introduction to Thyristors and their applications, East-West Press Pvt. Ltd., New Delhi, ISBN: 8185336679.
R3. Sugandhi, Rajendra Kumar and Sugandh, Krishna Kumar, Thyristors: Theory and Applications, New Age International (P) ltd. Publishers, New Delhi, ISBN: 978-0-85226-852-0.
R4. Bhattacharya, S.K., Fundamentals of Power Electronics, Vikas Publishing House Pvt. Ltd. Noida. ISBN: 978-8125918530.
R5. Jain &Alok , Power Electronics and its Applications, Penram International Publishing (India) Pvt. Ltd, Mumbai, ISBN: 978-8187972228.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Select power electronic devices for specific applications.				2	2	2						2
[CO2]	Understand how to maintain the performance of Thyristors.	2	2									2	
[CO3]	Develop methods for troubleshoot turn-on and turn-off circuits of Thyristors.	2	2	2	2							2	
[CO4]	Analyze& maintain phase controlled rectifiers.	2	2	2	2							2	
[CO5]	Assess different power semiconductor switches.				2	2	2						2
[CO6]	Design & maintain different industrial control circuits.	2			2	2	3						2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Switchgear & Protection

Code:DIP15245

3 Credits | Semester V

A. Introduction:

- To understand & maintain switchgear and protection schemes used in electrical power systems.
- To emphasis on various causes of faults & how to avoid occurrence of faults.
- To understand the working & application of various switchgears & relays.

B. Course Outcomes: At the end of the course, students will be able to

[CO1]Identify various types of faults in power system.

[CO2] Select suitable switchgears for different applications.

[CO3]Interpretvarious types of existingcircuit breakers, their design and constructionaldetails.

[CO4]Test the performance of different protective relays.

[CO5]Assess the protection systems of alternators and transformers.

[CO6]Anticipate protection schemes for motors, transmission lines & other power system devices.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

BASICS OF PROTECTION: Necessity, functions of protective system. Normal and abnormal conditions. Types of faults and their causes. Protection zones and backup protection, Current Transformer & Potential Transformers, Short circuit fault calculations in lines fed by generators through transformers, Need of current limiting reactors and their arrangements.

CIRCUIT INTERRUPTION DEVICES: Isolators- Vertical break, Horizontal break and Pantograph type. HRC fuses – Construction, working, characteristics and applications. Arc formation process, methods of arc extinction (High resistance and Low resistance), Arc voltage, Recovery voltage, Re-striking voltage, RRRV. HT circuit breakers (Sulphur-hexa Fluoride (SF6), Vacuum circuit breaker) - Working, construction, specifications and applications. L.T. circuit breaker (Air circuit breakers (ACB), Miniature circuit breakers (MCB), Moulded case circuit breakers (MCCB) and Earth leakage circuit

breaker (ELCB)) - Working and applications. Selection of LT and HT circuit breakers (ratings), Selection of MCCB for motors, Gas insulated switchgear.

PROTECTIVE RELAYS: Fundamental quality requirements: Selectivity, Speed, Sensitivity, Reliability, Simplicity, Economy. Basic relay terminology- Protective relay, Relay time, Pick up, Reset current, current setting, Plug setting multiplier, Time setting multiplier. Protective relays: Classification, principle of working, construction and operation of – Electromagnetic (Attracted armature type, Solenoid type, Watt-hour meter type) relay, Thermal relay. Block diagram and working of Static relay. Over current relay-Time current characteristics, Microprocessor based over current relays: Block diagram, working. Distance relaying- Principle, operation of Definite distance relays. Directional relay: Need and operation. Operation of current and voltage differential relay.

PROTECTION OF ALTERNATOR AND TRANSFORMER: Alternator Protection- Faults, Differential protection Over current, earth fault, overheating and field failure, protection, Reverse power protection. Transformer Protection- Faults, Differential, over current, earth fault, over heating protection, Limitations of differential Protection, Buchholz relay: Construction, operation, merits and demerits.

PROTECTION OF MOTORS, BUS-BAR AND TRANSMISSION LINE MOTOR: Motor Protection: Faults. Short circuit protection, Overload protection, Single phase preventer. Faults on Bus bar and Transmission Lines, Bus bar protection: Differential and Fault bus protection. Transmission line: Over current, Distance and Pilot wire protection.

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E. TEXT BOOKS

T1.Veerapan, N. Krishnamurty, S. R., Switchgear and Protection, S .Chand and Co., New Delhi, ISBN: 978-81-2193-212-7.

T2.Ram, Badri; Vishwakarma D. N., Power System Protection and Switchgear, McGraw-Hill, New Delhi. ISBN : 978-07-107774-X

F. REFERENCE BOOKS

R1.Mehta V. K ;Rohit Mehta, Principles of Power System, S .Chand and Co., New Delhi., ISBN: 978-81-2192-496-2.

R2.Rao Sunil S., Switchgear and Protection, Khanna Publishers, New Delhi, ISBN: 978-81-7409-2323.

R3.Singh, R. P., Switchgear and Power System Protection, PHI Learning, New Delhi, ISBN: 978-81-203-3660-5.

R4.Gupta. J. B.. Switchgear and Protection, S. K. Kataria and Sons, New Delhi, ISBN: 978-93-5014-372-8.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Identify various types of faults in power system.	3	2		2							2	2
[CO2]	Select suitable switchgears for different applications.	2	2	2								2	
[CO3]	Interpret various types of existing circuit breakers, their design and constructional details.	2	2	2	2							1	
[CO4]	Test the performance of different protective relays.		2	2	2								2
[CO5]	Assess the protection systems of alternators and transformers.		2				2	3				2	
[CO6]	Anticipate protection schemes for motors, transmission lines & other power system devices.		2					2			2	2	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Wind Power Technologies

Code:DIP15250

3 Credits | Semester V

A. Introduction:

- To understand & maintain large wind power plants and small wind turbines.
- To emphasis on Optimization of the aerodynamic and electric control of large wind power plants.
- To understand common faults of large wind power plants.

B. Course Outcomes: At the end of the course, students will be able to

[CO1]Identify the various types of wind power plants and their auxiliaries.

[CO2] Explain the normal working of large wind turbines.

[CO3]Simulate software of wind power plantfor human machine interface.

[CO4]Analyze varioustroubleshooting techniques for common faults of large wind power plants.

[CO5]Reframe the normal working of small wind turbines.

[CO6]Formulate the aerodynamic and electric control of large wind power plants

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

WIND ENERGY AND WIND POWER PLANTS: Wind power scenario in the world and India, Characteristics of Wind Energy: Wind movement, wind profile, roughness, effects of obstacles in wind path. Types of Wind Power Plants (WPPs): Small and large wind turbines; Horizontal and Vertical axis; Upwind and Downwind, One, Two and Three blades; constant and variable Speed; Geared, Direct-Drive and Semi-Geared (Hybrid) WPPs; WECS, WEGs, WTs, WPPs, WPP Tower Types: Lattice; tubular: steel, concrete, hybrid, ladders, cables. WPP substation: Switchgear, transformers, inside layouts of Electric electronic panels at block level.

CONSTRUCTION AND WORKING OF LARGE WIND POWER PLANTS: Wind Turbine Terminologies: Cut-in, cut-out and survival wind speeds, Threshold wind speeds, rated power, nominal power, Wind Power Curve, Major parts and Functions of WPP: Rotor blades, hub, nacelle, tower, electric

sub-station, nacelle layouts of Geared, Direct-Drive and Semi-Geared WPPs, Main shaft, gearbox, electric generator, electronic control panels, Rotation principles: Drag and Lift principle, thrust and torque of wind turbine rotor. Different types of Sensors: Anemometer, wind vane, rpm sensors of main shaft and generator, temperature sensors of nacelle, gearbox and generator; cable untwisting and vibration sensors. Different types of Actuators: Electric and hydraulic pitching and yawing mechanisms, cable untwisting and braking mechanisms.

AERODYNAMIC CONTROL, ELECTRIC GENERATORS AND GRID CONNECTION: Aerodynamic Control of WPPs: Stall Pitch and Active Stall. Braking mechanisms of large WPPs. Electric Generator Types: Working of Squirrel-Cage rotor Induction Generator (SCIG), Wound-Rotor Induction Generator (WRIG), Doubly-Fed Induction Generator (DFIG), wound rotor and permanent magnet synchronous generators. Electric grid connection of WPPs: Local Impacts and system wide impact

MAINTENANCE OF LARGE WIND POWER PLANTS: General maintenance of WPPs: preventive maintenance schedule of actuators such as yaw control, pitch control, braking mechanisms and sensors; oiling and greasing; electric and electronic equipment related; tower related; minor repairs, some tips, Scheduled Maintenance: of Stall and Pitch and Active Pitch controlled WPPs, Unscheduled maintenance: operational factors, design faults, wear and tear of components, spurious trip, Major repairs, Software related, warranty and insurance related issues

MAINTENANCE OF LARGE WIND POWER PLANTS: General maintenance of WPPs: preventive maintenance schedule of actuators such as yaw control, pitch control, braking mechanisms and sensors; oiling and greasing; electric and electronic equipment related; tower related; minor repairs, some tips, Scheduled Maintenance: of Stall and Pitch and Active Pitch controlled WPPs Unscheduled maintenance: operational factors, design faults, wear and tear of components, spurious trip, Major repairs, Software related, warranty and insurance related issues

CONSTRUCTION AND WORKING SMALL WIND TURBINES: Types and working of different type of small wind turbines (SWT): Classification: Horizontal and Vertical axis, Upwind and Downwind, One, Two and Three blades; Constant and Variable Speed; Direct-Drive and Geared; braking of SWTs, Parts of SWTs: Rotor, generator, gearbox, tower, electric control panel, tale vane, anemometer, wind vane, temperature and rpm sensors. Working SWTs: Direct-drive and Geared. Electrical generators in SWTs: permanent magnet synchronous generators, induction generators, SWT towers: Lattice tubular type, hydraulic towers, ladders, cables, Maintenance of Small Wind Turbines: Small wind turbine assembly, Installation of different types of small wind turbines (SWT): tubular and lattice types. SWT Routine maintenance: Tips; Preventive maintenance schedule of: braking mechanisms, sensors; oiling and greasing related; electric and electronic equipment related; tower related; software related, minor repairs, Power electronic devices and converters in different types of SWTs: thyristors, power transistors, Common electrical and mechanical faults in SWTs

E. TEXT BOOKS

T1.Bhadra, S.N., Kastha, D., Banerjee, S, Wind Electrical Systems installation; Oxford University Press, New Delhi, ISBN: 9780195670936
T2.O.P. Gupta, Energy Technology, Khanna Publishing House, New Delhi (ISBN: 978-93-86173-683)

F. REFERENCE BOOKS

R1.Hau, Erich: Wind TurbinesSpringer-Verlag, Berlin Heidelberg, Germany, ISBN: 978-3-642-27150-2
R2.Rachel, Sthuthi, Earnest, Joshua; -Wind Power Technologies, PHI Learning, New Delhi, ISBN: 978-93-88028-49- 3; E-book 978-93-88028-50-9
R3.Gipe, Paul: Wind Energy Basics, Chelsea Green Publishing Co; ISBN: 978-1603580304
R4.Wizelius, Tore, Earnest, Joshua - Wind Power Plants and Project Development, PHI Learning, New Delhi, ISBN:978-8120351660

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Identify the various types of wind power plants and their auxiliaries.	2	2	1								1	1
[CO2]	Explain the normal working of large wind turbines.	2	3		2							2	
[CO3]	Simulate software of wind power plantfor human machine interface.		2	2		2							2
[CO4]	Analyze varioustroubleshooting techniques for common faults of large wind power plants.	2	2	1								2	2
[CO5]	Reframe the normal working of small wind turbines.	2	2				2				2		2
[CO6]	Formulate the aerodynamic and electric control of large wind power plants		1			2	2					2	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Electric Vehicles

Code: DIP15222

3 Credits | Semester V

A. Introduction:

- To To understand & maintain electric vehicles.
- To know the various performance characteristics of EV motors.
- To understand different converter circuits used in EV main circuit..

B. Course Outcomes: At the end of the course, students will be able to

[CO1]Identify the salient features of Hybrid electric vehicles.

[CO2] Classify the Dynamics of hybrid and Electric vehicles.

[CO3]Employ the DC-DC converters in EV applications.

[CO4]Correlate the DC-AC converters in EV and HEV applications.

[CO5]Predict performance characteristics ofautomobile power train.

[CO6]Select the batteries for EV applications.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

INTRODUCTION TO HYBRID ELECTRIC VEHICLES: Evolution of Electric vehicles, Advanced Electric drive vehicle technology Vehicles: Electric vehicles (EV), Hybrid Electric drive (HEV), Plug in Electric vehicle (PIEV), Components used Hybrid Electric Vehicle, Economic and environmental impacts of Electric hybrid vehicle. Parameters affecting Environmental and economic analysis. Comparative study of vehicles for economic, environmental aspects

DYNAMICS OF HYBRID AND ELECTRIC VEHICLES: General description of vehicle movement, Factors affecting vehicle motion- Vehicle resistance, tyre ground adhesion, rolling resistance, aerodynamic drag, equation of grading resistance, dynamic equation, Drive train configuration, Automobile power train, classification of vehicle power plant, Performance characteristics of IC engine,

electric motor, need of gear box, Classification of motors used in Electric vehicles, Basic architecture of hybrid drive trains, types of HEVs, Energy saving potential of hybrid drive trains, HEV Configurations- Series, parallel, Series-parallel, complex.

DC-DC CONVERTERS FOR EV AND HEV APPLICATIONS: EV and HEV configuration based on power converters, Classification of converters –unidirectional and bidirectional, Principle of step down operation, Boost and Buck- Boost converters, Principle of Step-Up operation, Two quadrant converters; multi quadrant converters

DC-AC INVERTER & MOTORS FOR EV AND HEVS: DC-AC Converters, Principle of operation of half bridge DC-AC inverter (R load, R-L load). Single phase Bridge DC-AC inverter with R load, R-L load. Electric Machines used in EVs and HEVs, principle of operation, working & control. Permanent magnet motors, their drives, switched reluctance motor, Characteristics and applications of above motors

BATTERIES: Battery Parameters, types of batteries, Battery Charging, alternative novel energy sources- solar photovoltaic cells, fuel cells, super capacitors, flywheels, Control system for EVs and HEVs, overview, Electronic control unit ECU, Schematics of hybrid drive train, control architecture, Regenerative braking in EVs

E. TEXT BOOKS

T1.Rashid, M. H. Power Electronics: Circuits, Devices and Applications, 3rd edition, Pearson,
T2.Moorthi, V. R. Power Electronics: Devices, Circuits and Industrial Applications, Oxford University Press
T3.Krishnan, R. Electric motor drives: modelling, analysis, and control, Prentice Hall
T4.Krause, O. P. ; C. Wasynczuk, S. D. Sudhoff, Analysis of electric machinery, IEEE Press

F. REFERENCE BOOKS

R1.A.K. Babu, Electric & Hybrid Vehicles, Khanna Publishing House, New Delhi (Ed. 2018)
R2.Fuhs, A. E. Hybrid Vehicles and the Future of Personal Transportation, CRC Press,
R3.Gianfranco, Electric and Hybrid Vehicles: Power Sources, Models, Sustainability, Infrastructure And The Market, Pistoia Consultant, Rome, Italy,
R4.Ehsani, M. Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press
R5.Husain, I. Electric and Hybrid Electric Vehicles, CRC Press
R6.Chan C. C. and K. T. Chau, Modern Electric Vehicle Technology, Oxford Science Publication,
R7.Lechner G. and H. Naunheimer, Automotive Transmissions: Fundamentals, Selection,Design and Application, Springer

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Indentify the salient features of Hybrid electric vehicles.	2	3		1							1	1
[CO2]	Classify the Dynamics of hybrid and Electric vehicles.	1	2									2	1
[CO3]	Employ the DC-DC converters in EV applications	2	2				1					2	
[CO4]	Correlate the DC-AC converters in EV and HEV applications.	2	2	2								2	2
[CO5]	Predict performance characteristics ofautomobile power train.	2	1				2				2	2	2
[CO6]	Select the batteries for EV applications.		2		2		3						2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Industrial Automation and Control

Code:DIP15230

3 Credits | Semester V

A. Introduction:

- To understand & maintain Industrial Automation Systems.
- To gain knowledge regarding working for PLC, HMI & SCADA
- To understand commonly used peripheral / interfacing.
- To get acquainted with PLC programming

B. Course Outcomes: At the end of the course, students will be able to

[CO1]Describe working of various blocks of basic industrial automation system

[CO2] Illustrate the interfacing of I/O devices with the PLC modules.

[CO3]Develop PLC ladder programs for various applications.

[CO4]Select the suitable motor drives for different applications

[CO5]Summarize Distributed control system and SCADA system

[CO6]Design simple SCADA applications like Traffic light control, water distribution, pipeline control etc.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

INTRODUCTION TO INDUSTRIAL AUTOMATION: Automation: Need and benefits, Types of automation system: Fixed, Programmable, Flexible, Different systems used for Industrial automation: PLC, HMI, SCADA, DCS, Drives.

PLC FUNDAMENTALS: Evolution of PLC, Building blocks of PLC**:** CPU, Memory organization, Input- output modules (discrete and analog), Specialty I/O Modules, Power supply. Fixed and Modular PLC and their types, Redundancy in PLC module, I/O module selection criteria, Interfacing different I/O devices with appropriate I/O modules

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PLC PROGRAMMING AND APPLICATIONS: PLC I/O addressing, PLC programming Instructions**:** Relay type instructions, Timer instructions: On delay, off delay, retentive, Counter instructions: Up, Down, High speed, Logical instructions, Comparison Instructions, Data handling Instructions, Arithmetic instructions. PLC programming language**:** Functional Block Diagram (FBD), Instruction List. Structured text, Sequential Function Chart (SFC), Ladder Programming. Simple Programming examples using ladder logic**:** Language based on relay, timer counter, logical, comparison, arithmetic and data handling instructions. PLC Based Applications: Motor sequence control, Traffic light control, Elevator control, Tank Level control, Conveyor system, Stepper motor control, Reactor Control Gate trigger circuits – Resistance and Resistance-Capacitance circuits

ELECTRIC DRIVES AND SPECIAL MACHINES: Electric drives: Types, functions, characteristics, four quadrant operation. DC and AC drive controls: V/F control, Parameters, direct torque control. Drives: Specifications, Applications- Speed control of AC motor /DC Motor

SUPERVISORY CONTROL AND DATA ACQUISITION SYSTEM (SCADA): Introduction to SCADA: Typical SCADA architecture/block diagram, Benefits of SCADA, Various editors of SCADA, Interfacing SCADA system with PLC: Typical connection diagram, Object Linking & embedding for Process Control (OPC) architecture, Steps in Creating SCADA Screen for simple object, Steps for Linking SCADA object (defining Tags and Items) with PLC ladder program using OPC. Applications of SCADA: Traffic light control, water distribution, pipeline control.

E. TEXT BOOKS

T1.Stenerson Jon, Industrial automation and Process control, PHI Learning, New Delhi, 2003, ISBN: 9780130618900

T2.Mitra, Madhuchandra; Sengupta, Samarjit, Programmable Logic Controllers and Industrial Automation - An introduction, Penram International Publication, 2015, ISBN: 9788187972174

T3.Boyar, S. A., Supervisory Control and Data Acquisition, ISA Publication, USA, ISBN: 978-1936007097

T4.Bailey David ; Wright Edwin, Practical SCADA for industry, Newnes (an imprint of Elsevier), UK 2003, ISBN:0750658053

F. REFERENCE BOOKS

R1.Dunning, G., Introduction to Programmable Logic Controllers, Thomson /Delmar learning, New Delhi, 2005,ISBN 13 : 9781401884260

R2.Jadhav, V. R., Programmable Logic Controller, Khanna publishers, New Delhi, 2017, ISBN : 9788174092281

R3.Petruzella, F.D., Programmable Logic Controllers, McGraw Hill India, New Delhi, 2010, ISBN: 9780071067386

R4.Hackworth, John; Hackworth, Federic, Programmable Logic Controllers, PHI Learning, New Delhi, 2003, ISBN : 9780130607188

R5.Stenerson Jon, Industrial automation and Process control, PHI Learning, New Delhi, 2003, ISBN: 9780130618900

R6.Mitra, Madhuchandra; Sengupta, Samarjit, Programmable Logic Controllers and Industrial Automation - An introduction, Penram International Publication, 2015, ISBN: 9788187972174
R7.Boyar, S. A., Supervisory Control and Data Acquisition, ISA Publication, USA, ISBN: 978-1936007097
R8.Bailey David ; Wright Edwin, Practical SCADA for industry, Newnes (an imprint of Elsevier), UK 2003, ISBN:0750658053

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Describe working of various blocks of basic industrial automation system	2	2		1							1	2
[CO2]	Illustrate the interfacing of I/O devices with the PLC modules.	2	3	2	2							2	1
[CO3]	Develop PLC ladder programs for various applications	1	2	3									2
[CO4]	Select the suitable motor drives for different applications	2	2	2	2		2						2
[CO5]	Summarize Distributed control system and SCADA system				2	2						1	2
[CO6]	Design simple SCADA applications like Traffic light control, water distribution, pipeline control etc.		2		2		3				2	2	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

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Subject: Communication Technologies

Code: DIP15218

2 Credits | Semester V

A. Introduction:

- To make use of relevant data communication technique.
- To make use OSI model and relevant data communication protocols for establishing a communication terminology.
- To understand digital modulation techniques

B. **Course Outcomes:** At the end of the course, students will be able to

[CO1]Identify the different types of data communication equipment and techniques.

[CO2] Cite relevant digital modulation techniques.

[CO3] Interpret the specifications of the data communication media.

[CO4] Analyze the fiber optics networks for data communication.

[CO5] Assess wireless network environment.

[CO6]Develop expertise on Digital communication techniques

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

DATA COMMUNICATION AND MODULATION: Block diagram of communication system, Types of communication system: synchronous and asynchronous, simplex, half-duplex, Full duplex, serial and parallel communication, Classification of communication technique: AM, FM, & PM on the basis of definition, waveform, bandwidth, modulation index, Modulation and demodulation: Block diagram of AM, FM and PM, Pulse Modulation: Block diagram for waveform generation of PAM, PWM & PPM, working principle, advantages, disadvantages and applications. Advantagesof pulse modulation over AM and FM.

DIGITAL MODULATION TECHNIQUES: Digital Communication: Block diagram and working principle, waveforms, strength and limitations, Sampling process Nyquist sampling

theorem, quantization process, quantization error, quantization noise, PCM: Block diagram, working principle, waveforms, advantages, disadvantages, application of PCM., Principle of ASK, PSK, FSK. Application of ASK, PSK, FSK

DATA COMMUNICATION MEDIA: Baud rate, Bit rate, types of errors in data communication and error correction techniques.Types of communication media and frequency band of operation, Guided media: Types of cable-twisted pair cable, co-axial cable, fiber optic cable, Unguided media: Microwave communication, Infrared communication.

FIBRE OPTICS: Introduction to Fiber optic communication, Strength and limitations of fiber optic system, Light propagation : reflection, refraction, Snell's law, Light propagation through cable: Mode of propagation, index profile, Fibre optic cables: cable construction, fibre optics cable modes, single mode, step index fibre, multimode index fibre, multimode graded index fibre, fibre cable losses., Light source and Detector: Light emitting diode (LED), Photo Transistor, Laser diode, optocoupler.

DATA COMMUNICATION PROTOCOLS AND INTERFACING STANDARD: OSI (Open Systems Interconnection) Reference model, Introduction to protocol, FTP, SMTP, TCP/IP, UDP. LAN standards, Introduction to IEEE Standards for LAN and GPIB, RS-232 standard: Introduction, and working principle, Network topologies, introduction star, ring, tree, bus, mesh, hybridBasic functions of networking devices: modem, switches, routers, repeaters, hubs, bridges, gateway. Introduction to Wi-Fi and Wi- Max Bluetooth architecture and its layers, Universal serial bus (USB) architecture. Bluetooth and USB

E. TEXT BOOKS

T1.Agrawal, Govind P., Fiber Optic Communication System, Wiley; 4 edition ISBN :139780470505113

T2.Keiser, Gerd, Optical communications essentials, McGraw- Hill, New Delhi-2003, ISBN13:9780071412049

F. REFERENCE BOOKS

R1.Wayne Tomasi, Electronic Communication System, Prentice Hall of India, ISBN 13:9780130494924

R2.Reynders D., Steve Macky, Wright Edvin, Practical Industrial Data Communications, Newnes publication, ISBN 10:07506639523

R3.George F. Kennedy, Barnard Davis, Electronic Communication System, Tata McGraw Hill, , ISBN 13:9780074636824

R4.Forouzan B.A., Data Communication & Networking, McGraw Hill Education; 5 edition ISBN- 13: 0073376226-978
R5.Prasad K.V.K.K., Principles of Digital communication systems and computer networks, Dreamtech press, New Delhi, ISBN 13:9788177223620
R6.Tanenbaum, Andrew S.David J. Wetherall, Computer Networks, Pearson; 5 edition ISBN 13:9788121924252
R7.Kumar A.,Text Book of Communication Engineering, Umesh Publication, ISBN 13:978818114160
R8.A. Kumar,D. Manjunath, Joy Kuri, Communication Networking, Academic Press Publication ISBN 13:9780124287518
R9.Hemant Kumar Garg, Soni Manish, Electronic Communication & Data Communication, University Book House Private Ltd., ISBN 13:9788181980717
R10.Kao, Charles K., Optical Fiber Systems: Technology, Design, and Applications, Published by Mc-Graw-Hill Inc.,US ISBN 13: 9780070332775.

G. Course Articulation Matrix: (Mapping of Cos with Pos)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Identify the different types of data communication equipment and techniques.	2	3	2								1	1
[CO2]	Cite relevant digital modulation techniques.	2	2									1	1
[CO3]	Interpret the specifications of the data communication media.	2	2							2		2	1
[CO4]	Analyze the fiber optics networks for data communication.	2	2				2					2	
[CO5]	Assess wireless network environment.	2	2	2	2		2					1	2
[CO6]	Develop expertise on Digital communication techniques	2	2	2	2						2	1	2

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Electric Traction

Code:

3 Credits | Semester V

A. Introduction:

- To understand & maintain electric traction systems.
- To know the function of different components of the electric locomotive.
- To understand &maintain the signaling and supervisory control systems.

B. **Course Outcomes:** At the end of the course, students will be able to

[CO1]Describe Electric traction system in india.

[CO2]Discussthe power supply arrangements, like substation, feeding sectioning arrangements etc

[CO3] Interpret the traction layout and its systems.

[CO4] Analyze the different components of the electric locomotive.

[CO5]Evaluate the signaling and supervisory control systems.

[CO6]Structure the overhead equipment for electric traction

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

BASICS OF TRACTION: General description of Electrical Traction system in India. Advantages and Disadvantages of Electric Drive, Diesel Electric Drive, Battery Drive Problems associated with AC traction System and remedies for it. Voltage balance, current balance, production of harmonics, induction effects, Metro rail system, features

POWER SUPPLY ARRANGEMENTS: Constituents of supply system: - Substation: layout, list of equipment and their functions, Feeding post: list of equipment and their functions, Feeding and sectioning Arrangements, Sectioning and paralleling post, Sub sectioning and Paralleling post, Sub sectioning post, Elementary section. Major equipment at substation,

Miscellaneousequipment at control post or Switching station, Protection system for traction transformer and 25 Kv centenary construction

OVERHEAD EQUIPMENT: Different types of overhead equipment's, Pentagonal OHE Centenary Construction, Different Types of Centenary according to speed Limit, OHE Supporting Structure, Cantilever assembly diagram, Overhead system- Trolley collector, Bow collector, Pantograph Collector, Types and construction of pantograph

ELECTRIC LOCOMOTIVE: Classification and Nomenclature of Electric Locomotive, Block diagram of AC locomotive, Power Circuit of AC Locomotive, Equipment (List and Function only) used in auxiliary circuit of AC Locomotive, Loco bogie classification according to wheel arrangements, Maintenance of AC systems

TRACTION MOTORS, TRAIN LIGHTING, SIGNALLING & SUPERVISORY CONTROL: Desirable characteristics of traction motor, Types of motors used for traction with their characteristics and features, Control of motors used for traction and methods to control, Requirements of braking, types of braking: Electric braking, Regenerative braking, Systems of train lighting, Single battery, double battery parallel block system, SG, HOG, End on generation, Requirements of signaling systems, Types of signals, track circuits, Advantages of remote control, Systems of remote control, equipment and network , Metro rail-supply systems, advantages, schemes in India

E. TEXT BOOKS

T1. Suryanarayana N.V., New Age International Publishers, Reprint 2010
T2. Open Shaw Taylor, Orient Longman ltd., Utilisation of electrical energy.

F. REFERENCE BOOKS

R1.G.C. Garg, Utlization of Electric Power & Electric Traction, Khanna Book Publishing Co., New Delhi (ISBN: 978-93-86173-355) Revised Ed. 2018
R2. Gupta J.B., S.K.Kataria and Son, Utilization of Electric power and traction
R3. Partab H., Dhanpat Rai and Co,' Art and Science of Utilization of Electrical Energy
R4. Partab H., Dhanpat Rai and Co, Modern Electric Traction

G. Course Articulation Matrix: (Mapping of Cos with Pos)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Describe Electric traction system in india.	2	2									1	1
[CO2]	Discussthe power supply arrangements, like substation, feeding sectioning arrangements etc	2	2		2		2					1	2
[CO3]	Interpret the traction layout and its systems.	2	2	2	2							2	2
[CO4]	Analyze the different components of the electric locomotive.			2	2						2	1	2
[CO5]	Evaluate the signaling and supervisory control systems.		2	2			3					2	1
[CO6]	Structure the overhead equipment for electric traction	2	2	2			2			3		2	3

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Artificial Intelligence and Machine Learning

Code:DIP15215

3 Credits | Semester V

A. Introduction:

- To have a thorough understanding of classical and modern AI applications.
- To be able to implement a wide range of AI concepts using Prolog.
- To understand non-classical AI approaches such as genetic algorithms and neural networks.
- To be able to assess the potential of AI in research and real-world environments.

B. Course Outcomes: At the end of the course, students will be able to

[CO1]Visualize the concepts of artificial intelligence and how it is used in enabling machine to human like intelligence.

[CO2]Discuss the problems that are amenable to solution by AI methods.

[CO3] Have a good understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.

[CO4]Appraise the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.

[CO5] Assess and carry out an empirical evaluation of different algorithms on problem formalization, and state conclusions that evaluation supports

[CO6]Design and implement various machine learning algorithms in a range of real-world applications

C. Assessment Plan:

Criteria	**Description**	**Maximum Marks**
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

INTRODUCTION TO AI: History and foundations of AI, Problem solving: Uninformed and informed Search, Constraint Satisfaction Problems and Constrained Optimization problems (complete and incomplete techniques)

ADVERSARIAL SEARCH: Adversarial Search: Two players games, games with uncertainty, Decision support systems and technologies; Knowledge representation, Reasoning, Expert systems Contents (2/2), Planning (basics)

MACHINE LEARNING: Basics: Decision trees, Ensemble learning, Reinforcement learning, Evolutionary computation, Neural networks, Problems, data, and tools, Visualization

LINEAR REGRESSION: SSE, Gradient descent; closed form; normal equations; features, Fitting and complexity; training, validation, test data, and introduction to Matlab

CLASSIFICATION PROBLEMS: Decision boundaries, Probability and classification, Bayes optimal decisions, Naive Bayes and Gaussian class-conditional distribution

E. TEXT BOOKS

T1.EthemAlpaydin, Introduction to Machine Learning, Second Edition, http://mitpress.mit. edu/catalog/item/default.asp? ttype=2&tid=12012.

F. REFERENCE BOOKS

R1.Russell, Norvig, Artificial intelligence: A modern approach, 2nd edition. Pearson/Prentice Hall.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES							CORRELATION WITH PROGRAM SPECIFIC OUTCOMES				
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Visualize the concepts of artificial intelligence and how it is used in enabling machine to human like intelligence.		2		2							1	1
[CO2]	Discuss the problems that are amenable to solution by AI methods.		2			2		2				1	2
[CO3]	Have a good understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.	2	2		2							2	1
[CO4]	Appraise the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.	3	2	2	2							1	2
[CO5]	Assess and carry out an empirical evaluation of different algorithms on problem formalization, and state conclusions that evaluation supports	2	2	1	2							2	1
[CO6]	[CO6]Design and implement various machine learning algorithms in a range of real-world applications	2		2			2				2	2	1

1. **Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

Subject: Introduction to E-Governance

Code: DIP15235

3 Credits | Semester V

A. Introduction:

- To understand and appreciate the essence of e-Governance.
- To bring new introductory ideas and practices in e-Governance.
- To understand commonly used peripheral / interfacing.

B. **Course Outcomes:** At the end of the course, students will be able to

[CO1]Describe the basic concepts, terminology and technology of e-commerce/e-government.

[CO2] Understand the major federal and state laws and regulations impacting the evolution of e-government

[CO3] Develop skills to critically evaluate government web sites and eservices against current "best practice" principles and standards.

[CO4]Analyze new introductory ideas and practices followed in a selected number of e-Governance initiatives in India.

[CO5]Support the policy and social issues facing agencies in implementing e-government initiatives.

[CO6]Construct basic business case and government IT management concepts in preparing e-government proposals, plans or strategies.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

INTRODUCTION TO E-GOVERNANCE: Exposure to emerging trends in ICT for development, Understanding of design and implementation of e-Government projects e-governance lifecycle

RISE OF E-GOVERNANCE: Need for Government Process Re-engineering (GPR); National e-Governance Plan(NeGP) for India, SMART Governments & Thumb Rules

ARCHITECTURE OF E-GOVERNANCE: Architecture and models of e-Governance, including Public Private Partnership (PPP) , Need for Innovation and Change Management in e-Governance, Critical Success Factors; Major issue including corruption, resistance for change, e-Security and Cyber laws

E-GOVERNANCE PROJECTS IN INDIA: Focusing on Indian initiatives and their impact on citizens; Sharing of case studies to highlight best practices in managing e-Governance projects in Indian context, Visits to local e-governance sites (CSC, eSeva, Post Office, Passport Seva Kendra, etc) as part of Tutorials.

MINI PROJECT ON E-GOVERNANCE: Mini Projects by students in groups – primarily evaluation of various e-governance projects.

E. TEXT BOOKS

T1.https://negd.gov.in
T2.https://www.nisg.org/case-studies-on-e-governance-in-india

F. REFERENCE BOOKS

R1.Managing Transformation –Objectives to Outcomes. J Satyanarayana, Prentice Hall India
R2.The State, IT and Development. Kenneth Kenniston, RK Bagga and Rohit Raj Mathur, Sage Publications India Pvt Ltd.
R3.E-Government –The Science of the Possible. J Satyanarayana, Prentice Hall, India
R4.http://www.csi-sigegov.org/publications.php

G. Course Articulation Matrix: (Mapping of Cos with Pos)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Describe the basic concepts, terminology and technology of e-commerce/e-government.	1	1			2	3	2	2				
[CO2]	Understand the major federal and state laws and regulations impacting the evolution of e-government					3	2	3		2			
[CO3]	Develop skills to critically evaluate government web sites and eservices against current "best practice" principles and standards.				2	2	2	2	2	2			
[CO4]	Analyze new introductory ideas and practices followed in a selected number of e-Governance initiatives in India.					2		2	2	2			
[CO5]	Support the policy and social issues facing agencies in implementing e-government initiatives.					3			2	2			
[CO6]	Construct basic business case and government IT management concepts in preparing e-government proposals, plans or strategies.								2	2	2		

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Robotics

Code:DIP16273

3 Credits | Semester V

A. Introduction:

- To introduce the basic concepts, parts of robots and types of robots.
- To make the student familiar with the various drive systems for robot, sensors and their applications in robots and programming of robots.
- To select the robots according to its usage.
- To discuss about the various applications of robots, justification and implementation of robot.
- To conceptualize automation and understand applications of robots in various industries.

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B. Course Outcomes: At the end of the course, students will be able to

[CO1]Tabulate the robot anatomy, classification, characteristics of robot, advantages and disadvantages.

[CO2]Explain the various robotic actuators on hydraulic, pneumatic and electrical drives.

[CO3]Applyconcepts of robot kinematics and robot programming

[CO4]Analyze about various types of sensors and concepts on robot vision system

[CO5]Estimate various parameters that should be consideredinapplications of robots.

[CO6]Design work specific robot and program it with suitable programming language.

C. Assessment Plan:

Criteria	**Description**	**Maximum Marks**
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

FUNDAMENTALS OF ROBOTICS: Introduction; Definition; Robot anatomy (parts) and its working; Robot Components: Manipulator, End effectors; Construction of links, Types of joints; Classification of robots; Cartesian, Cylindrical, Spherical, Scalar, Vertical articulated, Structural Characteristics of robots; Mechanical rigidity; Effects of structure on control work envelope and work Volume; Robot work Volumes, comparison; Advantages and disadvantages of robots.

ROBOTIC DRIVE SYSTEM AND CONTROLLER: Actuators; Hydraulic, Pneumatic and Electrical drives; Linear actuator; Rotary drives; AC servo motor; DC servo motors and Stepper motors; Conversion between linear and rotary motion; Feedback devices; Potentiometers; Optical encoders; DC tachometers; Robot controller; Level of Controller; Open loop and Closed loop controller; Microprocessor based control system; Robot path control: Point to point, Continuous path control and Sensor based path control; Controller programming

SENSORS & MACHINE VISION: Requirements of a sensor; Principles and Applications of the following types of sensors, Position sensors (Encoders, Resolvers, Piezo Electric); Range sensors (Triangulation Principle, Structured lighting approach); Proximity sensing; Force and torque sensing, Introduction to Machine Vision**:** Robot vision system (scanning and digitizing image data); Image processing and analysis; Cameras (Acquisition of images); Videocon camera (Working principle & construction), Applications of Robot vision system: Inspection, Identification, Navigation & serving

ROBOT KINEMATICS AND ROBOT PROGRAMMING: Forward Kinematics; Inverse Kinematics and Differences; Forward Kinematics and Reverse Kinematics of Manipulators with Two Degrees of Freedom (In 2 Dimensional); Deviations and Problems, Teach Pendant Programming; Lead through programming; Robot programming Languages;, VAL Programming; Motion Commands; Sensor Commands; End effecter commands; and Simple programs

AUTOMATION& INDUSTRIAL APPLICATIONS: Basic elements of automated system, advanced automation functions, levels of automation. Application of robots in machining; welding; assembly andmaterial handling.

E. TEXT BOOKS

T1.A Text book on Industrial Robotics – Ganesh S. Hedge, Laxmi Publications Pvt. Ltd., New Delhi, 2008.
T2.Robotics Technology and Flexible Automation – S.R. Deb &Sankha Deb, Tata McGraw-Hill, 2010.
T3.Elements of Robotics Process Automation, Mukherjee, Khanna Publishing House, Delhi, 2018

F. REFERENCE BOOKS

R1.Introduction to Robotics: Analysis, Systems, Applications – Saeed B. Niku, Pearson Education Inc. New Delhi 2006.
R2.Industrial Robotics: Technology, Programming and Applications – M.P. Groover, Tata McGraw Hill Co, 2001.
R3.Robotics Control, Sensing, Vision and Intelligence – Fu.K.S. Gonzalz.R.C and Lee C.S.G, Mc-Graw Hill Book Co, 1987.
R4.Robotics for Engineers – YoramKoren, McGraw Hill Book Co, 1992

G. Course Articulation Matrix: (Mapping of Cos with Pos)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Tabulate the robot anatomy, classification, characteristics of robot, advantages and disadvantages.	2	2									2	2
[CO2]	Explain the various robotic actuators on hydraulic, pneumatic and electrical drives.	1	2		2							1	2
[CO3]	Apply concepts of robot kinematics and robot programming	2	2		2							2	2
[CO4]	Analyze about various types of sensors and concepts on robot vision system		2		2	2					2	2	1
[CO5]	Estimate various parameters that should be considered in applications of robots.	2	2	2							2	2	2
[CO6]	Design work specific robot and program it with suitable programming language.				2		2				2	2	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Microprocessor & Microcontroller Lab

Code:DIP15237

1Credits | Semester V

A. Introduction:

- To understand & maintain microprocessor & microcontroller based systems.
- To get acquainted with usage of Proteus &Keil Simulator Software.
- To know basic assembly language & C-language programming

B. Course Outcomes: At the end of the course, students will be able to

[CO1] Identify various components of microprocessor trainer kit

[CO2] Maintain the program features of the Microcontroller based application.

[CO3]Interpret the salient features of various types of microcontrollers

[CO4] Explain C- language program.

[CO5] Test mini projects with Proteus &KeilSoftwares.

[CO6]Develop assembly language program

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	5
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	35
Total		50
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

S.No.	Name of Experiment
1	Interpret details of Hardware kit for Microcontroller and practice to write and execute programs
2	Develop and execute Assembly language programs using Arithmetic Instructions and demonstrate outcome for a given input data
3	Develop and execute Assembly language programs using Logical Instructions and demonstrate outcome for a given input
4	Develop and execute an Assembly language program for Addition of series of 8 bit

	nos. and demonstrate outcome for a given input data
5	Develop and execute Assembly language program for subtraction of two 8 bit nos. and demonstrate outcome for a given input data
6	Develop and execute Assembly language program for addition of two 16 bit nos. and demonstrate outcome for a given input data
7	Develop and execute Assembly language program for subtraction of two 16 bit nos. and demonstrate outcome for a given input data
8	Introduction to PROTEUS Simulator & identify different menus available in a simulator software RIDE/KEIL and demonstrate their use

E. TEXT BOOKS

T1.Deshmukh, Ajay, Microcontroller Theory and Application, McGraw Hill., New Delhi, ISBN-9780070585959

T2.Kamal, Raj, Microcontroller Architecture Programming, Interfacing and System Design, Pearson Education India, Delhi, ISBN: 9788131759905

T3.Mathur; Panda, Microprocessors and Microcontrollers, PHI Learning, New Delhi, ISBN:978-81-203-5231-5

T4.Krishna Kant, Microprocessors and Microcontrollers: Architecture programming and System Design, PHI Learning, New Delhi, ISBN:978-81-203-4853-0

F. REFERENCE BOOKS

R1.Microprocessor architecture, programming & application with 8085, R. Gaonker, Penram International.

R2.Microprocessor & Interfacing, D.V. Hall, Mc Graw Hill.

R3.An introduction to the Intel family of Microprocessors, James L. Antonakos, Pearson Education.

G.Course Articulation Matrix: (Mapping of Cos with Pos)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Identify various components of microprocessor trainer kit	2	2	3								2	2
[CO2]	Maintain the program features of the Microcontroller based application.		2		2						2	2	2
[CO3]	Interpret the salient features of various types of microcontrollers			3						2	2	2	1
[CO4]	Explain C- language program.	2	2		2								2
[CO5]	Test mini projects with Proteus &KeliSoftware.	2		3	2							2	2
[CO6]	Develop assembly language program	2	2	1							2	1	3

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Fundamentals of Power Electronics Lab

Code: DIP15227

1Credits | Semester V

A. Introduction:

- To understand & maintain the proper functioning of power electronic devices.

B. Course Outcomes: At the end of the course, students will be able to

[CO1] Identify relevant information to supplement to the Power Electronics course.
[CO2] Explain the performance of converter and chopper
[CO3] Develop the techniques for troubleshootingofturn-on and turn-off circuits of Thyristors.
[CO4]Analyze phase controlled rectifiers.
[CO5] Find error in industrial control circuits.
[CO6]Construct power semiconductor circuits for industrial applications

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	5
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	35
Total		50
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

S.No.	Name of Experiment
1	Study of the characteristics of an SCR.
2	Study of the operation of a single phase uncontrolled bridge converter with R load.
3	Study of performance of single phase half controlled symmetrical and asymmetrical bridge converter
4	Study of the operation of a single phase full controlled bridge converter with R and R-L load without freewheeling diode.
5	Study of the operation of a single phase full controlled bridge converter with R and R-L load with freewheeling diode
6	Study of performance of three phase controlled converter with R & R-L load.
7	Study of performance of step up and step down chopper.

8	Study of performance of three phase AC controller with R and R-L load

E. Text Book:

T1.Rashid , Muhammad, Power Electronics Circuits Devices and Applications, Pearson Education India, Noida, ISBN: 978-0133125900.
T2. Singh, M. D. and Khanchandani, K.B., Power Electronics, Tata McGraw Hill Publishing Co. Ltd, New Delhi, 2008 ISBN: 9780070583894.
T3. Zbar, Paul B., Industrial Electronics: A Text –Lab Manual, McGraw Hill Publishing Co. Ltd., New Delhi, ISBN: 978-0070728226.

F. Reference Books:

R1. P.S. Bhimra, Power Electronics, Khanna Publication pvt ltd, ISBN-9788174092793.
R2. Ramamurthy M., An Introduction to Thyristors and their applications, East-West Press Pvt. Ltd., New Delhi, ISBN: 8185336679.
R3. Sugandhi, Rajendra Kumar and Sugandh, Krishna Kumar, Thyristors: Theory and Applications, New Age International (P) ltd. Publishers, New Delhi, ISBN: 978-0-85226-852-0.
R4. Bhattacharya, S.K., Fundamentals of Power Electronics, Vikas Publishing House Pvt. Ltd. Noida. ISBN: 978-8125918530.
R5. Jain &Alok , Power Electronics and its Applications, Penram International Publishing (India) Pvt. Ltd, Mumbai, ISBN: 978-8187972228.

G. Course Articulation Matrix: (Mapping of Cos with Pos)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Identify relevant information to supplement to the Power Electronics course.	2	2									2	2
[CO2]	Explain the performance of converter and chopper	2	2	2								2	3
[CO3]	Develop the techniques for troubleshootingof turn-on and turn-off circuits of Thyristors.		2	3	2					2		2	1
[CO4]	Analyze phase controlled rectifiers.		2	3	2					2		2	2
[CO5]	Find error in industrial control circuits.	2	2							2	3	2	3
[CO6]	Construct power semiconductor circuits for industrial applications	2	2							2	3	2	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject:Summer Internship-II

Code: DIP15244

3 Credits | Semester V

A. Introduction:

- Following are the intended objectives of internship training:
- Will expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
- Provide possible opportunities to learn understand and sharpen the real time technical / managerial skills required at the job.
- Exposure to the current technological developments relevant to the subject area of training.
- Experience gained from the 'Industrial Internship' in classroom will be use in classroom discussions.
- Create conditions conducive to quest for knowledge and its applicability on the job

B. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	30
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

GUIDELINES FOR INTERNSHIP

Summer Internship –II should be undertaken in an industry only

S.No.	Suggested Schedule	Suggested Duration (In weeks)	Activities
1	Summer/winter vacation after 4th Semester	4-6	Inter/Intra Institutional Activities

Subject:Major Project-I

Code:DIP15236

1 Credits | Semester V

A. Introduction: The objective of this course is to prepare students to use applications of the theory and practical learned during the course. It will also help students to develop an industry or research oriented project. This course helps students how to carry out project/studies in the field of interest of the student or as given by the industry.

B.Assessment Plan:

Criteria	**Description**	**Maximum Marks**
Continuous Internal Assessment (CIA)	Internal Examination	15
End Semester Examination(ESE)	End Semester Examination	35
Total		50
Attendance	Completion of Internship during the Summer vacation	

GUIDELINES FOR INTERNSHIP

Major Project-I should be based on real/ live problems of the Industry/Govt./NGO/ MSME/Rural Sector or an innovative idea having the potential of a Startup

ARKA JAIN University
Jharkhand

Syllabus of

Diploma in Electrical & Electronics Engineering

Semester-VI

ARKAJAIN University, Jharkhand
School of Engineering & IT
Department of Engineering
Faculty – Diploma in Electrical & Electronics Engineering (DEEE)
Scheme of Study (w.e.f Batch 2020-21)

SEMESTER –I(Group-A)

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Communication Skills in English	HSC	3	3	100	70	20	5	5
2	Mathematics-I	BSC	4	4	100	70	20	5	5
3	Applied Physics	BSC	4	4	100	70	20	5	5
4	Applied Chemistry	BSC	4	4	100	70	20	5	5
	Practical								
5.	Engineering Workshop Practice	ESC	2	4	50	35	5	5	5
6.	Applied Physics Lab	BSC	1	2	50	35	5	5	5
7.	Applied Chemistry Lab	BSC	1	2	50	35	5	5	5
8.	Communication Skills in English Lab	HSC	1	2	50	35	5	5	5
	Total		**20**	**25**	**600**	**420**	**100**	**40**	**40**

SEMESTER I (Group-B)

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Mathematics -I	BSC	4	4	100	70	20	5	5
2	Fundamentals of Electrical & Electronics Engg.	ESC	4	4	100	70	20	5	5
3	Introduction to IT system	ESC	3	3	100	70	20	5	5
4	Engineering Mechanics	ESC	4	4	100	70	20	5	5
5	Environmental Science	AC	0	2	50	35	10	2.5	2.5
	Practical								
6	Fundamentals of electrical & electronics Engg. Lab	ESC	1	2	50	35	5	5	5
7	Introduction to IT system Lab	ESC	1	2	50	35	5	5	5
8	Engineering Mechanics Lab	ESC	1	2	50	35	5	5	5
9	Engineering Graphics	ESC	2	4	50	35	5	5	5
	Total		**20**	**27**	**650**	**455**	**110**	**42.5**	**42.5**

SEMESTER II (Group-A)

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Mathematics -II	BSC	4	4	100	70	20	5	5
2	Fundamentals of Electrical & Electronics Engg.	ESC	4	4	100	70	20	5	5
3	Introduction to IT system	ESC	3	3	100	70	20	5	5
4	Engineering Mechanics	ESC	4	4	100	70	20	5	5
5	Environmental Science	AC	0	2	50	35	10	2.5	2.5
	Practical								
6	Fundamentals of electrical & electronics Engg. Lab	ESC	1	2	50	35	5	5	5
7	Introduction to IT system Lab	ESC	1	2	50	35	5	5	5
8	Engineering Mechanics Lab	ESC	1	2	50	35	5	5	5
9	Engineering Graphics	ESC	2	4	50	35	5	5	5
	Total		**20**	**27**	**650**	**455**	**110**	**42.5**	**42.5**

SEMESTER –II(Group-B)

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Communication Skills in English	HSC	3	3	100	70	20	5	5
2	Mathematics-II	BSC	4	4	100	70	20	5	5
3	Applied Physics	BSC	4	4	100	70	20	5	5
4	Applied Chemistry	BSC	4	4	100	70	20	5	5
	Practical								
5.	Engineering Workshop Practice	ESC	2	4	50	35	5	5	5
6.	Applied Physics Lab	BSC	1	2	50	35	5	5	5
7.	Applied Chemistry Lab	BSC	1	2	50	35	5	5	5
8.	Communication Skills in English Lab	HSC	1	2	50	35	5	5	5
	Total		**20**	**25**	**600**	**420**	**100**	**40**	**40**

SEMESTER-III

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Introduction to Electric Generation Systems	PCC	3	3	100	70	20	5	5
2	Electrical Circuits	PCC	3	3	100	70	20	5	5
3	Electrical and Electronic Measurements	PCC	3	3	100	70	20	5	5
4	Electric Motors and Transformers	PCC	3	3	100	70	20	5	5
5	Applied Electronics	PCC	3	3	100	70	20	5	5
	PRACTICAL								
6	Electrical Circuits Lab	PCC	1	2	50	35	5	5	5
7	Electrical and Electronic Measurements Lab	PCC	1	2	50	35	5	5	5
8	Electric Motors and Transformers Lab	PCC	1	2	50	35	5	5	5
9	Applied Electronics lab	PCC	1	2	50	35	5	5	5
10	Summer Internship-I (3-4 Weeks)	PROJ	2	0	50	35	15	0	0
	TOTAL		**21**	**23**	**750**	**525**	**135**	**45**	**45**

SEMESTER-IV

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Digital Electronics	PCC	3	3	100	70	20	5	5
2	Electric Power Transmission and Distribution	PCC	4	4	100	70	20	5	5
3	Induction, Synchronous and Special Electrical Machines	PCC	4	4	100	70	20	5	5
4	Elective I Industrial Instrumentation and ConditionMonitoring Electrical Testing & Commissioning Illumination Practices	PEC	3	3	100	70	20	5	5
5	Elective II Industrial Drives Electrical Estimation & Contracting Biomass and Micro-hydro Power plants	PEC	3	3	100	70	20	5	5
6	Essence of Indian Knowledge Tradition	AC	0	2	50	35	10	2.5	2.5
	PRACTICAL								
7	Digital Electronics Lab	PCC	1	2	50	35	5	5	5
8	Electrical& Electronics Engg. Drawing	PCC	2	4	50	35	5	5	5
9	Induction, Synchronous and Special Electrical Machines Lab	PCC	1	2	50	35	5	5	5
10	Minor Project	PROJ	2	4	50	35	15	0	0
	TOTAL		**23**	**31**	**750**	**525**	**140**	**42.5**	**42.5**

SEMESTER V

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA	Attendance
1	Microprocessor & Microcontroller	PCC	4	4	100	70	20	5	5
2	Fundamentals of Power Electronics	PCC	4	4	100	70	20	5	5
3	Elective III Switchgear and Protection Wind Power Technologies Electric Vehicles	PEC	3	3	100	70	20	5	5
4	Elective IV Industrial Automation & Control Communication Technologies Electric Traction	PEC	3	3	100	70	20	5	5
5	Open Elective I Artificial Intelligence & Machine Learning Introduction to E-Governance Robotics	OEC	3	3	100	70	20	5	5
	PRACTICAL								
6	Microprocessor & Microcontroller Lab	PCC	1	2	100	70	20	5	5
7	Fundamentals of Power Electronics Lab	PCC	1	2	50	35	5	5	5
8	Summer Internship-II(4-6 Weeks)	PROJ	3	0	100	70	30	0	0
9	Major Project-I (Project to be carried over to next semester)	PROJ	1	2	50	35	15	0	0
	TOTAL		**23**	**23**	**800**	**560**	**170**	**35**	**35**

SEMESTER VI

S.No	Name of the Subject	Type of Paper	Credit	Contact Hours Per Week	Total Marks	End Term Theory/ Practical Exam	Mid Term Theory/ Practical Exam	CIA*	Attendance
1	Building Electrification	PCC	4	4	100	70	20	5	5
2	Entrepreneurship and Start –ups	HSC	4	4	100	70	20	5	5
3	Open Elective II Internet of Things Project Management Operations Research	OEC	3	3	100	70	20	5	5
4	Open Elective III Economic Policies in India Energy Efficiency and Audit	OEC	3	3	100	70	20	5	5
5	Indian constitution	AC	0	2	50	35	10	2.5	2.5
	PRACTICAL								
6	Seminar	PROJ	1	2	50	35	15	0	0
7	Major Project-II	PROJ	3	6	100	70	30	0	0
	TOTAL		**18**	**24**	**600**	**455**	**135**	**22.5**	**22.5**

Distribution of Credit across 6 semesters:

Sl. No	Type of Paper	No. of Paper	Total Credit
1	Humanities and Social Sciences Courses **(HSC)**	3	8
2	Basic Science courses**(BSC)**	6	18
3	Engineering Science courses **(ESC)**	8	18
4	Professional core courses (**PCC)**	20	48
5	Professional Elective courses**(PEC)**	4	12
6	Open Electives Courses (**OEC)**	3	9
7	Project work, seminar and internship in industry or elsewhere**(PROJ)**	6	12
8	Audit Courses [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Knowledge Tradition]**(AC)**	3	(non-credit)
	Total	53	125

CIA – Continuous Internal Assessment – Based on Projects / Assignment during the semester

Note:

AICTE Activity Points to be earned by students admitted to Diploma program (For more details refer to Chapter 6, AICTE, Activity Point Program, Model Internship Guidelines):

Every regular student, who is admitted to the 3 year Diploma program, is required to earn 75 activity points in addition to the total credits earned for the program. Students entering 3 years Diploma Program through lateral entry are required to earn 50 activity points in addition to the total credits earned for the program.
The activity points earned by the student shall be reflected on the students 6th Semester grade card.
The activities to earn the points can be spread over the duration of the course. However, minimum prescribed duration should be fulfilled.
Activity Points (non-credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression.
Incase student fail to earn the prescribed activity points, Sixth semester Grade Card shall be issued only after earning the required activity Points.
Students shall be eligible for the award of degree only after the release of the Six Semester grade card.

There are two groups (A & B) in semester 1 & 2. The Group division will be decided by The Dean SoE& IT before commencement of classes*

ARKAJAIN University, Jharkhand
School of Engineering & IT
Department of Engineering
Faculty – Diploma in Electrical & Electronics Engineering (DEEE)
PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

PROGRAM OUTCOMES

After completing this undergraduate program, a learner:

[PO.1]. Basic knowledge: An ability to apply knowledge of basic mathematics, science and engineering to solve the engineering problems

[PO.2]. Discipline knowledge: An ability to apply discipline - specific knowledge to solve core and/or applied engineering problems.

[PO.3]. Experiments and practice: An ability to plan and perform experiments and practices and to use the results to solve engineering problems.

[PO.4]. Engineering Tools: Apply appropriate technologies and tools with an understanding of the limitation.

[PO.5]. The engineer and society: Demonstrate knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering practice.

[PO.6]. Environment and sustainability: Understand the impact of the engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development..

[PO.7]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

[PO.8]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse/multidisciplinary teams.

[PO.9]. Communication: An ability to communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

[PO.10]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the context of technological changes.

PROGRAM SPECIFIC OUTCOMES

[PSO.1]. Students will able to design, test and trouble shoot of electrical & electronics circuits, equipment and appliances.

[PSO.2]. Apply latest techniques, skills and modern engineering tools of industrial and system engineering throughout their professional careers in the fields of Electrical & Electronics.

Subject: Building Electrification

Code: DIP16261

4 Credits | Semester VI

A. Introduction:

- To understand the design electrical installation systems in building complexes.
- To understand the benefits of building electrification.

B. Course Outcomes: At the end of the course

[CO1] Identify various wiring tools, accessories, wiring methods, cables and remembering different IEC act.

[CO2] Understanding the fundamentals of electrical Installations like requirements, design considerations, testing, estimating and costing.

[CO3] Apply various scheme of illumination, the energy conversation method used in it and design methods of illumination system for building complexes.

[CO4] Select the design procedure, estimation and costing method, safety aspect of electrical installation in a commercial building, hospital, industries.

[CO5] Decide estimation and costing methods of outdoor, indoor substations and different electrification.

[CO6] Justify as per national electrical Code of service connections and its safety aspects according to user requirement and prepare report.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

WIRING TOOLS AND ACCESSORIES: Introduction of tools required for wiring- screwdrivers, pliers, Try square, saws, hacksaw, chisel, hammers, mallet, rawl punch, hand drill machine, portable drilling machine, files, plumb bob, line thread, electricians knife, test lamp, tester and their BIS specifications, application, care & maintenance of tools. Classification of electrical accessories- controlling, holding, safety, outlet BIS symbols of following electrical accessories. Switches- Types of Switches according to construction such as surface switch, flush switch, and pull switch, rotary switch, knife switch, pendent switch, Main-switch (ICDP, ICTP).

Their types according to working such as single pole, double pole, two-way, two-way centre off, intermediate, series parallel switch. Holders- Their types such as bayonet cap lamp holder, pendent holder, batten lamp holder, angle holder, bracket holder, tube light holder, screw type Edison and goliath Edison lamp holder, swivel lamp holder. Socket outlets and plugs- two pin, three-pin, multi pin sockets, two-pin and three-pin plug. Others- Iron connector, adaptor, and ceiling rose, distribution box, neutral link, bus-bar chamber. Wooden/ mica boards, Moulded/ MS Concealed boxes of different sizes. Modular accessories.

ELECTRICAL WIRES AND UNDERGROUND CABLES: Conductors: - wire, cable, bus bar, stranded conductor, cable, armoured cable, flexible cable, solid conductor, PVC wires, CTS wire, LC wire, FR (Fire retardant) wire, Size of wire according to BIS. Tools used for measurement of wire size, Wire jointing methods. Classification of cables, low tension, high tension, and extra high tension cables, solid, oil filled and gas filled type, Cable insulation materials –vulcanized rubber (VIR), polyvinyl chloride (PVC), cross linked polythene (XLPE), impregnated paper, Selection of suitable cable size and type from standard data Cable jointing methods Cable laying methods. Factors determining selection of electric cables

WIRING METHODS AND WIRINGLAYOUT: Factors determining the selection of wiring methods. Classification of wiring methods. PVC casing-capping wiring- wiring rules according to IS: 732-1983 Conduit wiring- Types of conduit, comparison between Metal and PVC conduit, types of conduit wiring (Surface/Concealed). Conduit wiring accessories, BIS rules for Metal and PVC conduit wiring. Comparison of various wiring systems. General BIS rules for domestic installations. Design, working and drawing of following electrical circuits: Simple light and fan circuits, Stair case wiring, Go-down wiring circuit, Bedroom lighting circuit, Corridor lighting circuit, Series parallel circuit, Master switch control circuit, Different lighting circuit using - Intermediate switch, Call bell circuit using bell indicator, Design of wiring circuits according to user's requirement

RESIDENTIAL BUILDING ELECTRIFICATION: Domestic Dwellings/Residential Buildings: reading of Civil Engineering building drawing, Interpretation of electrical installation plan and electrical diagrams, electrical symbols as per IS: 732. Electrical installation for residential building as per part I section 9 of NEC-2011 Difference between residential and industrial load, rules/requirements related to lighting load followed in electrical installations, Positioning of equipment. Lighting and power circuits: Light and fan circuit, Power circuit. Wiring and circuit Schematic diagram according to IS: 2042(Part-I)-1962: multiline and single line representation Load assessment: Selection of size of conductor, Selection of rating of main switch and protective switch gear. Design and drawing, estimation and costing of a residential installation having maximum 5 KW load; Sequence to be followed for preparing estimate; Calculation of length of wire and other materials, labor cost. Testing of wiring installation as per IS: 732-1982: Insulation resistance - between earth and conductors, between conductors, polarity test of single pole switches. Testing of earth continuity path. Residential building Service

Connection- types Underground and overhead. Calculation of Material required for service connection.

PROTECTION OF ELECTRICAL INSTALLATION: Fuse in electric circuit: fuse element, fuse current rating, minimum fusing current, cut-off current, fusing factor, Fuse material Types of fuses –Re-wirable, cartridge fuses (HRC and LRC), Fuse material Selection of fuse. Miniature circuit Breaker (MCB)-Construction, Principle rating and uses, Earth Leakage Circuit Breaker (ELCB)-Construction, Principle rating and uses. System and equipment earthing and its requirements, Earth, earth electrode, earth current, earth terminal, earthing wire, earthing lead, fault current, leakage current, Measurement of earth resistance using earth tester, Methods of reducing earth resistance, Methods of earthing as per IS 3043: 1987 and their procedure- Driven pipe, pipe and plate earthing, modern methods of earthing.

ILLUMINATION IN RESIDENTIAL INSTALLATION: Concept of Luminous flux, Luminous intensity, Lumen, Illumination or illuminance, Lux, Space-height ratio, utilization factor, depreciation factor, luminous efficiency- values for different luminaries. Laws of Illumination-Inverse Square Law, Cosine Law, illumination received directly underneath, horizontal screen and screen moved horizontally at certain distance. Factors affecting the illumination. Different types of lighting arrangements, Luminous flux of different types of light sources, Lux level required for different places as per SP 72: 2010. fault current, leakage current, Measurement of earth resistance using earth tester, Methods of reducing earth resistance.

E. TEXT BOOKS

T1. Electrical Estimation & Costing Uppal S.L. Khanna Publisher, New Delhi, Latest edition
T2. EditionAllagappan,N. S.Ekambarram, Electrical Estimating and Costing, New Delhi.

F. REFERENCE BOOKS

R1.Raina, K.B. and S.K.Bhattacharya, Electrical Design Estimating and Costing, New Age International Ltd., New Delhi.
R2.India Electrical Rules 1956 Hand book Chudley R. Butterwarth –London New Delhi.Latest
R3.Singh, Surjit, Electrical Estimating and Costing, Dhanpat Rai and Co. New Delhi.
R4.Gupta, J B, A Course in Electrical Installation Estimating and Costing, S K Kataria and Sons,New Delhi.
R5.Uppal, S. L, Electrical Estimation and Costing, Khanna Publisher, New Delhi.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Identify various wiring tools, accessories, wiring methods, cables and remembering different IEC act.	1	2										2
[CO2]	Understanding the fundamentals of electrical Installations like requirements, design considerations, testing, estimating and costing.			2	2								2
[CO3]	Apply various scheme of illumination, the energy conversation method used in it and design methods of illumination system for building complexes.	2	1		3								2
[CO4]	Select the design procedure, estimation and costing method, safety aspect of electrical installation in a commercial building, hospital, industries.		2	2								3	
[CO5]	Decide estimation and costing methods of outdoor, indoor substations and different electrification.		2			1						2	
[CO6]	Justify as per national electrical Code of service connections and its safety aspects according to user requirement and prepare report.		3	2	1							3	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Entrepreneurship and Start-Ups

Code:DIP16265

4 Credits | Semester VI

A. Introduction:

- To Acquiring Entrepreneurial spirit and resourcefulness.
- To Familiarization with various uses of human resource for earning dignified means of living.
- To Understanding the concept and process of entrepreneurship - its contribution and role in the growth and development of individual and the nation.
- To Acquiring entrepreneurial quality, competency, and motivation.
- To Learning the process and skills of creation and management of entrepreneurial venture.

B. Course Outcomes: At the end of the course, students will be able to

[CO1] Identify the most recognized sources of potential funding and financing for business start-ups and/or expansion.

[CO2] Understand the function of the entrepreneur in the successful, commercial application of innovations.

[CO3] Apply basic computer proficiency, including the use of word processing, presentation, and spreadsheet software packages, as well as a basic facility with the internet and other research tools.

[CO4] Analyze personal attributes that enable best use of entrepreneurial opportunities.

[CO5] Evaluate fundamental comprehension of business opportunity from the perspective of a prospective investor.

[CO6] Build entrepreneurial leadership and management style for startup and exit strategies.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

INTRODUCTION TO ENTRPRENEURSHIP AND START-UPS: Definitions, Traits of an entrepreneur, Entrepreneurship, Motivation, Types of Business Structures, Similarities/differences between entrepreneurs and managers.

BUSINESS IDEAS AND THEIR IMPLEMENTATION: Discovering ideas and visualizing the business ,Activity map , Business Plan

IDEA TO START-UP: Market Analysis – Identifying the target market, Competition evaluation and Strategy Development, Marketing and accounting,, Risk analysis

MANAGEMENT: Company's Organization Structure,, Recruitment and management of talent., Financial organization and management

FINANCING AND PROTECTION OF IDEAS: Financing methods available for start-ups in India, Communication of Ideas to potential investors – Investor Pitch, Patenting and Licenses

STRATAGIES IN VARIOUS SECTORS: Exit strategies for entrepreneurs, Bankruptcy, succession and harvesting strategy

E. TEXT BOOKS

T1. Fundamental of Management by S P Robbins, MCoulter and D de Cenzo. Pearson.
T2. Principles of Management by P C Tripathi and P N Reddy. McGraw Hill.
T3. Innovation and Entrepreneurship by Peter F. Drucker (Special Indian Edition). Routledge
T4. Entrepreneurship (11^{th}Edn) by R. Hisrich, M. Peters and D. Shepherd. McGraw Hill
T5. Entrepreneurship Development by Sangeeta Sharma. Prentice-Hall India.
T6. Guide to Start-Ups by Taxmann.
T7. Entrepreneurship Development by S.S. Khanka. S. Chand Publishers

F. REFERENCE BOOKS

R1.Steve Blank and Bob Dorf The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company, K & S Ranch.
R2.Eric Ries, The Lean Startup, How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses, Penguin UK.
R3.Adrian J. Slywotzky with Karl Weber, Demand, Creating What People Love Before They Know They Want It, Headline Book Publishing.
R4.Clayton M. Christensen, The Innovator's Dilemma, The Revolutionary Book That Will Change the Way You Do Business, Harvard business.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Identify the most recognized sources of potential funding and financing for business start-ups and/or expansion.					1				1			1
[CO2]	Understand the function of the entrepreneur in the successful, commercial application of innovations.					2	2				2		2
[CO3]	Apply basic computer proficiency, including the use of word processing, presentation, and spreadsheet software packages, as well as a basic facility with the internet and other research tools.	2				2	1						2
[CO4]	Analyze personal attributes that enable best use of entrepreneurial opportunities.						3		2				
[CO5]	Evaluate fundamental comprehension of business opportunity from the perspective of a prospective investor.						3			3			
[CO6]	Build entrepreneurial leadership and management style for startup and exit strategies.							2	3		2	2	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Internet of Things

Code:DIP15234

3 Credits | Semester VI

A. Introduction:

- To Build different solutions in various sectors.
- To learn the fundamentals of the emerging technology.

B. **Course Outcomes:** At the end of the course, students will be able to

[CO1] Identify the factors that contributed to the emergence of IoT.

[CO2] Understand the application areas of IOT ·

[CO3] Apply Arduino to get automations as per requirement.

[CO4] Analyze the revolution of Internet in Mobile Devices, Cloud & Sensor Networks.

[CO5] Evaluate building blocks of Internet of Things and characteristics.

[CO6] Design an IoT device to work with a Cloud Computing infrastructure.

C. Assessment Plan:

Criteria	**Description**	**Maximum Marks**
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

INTRODUCTION TO INTERNET OF THINGS: Introduction to Internet of Things, Physical Design of IOT,Logical Design of IOT, IOT Enabling Technologies, IOT Levels.

BASICS OF IoT NETWORKING: Communication Protocols, Sensor networks

Domain Specific IOTs: Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry , Health & Life St yle.

INTRODUCTION TO ARDUINO PROGRAMMING: Integration of Sensors, Actuators to Arduino

IMPLEMENTATION OF IoT: With Raspberry Pi, Data Handling Analytics

CASE STUDIES DIFFERENT SECTORS: Agriculture, Healthcare, Activity Monitoring

E. TEXT BOOKS

T1. Vijay Madisetti, ArshdeepBahga," Internet of Things A Hands-On- Approach",2014, ISBN:978 0996025515

T2.Dr. JeevaJose , Internet of Things, Khanna Publishing House.

F. REFERENCE BOOKS

R1.Pethuru Raj and Anupama C. Raman, The Internet of Things: Enabling Technologies, Platforms, and Use Cases, CRC Press.

R2.Adrian McEwen, "Designing the Internet of Things", Wile y Publishers, 2013, ISBN:978- 1-118-43062-0

R3.Daniel Kellmereit, "The Silent Intelligence: The Internet of Things". 2013, ISBN 0989973700

R4.Raj Kamal, Internet of Things: Architecture and Design Principles, McGraw Hill.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Identify the factors that contributed to the emergence of IoT.	2	2		1								3
[CO2]	Understand the application areas of IOT ·		2		2							2	
[CO3]	Apply Arduino to get automations as per requirement.			1	2		2						2
[CO4]	Analyze the revolution of Internet in Mobile Devices, Cloud & Sensor Networks.		2		3							2	
[CO5]	Evaluate building blocks of Internet of Things and characteristics.		2			2						2	
[CO6]	Design an IoT device to work with a Cloud Computing infrastructure.		2	3								2	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Project Management

Code:DIP16257

3 Credits | Semester VI

A. Introduction:

- To understand the concept of Management.
- To Understand the goal of Economics

B. Course Outcomes: At the end of the course, students will be able to

[CO1]Identify project goals, constraints, deliverables, performance criteria, control needs, and resource requirements in consultation with stakeholders.

[CO2] Understand the conceptual clarity about project organization and feasibility analyses Market, Technical, Financial and Economic.

[CO3] Apply the risk management plan and analyse the role of stakeholders.

[CO4] Analyze the learning and understand techniques for Project planning, scheduling and Execution Control.

[CO5] Evaluate the scope, cost, timing, and quality of the project, at all times focused on project success as defined by project stakeholders.

[CO6] Improve project management knowledge, processes, lifecycle and the embodied concepts, tools and techniques in order to achieve project success.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

BASIC CONCEPTS OF MANAGEMENT: Definition – Essence, Functions, Roles, Level. Functions of Management: Planning – Concept, Nature, Types, Analysis, Management by objectives. Organization Structure – Concept, Structure, Principles, Centralization, Decentralization, Span of Management; Organizational Effectiveness.

MANAGEMENT AND SOCIETY: Concept, External Environment, CSR, Corporate Governance, Ethical Standards. People Management – Overview, Job design, Recruitment & Selection, Training &Development, Stress Management. Managerial Competencies –

Communication, Motivation, Team Effectiveness, Conflict Management, Creativity, Entrepreneurship

LEADERSHIP: Concept, Nature, Styles. Decision making: Concept, Nature, Process, Tools & techniques. Economic, Financial & Quantitative Analysis – Production, Markets, National Income Accounting, Financial Function & Goals, Financial Statement & Ratio Analysis, Quantitative Methods – Statistical Interference, Forecasting, Regression Analysis, Statistical Quality Control.

CUSTOMER MANAGEMENT: Market Planning & Research, Marketing Mix, Advertising &, Brand Management., Operations & Technology Management – Production & Operations Management, Logistics & Supply Chain Management, TQM, Kaizen & Six Sigma, MIS.

E. TEXT BOOKS

T1. Construction Project Management**by Frederick Gould & Nancy Joyce**

T2. Identifying and Managing Project Risk **by Tom Kendrick PMP**

T3. HBR Guide to Project Management **by Harvard Business Review**

T4. Effective Project Management: Traditional, Agile, Extreme**by Robert K. Wysock**

F. REFERENCE BOOKS

R1. Bhat, A & Kumar, A , Management: Principles, Processes & Practices OUP.
R2. Koontz, .Essentials for Management, Revised edition, Tata McGraw Hill.
R3. Stoner, James A. F., Management, Pearson.
R4.Ghuman, Management, Tata McGraw Hill.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Identify project goals, constraints, deliverables, performance criteria, control needs, and resource requirements in consultation with stakeholders.					1	1						
[CO2]	Understand the conceptual clarity about project organization and feasibility analysesMarket, Technical, Financial and Economic.						2			2	1		1
[CO3]	Apply the risk management plan and analyse the role of stakeholders.					2	1	2					
[CO4]	Analyze the learning and understand techniques for Project planning, scheduling and Execution Control.						3			2			
[CO5]	Evaluate the scope, cost, timing, and quality of the project, at all times focused on project success as defined by project stakeholders.							2	2	3			
[CO6]	Improve project management knowledge, processes, lifecycle and the embodied concepts, tools and techniques in order to achieve project success.					2				3		1	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Operations Research

Code:DIP16256

3 Credits | Semester VI

A. Introduction:

- To provide a broad and in depth knowledge of a range of operation research models.
- To understand the techniques, which can be applied to a variety of industrial applications.

B. Course Outcomes: At the end of the course, students will be able to

[CO1] Identify the elements of operations management and various transformation processes to enhance productivity and competitiveness.

[CO2] Understandingthe problems as networks and graphs.

[CO3] Apply different mathematical models and the solution to solve optimisation problems.

[CO4] Analyze linear programming (LP) models for shortest path, maximum flow, minimal spanning tree, critical path, minimum cost flow, and transshipment problems.

[CO5] Evaluate the problems using special solution algorithms.

[CO6] Plan and implement suitable materials handling principles and practices in the operations.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

DEVELOPMENT: Definition, Characteristics and phase of Scientific Method, Types of models- General methods for solving operations research models.

ALLOCATION: Introduction to linear programming formulation, graphical solution, Simplex Method, artificial variable technique, Duality principle. Sensitivity analysis.

TRANSPORTATION PROBLEM FORMULATION OPTIMAL SOLUTION: Unbalanced transportation problems, Degeneracy, Assignment problem, Formulation optimal solution.

SEQUENCING: Introduction, Terminology, notations and assumptions, problems with n-jobs and two machines, Brand Management. Optimal sequence algorithm, problems with n-jobs and three machines.

THEORY OF GAMES: Introduction, Two-person zero-sum games, The Maximum –Minimax principle, Games without saddle points – Mixed Strategies, 2 x n and m x 2 Games – Graphical solutions,, Dominance property, Use of L.P. to games.

D. TEXT BOOKS

T1. Linear Programming and Network Flows(by Mokhtar S. Bazaraa, John J. Jarvis, HanifD.Sherali)
T2. Operations Research: Applications and Algorithms (by Wayne L. Winston)
T3.Nonlinear Programming: Theory and Algorithms 3rd Edition (by Mokhtar S. Bazaraa, Hanif D. Sherali C. M. Shetty)

F. REFERENCE BOOKS

R1.Hamdy A. Taha, Operations Research: an introduction, Pearson Education.
R2. J.K. Sharma, Operations. Research: theory and application, Macmillan Publishers.
R3. Frederick S. Hillier and Gerald J Lieberman, Introduction to Operations Research: concept and cases, Tata McGraw-Hill.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Identify the elements of operations management and various transformation processes to enhance productivity and competitiveness.						1			1			1
[CO2]	Understanding the problems as networks and graphs.						2			2	2		1
[CO3]	Apply different mathematical models and the solution to solve optimization problems.	1						2					
[CO4]	Analyze linear programming (LP) models for shortest path, maximum flow, minimal spanning tree, critical path, minimum cost flow, and transshipment problems.						3		2				
[CO5]	Evaluate the problems using special solution algorithms.		1						2	3			
[CO6]	Plan and implement suitable materials handling principles and practices in the operations.						3	2					

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Economic Policies in India

Code: DIP16263

3 Credits | Semester VI

A. Introduction:

- To familiarize the different streams with the basic concepts, structure, problems and issues concerning Indian economy.

B. Course Outcomes: At the end of the course, students will be able to

[CO1]Identify the importance of small scale industries and its problems..

[CO2] Understand Indian economics policy, planning strategies.

[CO3] Apply economics as a discipline encompasses for different approaches to the problems of unemployment, poverty, income generation, industrialization from different perspectives.

[CO4] Analyze economic issues and find solutions to complex economic problems and take correct economic judgment.

[CO5] Evaluate the problems and capable to decide the application for future development.

[CO6] Design the conceptual framework of govt policies and programmes.

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C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

BASIC FEATURES AND PROBLEMS OF INDIAN ECONOMY: Economic History of India- Nature of Indian Economy, demographic features and Human Development Index. Problems of Poverty, Unemployment, Inflation, income inequality, Black money in India.

SECTORAL COMPOSITION OF INDIAN ECONOMY: Issues in Agriculture sector in India. Land reforms Green Revolution and agriculture policies of India.

INDUSTRIAL DEVELOPMENT: Small scale and cottage industries, industrial Policy, Public sector in India, service sector in India.

ECONOMIC POLICIES: Economic Planning in India, Planning commission v/s NITI Aayog, Five Year Plans. Monetary policy in India, Fiscal Policy in India, Centre state Finance Relations, Finance commission in India. LPG policy in India

EXTERNAL SECTOR IN INDIA: India's foreign trade value composition and direction, India Balance of payment since 1991.

FDI in India, Impact of Globalization on Indian Economy, WTO and India.

E. TEXT BOOKS

T1.Karam Singh Gill, Evolution of the Indian Economy, NCERT, New Delhi
T2. Kaushik Basu, The Oxford Companion to Economics of India, Oxford University Press.

F. REFERENCE BOOKS

R1.Dutt Rudder and K.P.M Sunderam, Indian Economy. S Chand & Co. Ltd. New Delhi.
R2. Mishra S.K & V.K Puri, Indian Economy and –Its Development Experience. Himalaya Publishing House.
R3. Singh, Ramesh, Indian Economy, Tata-McGraw Hill Publications, New Delhi.
R4.Dhingra, I.C., March of the Indian Economy, Heed Publications Pvt. Ltd.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Identify the importance of small scale industries and its problems.					1	1						1
[CO2]	Understand Indian economics policy, planning strategies.						2			2			
[CO3]	Apply economics as a discipline encompasses for different approaches to the problems of unemployment, poverty, income generation, industrialization from different perspectives.					2	2				2		1
[CO4]	Analyze economic issues and find solutions to complex economic problems and take correct economic judgment.					3			2				
[CO5]	Evaluate the problems and capable to decide the application for future development.						3	3				1	
[CO6]	Design the conceptual framework of Govt policies and programmer.							3					1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Energy Efficiency and Audit

Code:DIP16264

3 Credits | Semester VI

A. Introduction:

- Undertake energy efficiency measures and energy audit.

B. Course Outcomes: At the end of the course, students will be able to

[CO1] Identify Energy forecasting, Energy economics, Energy pricing and incentives For energy conservation

[CO2] Understand various options and assess the business and policy environment regarding energy conservation and energy auditing.

[CO3] Apply the strategies and policy recommendations on energy conservation and energy auditing.

[CO4] Analyze the viability of energy conservation projects.

[CO5]Evaluate technology, economics and regulation related issues associated with energy conservation and energy auditing.

[CO6] Create competency in Energy analysis techniques and methods & Energy conservation Planning and practices.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS

INTRODUCTION TO ENERGY EFFICIENCY: Energy Scenario- Energy demand and supply, National scenario. Energy Efficiency and Energy Conservation- concepts. Indian Electricity Act 2001; relevant clauses of energy conservation, BEE and its Roles, Star Labeling-Need and its benefits.

PUMPING SYSTEMS, FANS AND BLOWERS: Factors affecting pump performance, Efficient Pumping system operation, Energy conservation opportunities in Pumping systems, Fan types, flow control strategies, Fan performance Assessment. Energy Conservation opportunities in Pumping systems, Tips for energy saving in fans and blowers

AIR COMPRESSORS AND DIESEL POWER GENERATOR SETS: Classification of compressors, Pneumatic System components, Effect of various parameters on efficiency of Compressor, Capacity control of Compressors, Checklist for Energy Efficiency in Compressed air systems, Operating guidelines for diesel generator, operational factors, Effects of improper ventilation of genset, Energy saving measures for DG sets

ENERGY CONSERVATION IN LIGHTING SYSTEM: Replacing Lamp sources, Using energy efficient luminaries, Using light controlled gears.

Installation of separate transformer / servo stabilizer for lighting, Periodic survey and adequate maintenance programs, Innovative measures of energy savings in lighting.

ENERGY EFFICIENT ELECTRICAL MACHINES : Need for energy conservation in induction motor and transformer, Energy conservation techniques in induction motor by: Energy conservation techniques in Transformer, Energy Conservation Equipment: Soft starters, Automatic star delta convertor, Variable Frequency Drives, Automatic p. f. controller (APFC), Energy efficient motor; significant features, advantages, applications and Limitations, Energy efficient transformers, amorphous transformers; epoxy Resin cast transformer / Drytype of transformer, Aggregated Technical and commercial losses (ATC), Technical losses; causes and measures to reduce, Commercial losses: pilferage, causes and remedies. Application of tariff system to reduce energy bill. Co-generation and Tariff; concept, significance for energy conservation.

ENERGY AUDIT OF ELECTRICAL SYSTEMS: Energy audit (definition as per Energy Conservation Act), Energy audit instruments and their use, Questionnaire for energy audit projects, Energy flow diagram (Sankey diagram), Simple payback period, Energy Audit procedure (walk through audit and detailed audit). Energy Audit report format

E. TEXT BOOKS

T1. “Energy Management, Audit and Conservation” by Barun Kumar De
T2. “Energy Management, Audit and Conservation” by Barun Kumar De
T3. “Fundamentals of Energy Conservation and Audit” by Agarkar Santosh Vyankatro and Mateti Naresh Kumar
T4. “Energy Audits and Improvements for Commercial Buildings” by Ian M Shapiro

F. REFERENCE BOOKS

R1. Turner, W. C., Energy Management Handbook, Fairmount Press.
R2. Sharma, K. V. Venkataseshaiah, P., Energy Management and Conservation, I K InternationalPublishing House Pvt. Ltd.
R3. Mehta ,V. K., Principles of Power System, S. Chand and Co. New Delhi,
R4. Singh, Sanjeev; Rathore, Umesh, Energy Management, S K Kataria and Sons, New Delhi
R5. Desai, B. G., Rana, J. S, A. Dinesh, V, Paraman, R., Efficient Use and Management of Electricity in Industry,Devki Energy Consultancy Pvt. Ltd.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Identify Energy forecasting, Energy economics, Energy pricing and incentives For energy conservation	3		2								2	
[CO2]	Understand various options and assess the business and policy environment regarding energy conservation and energy auditing.		2		2	2						2	
[CO3]	Apply the strategies and policy recommendations on energy conservation and energy auditing.		2		2								2
[CO4]	Analyze the viability of energy conservation projects.		2		3					2		2	
[CO5]	Evaluate technology, economics and regulation related issues associated with energy conservation and energy auditing.		3	2									1
[CO6]	Create competency in Energy analysis techniques and methods & Energy conservation Planning and practices.		2	3								3	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Indian Constitution

Code:DIP16266

0 Credits | Semester VI

A. INTRODUCTION:

- The objective of the Constitution of India is to establish a society where there is Justice in social, economic and political. Liberty - thought, expression, faith, belief and worship.

B. COURSE OUTCOMES: By the end of this course, students will be able to:

[CO1] Recall historical background of the Indian constitution.
[CO2] Observe importance for building democratic India, the structure of Indian government, the structure of state government, the local Administration.
[CO3] Develop the knowledge on directive principle of state policy, the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.
[CO4] Analyze the History, features of Indian constitution, the role of Governor and Chief Minister,of state election commission, decentralization of power between central, state and local self-Government.
[CO5] Assess Preamble, Fundamental Rights and Duties,Zilla Panchayat, block level organization, various commissions of viz SC/ST/OBC and women
[CO6] Create ideological framework relied upon by the framers of the Constitution of India, the system of government and role of judiciary by discussing and analyzing the rights and duties specified under the Constitution of India.

C. ASSESSMENT PLAN:

Criteria	**Description**	**Maximum Marks**
Continuous Internal Assessment (CIA)	Internal Examination	20
	Attendance	5
	Assignment	5
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

D. SYLLABUS:

THE CONSTITUTION – INTRODUCTION:

The History of the Making of the Indian Constitution, Preamble and the Basic Structure, and its interpretation. Fundamental Rights and Duties and their interpretation , State Policy Principles

UNION GOVERNMENT:
Structure of the Indian Union, President – Role and Power, Prime Minister and Council of Ministers, Lok Sabha and Rajya Sabha

STATE GOVERNMENT:

Governor – Role and Power, Chief Minister and Council of Ministers, State Secretariat..

.**LOCAL, DISTRICT& ZILA ADMINISTRATION:**
Local Administration, District Administration , Municipal Corporation , Zila Panchayat.

ELECTION COMMISSION:

Election Commission Role and Functioning, Chief Election Commissioner , State Election Commission.

E. TEXT BOOKS

T1. 'Indian Polity' by Laxmikanth
T2. 'Indian Administration' by SubhashKashyap
T3. 'Indian Constitution' by D.D. Basu
T4. 'Indian Administration' by Avasti and Avasti

F. REFERENCE BOOKS

R1. Ethics and Politics of the Indian Constitution Rajeev Bhargava Oxford University Press, New Delhi, 2008
R2. The Constitution of India B.L. FadiaSahityaBhawan; New edition (2017)

R3. Introduction to the Constitution of India DD Basu Lexis Nexis; Twenty-Third 2018 edition

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES										CORRELATION WITH PROGRAM SPECIFIC OUTCOMES	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
[CO1]	Recall historical background of the Indian constitution.					3	2	2					
[CO2]	Observe importance for building democratic India, the structure of Indian government, the structure of state government, the local Administration.					3	1	2					
[CO3]	Develop the knowledge on directive principle of state policy, the knowledge in strengthening of					3		2					
[CO4]	Analyze the History, features of Indian constitution, the role of Governor and Chief Minister, of government.					3		2		2			
[CO5]	Assess Preamble, Fundamental Rights and Duties ,Zilla Panchayat, block level organization,					3	2	2		2			
[CO6]	Create ideological framework relied upon by the framers of the Constitution of India, the system of government and role of judiciary by discussing and analyzing the rights and duties specified under the Constitution of India.					2		3					

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject: Seminar

Code:

1 Credits | Semester VI

A. Introduction:

- The students with consultation with faculty adviser shall arrive at topic of seminar based on exhaustive literature review, current civil engineering scenario, latest techniques or materials etc.
- The students shall review available information and compile the information.
- The students shall prepare technical report.
- The students shall present their seminar to the review committee.
- The seminar topic shall be chosen during the 2nd week of the semester.
- The review and organizing the seminar shall be completed during 6th week.
- The seminar report shall be submitted during 10th week.
- The presentation will be held during 12th week.
- The award of marks is based on the following criteria
    - Selection of Topic for the seminar and its relevance -10%
    - The quality of Seminar Report- 40%
    - Presentation skills and depth of knowledge - 30%
    - Viva and discussion - 20%

B. Course Outcomes:

The students will be able to:

[CO.1]. Appraise the current engineering research/ techniques / developments /interdisciplinary areas.
[CO.1]. Formulate seminar topic by utilizing technical resources/ Journals/ web sources.
[CO.1]. Carry out detailed review of available literature.
[CO.1]. Compose technical report.
[CO.1]. Demonstrate command of voice modulation, voice projection, and pacing duringpresentation.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Continuous Internal Assessment (CIA)	Internal Examination	15
	Attendance	
	Assignment	
End Semester Examination(ESE)	End Semester Examination	35
Total		50
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

Subject:Major Project-II

Code:

3 Credits | Semester V

A. Introduction: The objective of this course is to prepare students to use applications of the theory and practical learned during the course. It will also help students to develop an industry or research oriented project. This course helps students how to carry out project/studies in the field of interest of the student or as given by the industry.

B .Assessment Plan:

Criteria	**Description**	**Maximum Marks**
Continuous Internal Assessment (CIA)	Internal Examination	30
End Semester Examination(ESE)	End Semester Examination	70
Total		100
Attendance	Completion of Internship during the Summer vacation	

GUIDELINES FOR INTERNSHIP

Major Project-II should be based on real/ live problems of the Industry/Govt./NGO/ MSME/Rural Sector or an innovative idea having the potential of a Startup