

**REVISED DIPLOMA CURRICULUM
OF COMPUTER APPLICATION
(PART-II)**

**For the State of Meghalaya
(2024-2025)**



National Institute of Technical Teachers' Training & Research
Block – FC, Sector – III, Salt Lake City, Kolkata – 700 106

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**CURRICULUM STRUCTURE FOR DIPLOMA PROGRAMME IN
COMPUTER APPLICATION**

SEMESTER – III

Sl. No.	Category	Code	Course	Study Scheme			Evaluation Scheme						Total Marks	Credit	
				Contact Hour/Week			Theory			Practical					
				L	T	P	End Exam.	Internal Assessment			End Exam.	Internal Assessment			
								Class Test	Assignment	Attendance		Sessional			Viva
1	Program Core	CAPC201	Computer Programming	2	1	0	60	20	15	5	-	-	-	100	3
2		CAPC203	Scripting Language – Python	2	1	0	60	20	15	5	-	-	-	100	3
3		CAPC205	Data Structure	2	1	0	60	20	15	5	-	-	-	100	3
4		CAPC207	PC Utilities	2	0	0	60	20	15	5	-	-	-	100	2
5		CAPC209	Computer Programming Lab	0	0	4	-	-	-	-	40	40	20	100	2
6		CAPC211	Scripting Languages Lab	0	0	4	-	-	-	-	40	40	20	100	2
7		CAPC213	Data Structure Lab	0	0	4	-	-	-	-	40	40	20	100	2
8		CAPC215	PC utilities Lab	0	0	4	-	-	-	-	40	40	20	100	2
9	Internship	I-201	Internship-I	0	0	4	-	-	-	-	40	40	20	100	2
Total				8	3	20	240	80	60	20	200	200	100	900	21

**CURRICULUM STRUCTURE FOR DIPLOMA PROGRAMME IN
COMPUTER APPLICATION**

SEMESTER – IV

Sl. No.	Category	Code	Course	Study Scheme			Evaluation Scheme							Total Marks	Credit
				Contact Hour/Week			Theory				Practical				
				L	T	P	End Exam.	Internal Assessment			End Exam.	Internal Assessment			
								Class Test	Assign-ment	Attend-ance		Sessional	Viva		
1	Program Core	CAPC202	Multimedia Applications	2	0	0	60	20	15	5	-	-	-	100	2
2		CAPC204	Operating Systems	2	0	0	60	20	15	5	-	-	-	100	2
3		CAPC206	Introduction to DBMS	2	0	0	60	20	15	5	-	-	-	100	2
4		CAPC208	Computer Networks	2	0	0	60	20	15	5	-	-	-	100	2
5		CAPC210	SSAD/Software Engineering	2	0	0	60	20	15	5	-	-	-	100	2
6		CAPC212	Multimedia Lab	0	0	4	-	-	-	-	40	40	20	100	2
7		CAPC214	DBMS Lab	0	0	4	-	-	-	-	40	40	20	100	2
8		CAPC216	Computer Networks Lab	0	0	4	-	-	-	-	40	40	20	100	2
9	Open Elective (Any One)	CAOE202	Open Elective – 1 A. Economic Policies in India B. Renewable Energy Technologies	3	0	0	60	20	15	5	-	-	-	100	3
10	Minor Project	PR202	Minor Project	0	0	4	0	0	0	0	40	40	20	100	2
11	Mandatory	AU202	Essence of Indian Knowledge and Tradition	2	0	0	0	0	0	0	0	0	0	0	0
Total				15	0	16	360	120	90	30	160	160	80	1000	21

SEMESTER - III

COMPUTER PROGRAMMING

L	T	P		Course Code No.: CAPC201
2	1	0		
Total Contact hrs.: Lecture: 30 Tutorial: 15 Practical: 0 Credit : 3			Total marks: 100	Theory: End Term Exam.: 60 P.A: 40

Rationale:

To enable student, develop structured solutions to problems and implementing them using computers. This involves two parts: i) Formulating a solution for a given problem as a well-defined sequence of actions, and ii) Expressing solution in a machine readable form or a programming language. For the second part, we will learn the common units of programming languages. The first part can only be learned through the repeated practice of solving problems.

Course outcomes:

After Completion of the course, student will be able to

- Formulate basic problems computationally
- Identify, analyze, develop, implement, verify and document the requirements for a computing environment
- Demonstrate the use of Conditional Statements, Loops, Arrays, Functions etc.
- Write code snippets to execute them.

Course Content:

The language of choice will be C. The focus will be on problem solving and problem where these ideas can be applied. The main focus of the class will to take examples of problems where these ideas can be employed.

UNIT NO.	CONTENT	TIME ALLOTTED (HRS.)
I	Introduction to Problem Solving (computational way of thinking); Variables and Representation	4
II	Arithmetic, Relational, Logical and Bitwise Operators; Input, Output, Formatting and File I/O	6
III	Conditional Statements, Repeat Statements, Loops and Nested Loops	8
IV	Arrays and Memory Organization, Strings, Multidimensional Arrays, Functions and Parameter Passing	8
V	Recursion and Recursive solutions	4

Tutorial needs to be taken

Suggested Lab Work:

This is a skill course. Topics/concepts taught in the class should be practiced in the Lab same week and practiced regularly during the semester till student becomes confident about it. Students should work on solved and unsolved problems listed in the text books. Teacher also should formulate problems and give them as assignment. This course is all about some theory and a lot of practice.

Reference Books:

1. Let Us C, Yashavant Kanetkar
2. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House
3. C Programming Absolute Beginner's Guide, Dean Miller and Greg Perry
4. The C Programming Language, Kernighan and Ritchie, Prentice Hall of India
5. Programming in ANSI C, E. Balagurusamy, Tata McGraw-Hill
6. C Programming & Data Structures, B. A. Fouruzan and R. F. Gilberg, CENGAGE Learning.
7. Outline of Programming with C, Byron Gottfried, Schaum, McGraw-Hill.

SCRIPTING LANGUAGE-PYTHON

L	T	P		Course Code No.: CAPC203
2	1	0		
Total Contact hrs.: Lecture: 30 Tutorial: 15 Practical: 0 Credit : 3			Total marks: 100	Theory: End Term Exam.:60 P.A: 40

Rationale:

This course is included for developing understanding of how to work with a scripting language.

Course outcomes:

At the end of the course student will be able to

- Write programs with a scripting language
- Demonstrate the use of Variables, Data Types, Control Structures, Functions etc.
- Identify, analyze, develop, implement, verify and document the requirements for a computing environment
- Develop the ability to use any other scripting language on their own.

Course Content:

UNIT NO.	CONTENT	TIME ALLOTTED (HRS.)
I	Introduction, Variables and Data Types History, Features, Setting up path, Installation and Working with Perl/Python, Basic Syntax Understanding Perl/Python variables, Numeric data types, Using string data type and string operations, Basic Operators, understanding coding blocks, defining list and list slicing, Other Data Types (Tuples, List, Dictionary -Python, Arrays, Associative Arrays/Hashes - Perl)	5
II	Control Structures Conditional blocks using if, else and elif, For loops and iterations, while loops, Loop manipulation using continue, break and else (and pass in Python), Programming using conditional and loops block	7
III	Functions, Modules and Packages Organizing Perl codes using functions, Organizing Perl projects into modules, Importing own module as well as external modules, Understanding Packages	7

IV	File I/O, Text Processing, Regular Expressions	6
	Understanding read functions, Understanding write functions, Programming using file operations, Powerful pattern matching and searching, Power of pattern searching using regex	
V	Frameworks Frameworks - Web2Py, Django, Ruby on Rails, Struts (any one of these or any other)	5

Tutorial needs to be taken

Suggested Lab Work:

This is a skill course. Topics/concepts taught in the class should be practiced in the Lab same week and practiced regularly during the semester till student becomes confident about it. Students should work on solved and unsolved problems listed in the text books. Teacher also should formulate problems and give them as assignment. This course is all about some theory and a lot of practice.

Reference Books:

1. Taming Python by Programming, Jeeva Jose, Khanna Publishing House
2. Starting Out with Python, Tony Gaddis, Pearson
3. Core Python Programming, Wesley J. Chun, Prentice Hall
4. Python Programming: Using Problem Solving Approach, Reema Thareja, Oxford University
5. Introduction to Computation and Programming Using Python. John V. Guttag, MIT Press.
6. Beginning Python using Python 2.6 and Python 3, James Payne, Wrox publishing
7. Practical Programming: An Introduction to Computer Science using Python 3, Paul Gries, The Pragmatic Bookshelf

DATA STRUCTURE

L	T	P		Course Code No.: CAPC205
2	1	0		
Total Contact hrs.: Lecture: 30 Tutorial: 15 Practical: 0 Credit : 3			Total marks: 100	Theory: End Term Exam.:60 P.A: 40

Rationale:

This course is to provide strong foundation for implementing programming language to formulate, analyze and develop solutions related to various data structures problems.

Course outcomes:

After completion of the course, students will be able to

- Formulate various data structures problems
- Analyze any given data structures problem
- Develop solution of the problems by understanding of Data Structures
- Identify the applications of data structure in different problems

Course Content:

UNIT NO.	CONTENT	TIME ALLOTTED (HRS.)
I	Introduction to Data Structures: Basic Terminology, Classification of Data Structures, Operations on Data Structures.	4
II	Linear Data Structures- Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on a Stack, Applications of Stacks- Infix-to-Postfix Transformation, evaluating Postfix Expressions. Queues: Introduction to Queues, Array Representation of Queues, Operations on a Queue, Types of Queues-DeQueue, Circular Queue, Applications of Queues-Round Robin Algorithm.	9
III	Linked Lists: Singly Linked List, Representation in Memory, Operations on a Single Linked List, Circular Linked Lists, Doubly Linked Lists, Linked List Representation and Operations of Stack, Linked List Representation and Operations of Queue	9
IV	Non Linear Data Structures - Trees: Basic Terminologies, Definition and Concepts of Binary Trees, Representations of a Binary Tree using Arrays and Linked Lists, Operations on a Binary Tree-Insertion, Deletion, Traversals, Types of Binary Trees. GRAPHS: Graph Terminologies, Representation of Graphs- Set, Linked,	8

	Matrix, Graph Traversals	
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Tutorial needs to be taken

Suggested Lab Work:

This is a skill course. Topics/concepts taught in the class should be practiced in the Lab same week and practiced regularly during the semester till student becomes confident about it. Students should work on solved and unsolved problems listed in the text books. Teacher also should formulate problems and give them as assignment. This course is all about some theory and a lot of practice.

This course is linked with a previous course on Computer Programming and a parallel course on Algorithms, hence exercises should not be done in isolation.

Reference Books:

1. Data Structures, R.S. Salaria, Khanna Book Publishing, New Delhi
2. Data Structures Using C, Reema Thareja, Oxford University Press India.
3. Classic Data Structures, Samanta Debasis, Prentice Hall of India.
4. Fundamentals of Data Structure in C, Horowitz, Ellis, Sahni, Sartaj, Anderson-Freed, Susan, University Press, India.
5. Data Structures: A Pseudo code approach with C, Richard F. Gilberg, Behrouz A. Forouzan, CENGAGE Learning, India.
6. Data Structures and Algorithms: Concepts, Techniques and Applications, G. A. V. Pai, McGraw- Hill Education, India.

PC UTILITIES

L	T	P		Course Code No.: CAPC207
2	0	0		
Total Contact hrs.: Lecture: 30 Tutorial: 0 Practical: 0 Credit : 2			Total marks: 100	Theory: End Term Exam.:60 P.A: 40

Rationale:

This course is to provide the knowledge about computer oriented financial accounting in order to perform accounting related tasks of various organizations.

Course Outcomes:

After completion of the course, students will be able to

- Explain The Basic Concepts of financial accounting
- Prepare the financial accounts
- Explain the financial statements of various types of business units
- Calculate profits or losses from incomplete records
- Prepare accounts of consignment

Course Content:

Part-I Computer Oriented Financial Accounting

UNIT NO.	CONTENT	TIME ALLOTTED (HRS.)
I	Meaning of Accountancy, Generally Accepted Accounting Principles (GAAP), Transaction, Rules of Debit and Credit, journal, Ledger, Trial Balance, Balance Sheet, Accounting Standard.	3
II	Role of Computer in Financial Accounting, Management Accounting and Cost Accounting. Accounting Information System, IT and Online accounting, Differences between manual Accounting and Computerized Accounting	4
III	Introduction to Accounting Packages. TALLY, TALLY ERP- Features and configuration, Preparation of Ledger Account and Groups, Voucher types and their entry, Maintenance of Accounting Books, Final Accounts, Generation of Financial Reports, Preparation of Accounting Reports, Day Book Summaries, Report Printing, TDS.	8

Part -II Computer Oriented Financial Accounting

UNIT NO.	CONTENT	TIME ALLOTTED (HRS.)
I	Create Multiple Ledger of the following Account Heads: Bank Charges; Salary; Bonus Paid; Business Promotion Expenses; Commission Paid ; Conveyance ; Depreciation on Air Conditioner ; Depreciation on Building ; Depreciation on Computers ; Depreciation on Furniture & Fixtures ; Depreciation on Motor Car ; Depreciation on Plant & Machinery ; Discount ; Donation ; Electricity Charges ; Employers Contribution to Provident Fund ; Freight Outward ; Insurance Premium ; Interest Due ; Interest & Finance Charge ; Interest on Bank Overdraft ; Interest on Partner’s Capital A/c ; Interest on Unsecured Loans ; Legal Fees ; Miscellaneous Expenses ; Office Rent ; Office Repairs & Maintenance ; Printing & Stationery ; Rent ; Rent Due ; Travelling Expenses .	2
II	Prepare a Trading and P & L A/C and Balance sheet by creating a company using TALLY from the following information- 1) April 1 2010: Started business with cash Rs. 10,00,000.00 2) April 2 2010: Brought furniture worth Rs. 20,000.00 3) April 3 2010: Deposited into bank Rs. 8,00,000.00 4) April 6 2010: Brought goods in cash Rs. 1,00,000.00 5) April 8 2010: Brought goods worth Rs.12,00,000.00 from Ram Trading on credit 6) April 9 2010: Brought goods worth Rs. 5,00,000.00 from Shyam Trading on credit 7) April 10 2010: Paid Rs. 2,00,000.00 to Ram Trading from bank account. 8) April 14 2010: Sold goods worth Rs. 15,00,000.00 to Pradip & Co. and received Rs 5,00,000.00 in cash from them. 9) April 19 2010: Deposited Rs. 3,00,000.00 to the bank account. 10) April 25 2010: Sold goods to Hari Brothers worth Rs. 7,00,000.00 11) April 26 2010: Postage expenditure paid Rs. 700.00 12) April 26 2010: Office general expanses Rs. 4,000.00 13) April 28 2010: Bank charges Rs. 800.00 14) April 1 2010: Paid for rent Rs. 8000.00 15) April 1 2010: Paid salary to staff Rs. 15,000.00	2
III	Make necessary entries in Tally in the books of Galaxy Enterprise: (a) Introduced Cash Rs 10,00,000, Furniture worth Rs1,00,000 , Computer worth Rs 86,000 , Machinery Rs 1,20,000 into the business on 1 st Jan,2010 (b) Opened a Current A/c with Bank of Baroda with Rs1,00,000 on 2 nd Jan,2011 (c) Purchased goods on 6 th Jan,2010 from Sridhar Stores on credit Rs 2,25,000 (d) Sold goods for Cash Rs 1,20,000 to Maitree Stores on 7 th Jan,2010 (e) Sold goods to Sankar on credit for Rs 34,000 on 9 th Jan,2010 (f) Paid Rentadvance Rs 25,000 by Cheque No 345671 on 10 th Jan,2010 (g) Withdrew from bank Rs 5,000 for office expenses on 18 th Jan,2010 (h) Purchased stationery items on 22 nd Jan, 2010 for office use from Radhika Stationeries Rs 1,500 (i) Received Advance from Jagat for supply of goods worth Rs 12,000 (j) Paid salary to office staff Rs10,000 by Cheque 345672 on 31 st Jan, 2010	2

IV	<p>Prepare a Cash Book from the books of ABC Enterprise:</p> <p>(a) Cash Balance on 1st April 2010 Rs 4,00,000</p> <p>(b) Opened a Current Account with UCO Bank on 5th April, 2010 with Rs16,000</p> <p>(c) Purchased goods for Cash Rs 2,50,000 on 6th April, 2010</p>	2
	<p>(d) Sold goods for Cash Rs 1,25,000 on 8th April, 2010</p> <p>(e) Paid for Travelling Expenses Rs 2,300 on 10th April, 2010</p> <p>(f) Paid for Staff Welfare Rs 1,200 on 16th April, 2010</p> <p>(g) Introduced Additional Capital Rs 50,000 on 20th April, 2010</p> <p>(h) Withdrew from Bank for Office Cash Rs 2,000 on 27th April, 2010</p> <p>(i) Sold goods for Rs 65,000 on 28th April, 2010 and payment received by Cheque 15,000 and balance in Cash</p>	
V	<p>Make Data Entries for the following transactions:</p> <p>(a) Withdrew Rs 1,00,000 cash from SBI on 6th Jan ,2011</p> <p>(b) Deposited Rs 40,000 in HDFC Bank on 9th Jan ,2011</p> <p>(c) Transferred Rs 20,000 from HDFC Bank to SBI on 12th Jan, 2011</p> <p>(d) Paid Rs 4,300 as Insurance charges through HDFC Bank on 18thJan, 2011</p> <p>(e) Received Rs 3,25,000 from ABC Co. Ltd. On 23rd Jan, 2011 against our sales through Cheque and it has been deposited in SBI</p> <p>(f) Sales worth Rs 5,50,000 made on credit to Vikas Group on 29thjan,2011</p> <p>(g) Provision towards Employers PF Contribution Rs 78,000 made on 31stjan,2011</p> <p>(h) Purchased Machinery Rs 1,00,000 from Sunder Enterprise (INPUT VAT 12.5%)</p>	1
VI	<p>Enter the following transactions in Tally in the books of Computer Solutions:</p> <p>(a) Purchased on 8th April, 2009 HCL Celeron 15 Nos @ Rs 14,000; HCL PIV 15 Nos @ Rs 21,000 from Next Generation Systems (Input VAT @ 4%)</p> <p>(b) Sold on 10th April, 2009 to Fortune Computer Services 10 Nos HP LaserJet Series 1010 @ Rs 12,000 (Output VAT @ 12.5%)</p> <p>(c) Received from Fortune Computer Services Rs 80,000 on 25th April, 2009</p> <p>(d) Paid to Next Generation System Rs 2,00,000 vide Cheque No 357602 of HDFC Bank</p>	1
VII	<p>Prepare a Double Column Cash Book from the following transactions of XY Ltd:</p> <p>(a) On 1stJan, 2010 Cash in Hand Rs 5,00,000 and Cash at SBI Rs 2,30,000</p> <p>(b) On 4thJan, 2010 Goods purchased for cash Rs 1,24,000</p> <p>(c) On 8thJan, 2010 Goods sold for cash Rs 2,25,000</p> <p>(d) Deposited into SBI an amount of Rs 1,10,500</p> <p>(e) Paid rent to landlord Rs 24,000 by Cheque no 234675</p> <p>(f) Withdrew from SBI Rs 30,000 for purchase of Furniture</p> <p>(g) Received payment of Rs 30,000 from Amit Kothari, a customer by Cheque</p> <p>(h) Withdrew from SBI Rs 23,000 for office cash</p>	2
VIII	<p>Make relevant Voucher Entries from the following transactions:</p> <p>(a) On 1st April, 2010 India InfoTech received a Bill (vide No. 001) from Phoenix Agencies for Rs. 5,00,000 towards the Advertisement services rendered.</p> <p>(b) On April 8, 2010, payment of Rs. 4,95,000 is made towards bill no. Bill-001 to Phoenix Agencies for the purchase of Advertisement services, vide cheque no. 254781 23</p> <p>(c) On May 6, 2010, Universal InfoTech, paid TDS of Rs. 5,000 towards Advertisement</p>	1

	Expenses, vide cheque no. 056330 for the month of April, 2010.	
IX	<p>Show how would you deal with the following Bills in Tally:</p> <p>(a) On 7th May, 2010, India InfoTech received a bill (vide no. 911) from Gautam Bishnu & Associates for Rs. 1,12,360 inclusive of other charges of Rs. 12,360 towards the auditing services provided (TDS Rs10,000)</p> <p>(b) On 8th May, 2010 India InfoTech received a bill (vide No. 696) from Digitech Computers for Rs. 25,000 towards commission charges.</p> <p>(c) On 12th May, 2010 India InfoTech received a bill (vide No. 874) from Digitech Computers for Rs. 40,000 towards commission charges.</p> <p>(d) On 14th May, 2010 India InfoTech deducted tax Rs 2,500 towards Commission Expenses for the transaction dated 8th May and Rs 4,000 towards transaction dated 12th May. 10.</p> <p>BX Ltd purchased a machinery for Rs 5,00,000. To use this machine company requires a platform, pipe connections, electrical connections, fabrication works etc. at the cost of Rs. 1,00,000. On the expense of Rs. 1,00,000 tax to be deducted at source. The Company made a contract with Arun Contractors for electrical and fabrication work. On 10-8-2010 BX Ltd received bill for Rs. 60,000 from Arun contractors towards electrical and fabrication work. Record the above transaction in Tally.</p>	2

COMPUTER PROGRAMMING LAB

L	T	P		Course Code No.: CAPC209
0	0	4		
Total Contact hrs.: Lecture: 0 Tutorial: 0 Practical: 60 Credit : 2			Total marks: 100	Practical: End Term Exam.:40 P.A: 60

Rationale:

This Lab course is intended to practice what is taught in theory class of ‘Computer Programming’ and become proficient in computer programming. Computer programming is all about regular practice. Students should work on solved and unsolved problems listed in the text books, and the problems given by the teacher. Some of the topics that should necessary be covered in lab are listed below.

Course outcomes:

After completion of the course, student will be able to

- Write code snippets for given programs
- Debug the programs
- Execute the programs
- Prepare report on the executed programs

• Course Content:

S.No.	Topics for Practice
1	Familiarization with programming environment (Editor, Compiler, etc.)
2	Programs using I/O statements and various operators
3	Programs using expression evaluation and precedence
4	Programs using decision making statements and branching statements
5	Programs using loop statements
6	Programs to demonstrate applications of n dimensional arrays
7	Programs to demonstrate use of string manipulation functions
8	Programs to demonstrate parameter passing mechanism
9	Programs to demonstrate recursion
10	Programs to demonstrate use of pointers
11	Programs to demonstrate command line arguments
12	Programs to demonstrate dynamic memory allocation
13	Programs to demonstrate file operations

The language of choice will be C. This is a skill course. More you practice, better it will be.

Reference Books:

1. Let Us C, Yashavant Kanetkar
2. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House
3. C Programming Absolute Beginner's Guide, Dean Miller and Greg Perry
4. The C Programming Language, Kernighan and Ritchie, Prentice Hall of India
5. Programming in ANSI C, E. Balagurusamy, Tata McGraw-Hill
6. C Programming & Data Structures, B. A. Fouruzan and R. F. Gilberg, CENGAGE Learning.

SCRIPTING LANGUAGES LAB

L	T	P		Course Code No.: CAPC211
0	0	4		
Total Contact hrs.: Lecture: 0 Tutorial: 0 Practical: 60 Credit : 2			Total marks: 100	Practical: End Term Exam.:40 P.A: 60

Rationale:

This Lab course is intended to practice whatever is taught in theory class of ‘Scripting Languages’ and become proficient in scripting. Computer programming is all about regular practice. Students should work on solved and unsolved problems listed in the text books, and the problems given by the teacher. Some of the topics that should necessary be covered in lab are listed below.

Course outcomes:

At the end of the course student will be able to

- Write the program with a scripting language
- Debug the programs
- Execute the programs
- Prepare report on the executed programs

Course Content:

Sl. No.	Topics for Practice
1	Practice basic coding syntax
2	Write and execute scripts based on data types
3	Write and execute Python scripts with conditionals and loops
4	Write and execute Scripts based on Functions and Modules
5	File Processing scripts
6	Write and execute Regular Expressions
7	Write and execute SQL Queries
8	Write and execute scripts using DBI
9	Develop a simple web application

Teacher may choose any one scripting language. This is a skill course. More student practice and try to find solution on their own, better it will be.

Reference Books:

1. Taming Python by Programming, Jeeva Jose, Khanna Publishing House
2. Starting Out with Python, Tony Gaddis, Pearson
3. Core Python Programming, Wesley J. Chun, Prentice Hall
4. Python Programming: Using Problem Solving Approach, Reema Thareja, Oxford University Press
5. Introduction to Computation and Programming Using Python. John V. Guttag, MIT Press.
6. Beginning Python using Python 2.6 and Python 3, James Payne, Wrox publishing
7. Practical Programming: An Introduction to Computer Science using Python 3, Paul Gries, The Pragmatic Bookshelf

DATA STRUCTURE LAB

L	T	P		Course Code No.: CAPC213
0	0	4		
Total Contact hrs.: Lecture: 0 Tutorial: 0 Practical: 60 Credit : 2			Total marks: 100	Practical: End Term Exam.:40 P.A: 60

Rationale:

This Lab course is intended to practice whatever is taught in theory class of ‘Data Structures’, ‘Algorithms’ and is an extension of previous course on ‘Computer Programming’. Students should work on problems listed in the text books, and the problems given by the teacher. Some of the topics that should necessary be covered in lab are listed below. This Lab course requires a good coordination between theory course in Data Structures and Algorithms.

Course outcomes:

After completion of the course, student will be able to

- Write programs for creating and doing different operations on various data structures.
- Implement various algorithms learnt in the course on Algorithms.
- Demonstrate good command over Data Structures and its applications in Algorithms.
- Explain the use of data structure for various problems

Course Content:

Sl. No.	Topics for Practice
1	Write a program using recursive and non-recursive functions to perform search operation in a given list of integers using linear search technique
2	Search operation in a given list of integers using binary search technique
3	Write a program to implement insertion sorting for a given random data
4	Write a program to implement bubble sorting for a given random data
5	Write a program to implement quick sorting for a given random data
6	Write a program to implement selection sorting for a given random data
7	Write a program to implement heap sorting for a given random data
8	Write a program to implement Hashing tables
9	Write a program to implement single linked list
10	Write a program to implement double linked list

11	Write a program to implement circular linked list
12	Write a program to Implement Stack operations using array and linked list
13	Write a program to Implement Queue operations using array and linked list.
14	Write a program to implement Breadth First Search (BFS)
15	Write a program to implement Depth First Search (DFS)
16	Write a program to implement a binary tree of integers
17	Write a program to find the minimum depth of a binary tree

Use 'C' as programming language for the purpose. This is a skill course. More student practice and try to find solution on their own, better it will be.

Reference Books:

- 1.Data Structures, R.S. Salaria, Khanna Book Publishing
- 2.Data Structures Using C, Reema Thareja, Oxford University Press India.
- 3.Classic Data Structures, Samanta Debasis, Prentice Hall of India.
- 4.Fundamentals of Data Structure in C, Horowitz, Ellis, Sahni, Sartaj, Anderson-Freed, Susan, University Press, India.
- 5.Data Structures: A Pseudo code approach with C, Richard F. Gilberg, Behrouz A. Forouzan, CENGAGE Learning, India.
- 6.Data Structures and Algorithms: Concepts, Techniques and Applications, G. A. V. Pai, McGraw-Hill Education, India.

PC UTILITIES LAB

L	T	P		Course Code No.: CAPC215
0	0	4		
Total Contact hrs.: Lecture: 0 Tutorial: 0 Practical: 60 Credit : 2			Total marks: 100	Practical: End Term Exam.:40 P.A: 60

Rationale:

This course is introduced to the students for familiarizing the domain of PC Utilities, which explain the applications of MS OFFICE, MS ACCESS and AutoCAD.

Course outcomes:

At the end of the course student will be able to

- Demonstrate the use of various tools of MS Office
- Explain the use of various tools of MS Office
- Apply the tools of MS Office in real life problems
- Illustrate the AutoCAD for various engineering drawings

Course Content:

<u>S. No</u>	<u>Topics for Practice</u>
<u>1</u>	Introduction to MS Office Basic features of Ms Office, Overview of Different Office Tools
<u>2</u>	Introduction to MS Word Creating and Editing document, Formatting Documents, Working with Tables, Spell checking, Mail Merging, Importing Graphics into word Document
<u>3</u>	Introduction to MS Excel Creating a New Work Book, Entering Labels, Values and Formulas, Formatting the layout, Working with Functions, Creating the Chart from data, Writing macros
<u>4</u>	Introduction to Power Point Creating a Presentation, Adding/Editing Text, Working with objects, Formatting the Presentation, Placing the chart in slide, Slide Show and Printing
<u>5</u>	Introduction to MS Access Creation of database Creation of tables - Field Declaration, Data type Declaration, Constraint Declaration. Working with records, Querying the database, Joining Tables, Designing the Form, Creating the report
<u>6</u>	AutoCAD Use of AutoCAD to make simple engineering drawing – making of simple drawing, editing of existing drawing, dimensioning, drawing section lines and hatched sections, writing text on drawings, display of drawings, making different settings of drawings related to scale, units, co-ordinate system

Reference Books:

1. Manual for MS Office
2. Self Learning Study Material on MSWORD developed by TTTI, Calcutta
3. Self Learning Study Material on MS POWER POINT developed by TTTI, Calcutta
4. Self Learning Study Material on MS EXCEL developed by TTTI, TTTI, Calcutta
5. Manual for AutoCAD
6. Engineering Drawing by Bhatt & Panchal – Charotar Publishing House
7. AutoCAD 14 for Windows Bible by Tickoo, Tickoo & Muthoo – Galgotia Publication
8. B.B. Dam, H.C. Gautam, Theory and Practice of Financial Accounting, Ashok Publication.
9. Sanjay Saxena, P. Chopra, Computer application in Management, Vikas Publishing House Pvt. Ltd., New Delhi.
10. Marshall Romney & Steinbart, Accounting Information System, Pearson Education, New Delhi.
11. K.K. Nadhani, Implementing Tally ERP 9, BPB Publications, New Delhi

INTERNSHIP-I

L 0	T 0	P 4		Course Code No.: I-201
Total Contact hrs.: Credit: 2			Total Marks: 100	Evaluation Scheme: End Term Exam: 40 P.A.: 60

RATIONALE:

Internship provides an in-depth knowledge on engineering students. This internship enables the students to understand and learn the current trend in the job market. Internship provides great opportunity to get real life experience and exposure.

Students will be exposed to structured and practical learning experience that prepares individuals for their future careers, helps them make informed career choices, and equips them to build their profile for their jobs and also for their higher studies.

INTERNSHIP PROTOCOL:

Students are required to take up an Internship/ Entrepreneurial activities / Project work/ Seminar and Inter/ Intra Institutional Training.

As per AICTE guideline the institutes have the flexibility to schedule internship, Project work, Seminar etc. according to the availability of the opportunities. Students are required to be involved in Inter/ Intra Institutional Activities viz.,

- Training with higher Institutions;
- Soft skill training organized by **Training and Placement Cell of the respective institutions;**
- Contribution at incubation/ innovation /entrepreneurship cell of the institute;
- Participation in conferences/ workshops/ competitions etc.;
- Learning at Departmental Lab/ Idea Lab/ Institutional workshop;
- Working for consultancy/ research project within the institutes and
- Participation in all the activities of Institute's Innovation Council for eg: IPR workshop/Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.

SEMESTER - IV

MULTIMEDIA APPLICATIONS

L	T	P		Course Code No.: CAPC202
2	0	0		
Total Contact hrs.: Lecture: 30 Tutorial: 0 Practical: 0 Credit : 2			Total marks: 100	Theory: End Term Exam.:60 P.A: 40

Rationale:

This course enables the students to familiar with the domain of Multimedia Technologies, which explain the technologies underlying digital images, videos and audio contents, including various compression techniques and standards, and the issues to deliver multimedia content over the Internet.

Course outcomes:

After completion of the course, students will be able to

- Explain various aspects of Multimedia and related standards.
- Build multimedia content and applications
- Develop multimedia enable web applications and computer applications
- Apply the concept of Multimedia for the simulation of real life cases

Course Content:

UNIT NO.	CONTENT	TIME ALLOTTED (HRS.)
I	Introduction Multimedia Foundation and Concepts: Multimedia Hardware, Multimedia Software, Multimedia operating systems, Multimedia communication system	3
II	Text and Audio Text: Types of Text, Ways to Present Text, Aspects of Text Design, Character, Character Set, Codes, Unicode, Encryption; Audio: Basic Sound Concepts, Types of Sound, Digitizing Sound, Computer Representation of Sound (Sampling Rate, Sampling Size, Quantization), Audio Formats, Audio tools, MIDI	4
III	Image and Video Image: Formats, Image Color Scheme, Image Enhancement; Video: Analogue and Digital Video, Recording Formats, Video Capture, and Computer based Animation.	5
IV	Content Development and Distribution Desktop publishing (Coral Draw, Photoshop, Page maker) Multimedia Animation & Special effects (2D/3D animation, Flash)	6
V	Basic Compression Techniques Video and Audio Data Compression Techniques – Lossy and Lossless. Example algorithms/standards: Huffman, RLE, JPEG, MPEG, MP3, MP4, LZMA, FLAC,	4

	ALAC, ITU G.722, H.261, H.265	
VI	Document Architecture and Content Management Content Design and Development, General Design Principles Hypertext: Concept, Open Document Architecture (ODA), Multimedia and Hypermedia Coding Expert Group (MHEG), Standard Generalized Markup Language (SGML), Document Type Definition (DTD), Hypertext Markup Language (HTML) in Web Publishing. Case study of Applications	5
VII	Multimedia Applications Interactive television, Video-on-demand, Video Conferencing, Educational Applications, Industrial Applications, Multimedia archives and digital libraries, media editors.	3

Reference Books:

1. An Introduction to Multimedia Authoring, A. Eliens
2. Fundamentals of Multimedia, Prentice Hall/Pearson, Ze-Nian Li & Mark S. Drew.
3. Multimedia and Animation, V.K. Jain, Khanna Publishing House, Edition 2018
4. Fundamentals of Multimedia, Ramesh Bangia, Khanna Book Publishing Co., N. Delhi (2007)
5. Macromedia Flash5 fast and easy Web Development, Design, PHI
6. Castro, HTML4 for the World Wide Web, Pearson Ed.
7. Schurman & Purdi, Dynamic HTML in Action, Second Edition, PHI
8. Lozano, Multimedia- Sound & Video, PHI

OPERATING SYSTEMS

L	T	P		Course Code No.: CAPC204
2	0	0		
Total Contact hrs.: Lecture: 30 Tutorial: 0 Practical: 0 Credit : 2			Total marks: 100	Theory: End Term Exam.:60 P.A: 40

Rationale:

This course is included to introduce various ideas in implementing operating systems, particularly UNIX. Introduce to various options available so as to develop capacity to compare, contrast, and evaluate the key trade-offs between different design choices.

Course outcomes:

After completion of the course, students will be able to

- Explain the basic components of Operating System and its Architecture
- Explain the Process and Memory Management techniques
- Explain the File Management techniques
- Explain various disk scheduling algorithms

Course Content:

UNIT NO.	CONTENT	TIME ALLOTTED (HRS.)
I	Overview of Operating System, basic concepts, UNIX/LINUX Architecture, Kernel, services and systems calls, system programs.	6
II	Process Management: Process concepts, operations on processes, IPC, Process Scheduling, Multi- threaded programming Memory management: Memory allocation, Swapping, Paging, Segmentation, Virtual Memory, various faults.	7
III	File management: Concept of a file, access methods, directory structure, file system mounting, file sharing and protection, file system structure and implementation, directory implementation, free- space management, efficiency and performance. Different types of file systems	7
IV	I/O System: Mass storage structure - overview, disk structure, disk attachment, disk scheduling algorithms, swap space management, RAID types.	6
V	OS Security: Authentication, Access Control, Access Rights, System Logs	4

Reference Books:

1. Operating System Concepts, Silberschatz and Galvin, Wiley India Limited
2. UNIX Concepts and Applications, Sumitabha Das, McGraw-Hill Education
3. Operating Systems, Internals and Design Principles, Stallings, Pearson Education, India
4. Operating System Concepts, Ekta Walia, Khanna Publishing House
5. Modern Operating Systems, Andrew S. Tanenbaum, Prentice Hall of India
6. Operating systems, Deitel & Deitel, Pearson Education, India

INTRODUCTION TO DBMS

L	T	P		Course Code No.: CAPC206
2	0	0		
Total Contact hrs.: Lecture: 30 Tutorial: 0 Practical: 0 Credit : 2		Total marks: 100		Theory: End Term Exam.:60 P.A: 40

Rationale:

This course covers the development of database-driven applications using the capabilities provided by modern database management system software. The concepts include conceptual modeling, relational database design and database query languages.

Course outcomes:

After completing the course, the students will be able to

- Explain the procedure for designing a database and database-based applications
- Explain the principle of using a DBMS
- Demonstrate the use of DBMS in real life applications
- Discuss the critical role of database system in designing several information system-based software systems or applications.

Course Content:

As a part of the lab, project work is included.

UNIT NO.	CONTENT	TIME ALLOTTED (HRS.)
I	Introduction; Database System Concepts and Architecture	4
II	Data Modeling using the Entity-Relationship Model; The Enhanced Entity-Relationship (EER) model	6
III	The Relational Data Model and Relational Database Constraints; ER/EER to Relational Model map-ping; Relational Algebra and Relational Calculus	7
IV	SQL-99: Schema definition, Constraints, Queries, and Views; Security; Introduction to SQL programming Techniques	8
V	Functional dependencies and normalization for relational databases; Relational database design algorithms and further dependencies.	5

Reference Books:

1. Fundamentals of Database Systems, Elmasri & Navathe, Pearson Education
2. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata McGraw-Hill.
3. Database System Concepts, Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw- Hill, New Delhi, India.
4. Introduction to Database Systems, C.J. Date, Pearson Education
5. Introduction to SQL, Rick F. Vander Lans, Pearson Education

COMPUTER NETWORKS

L	T	P		Course Code No.: CAPC208
2	0	0		
Total Contact hrs.: Lecture: 30 Tutorial: 0 Practical: 0 Credit : 2			Total marks: 100	Theory: End Term Exam.:60 P.A: 40

Rationale:

This course enables the students to understand functioning of computer networks and popular networking protocols

Course outcomes:

After completion of the course, students will be able to

- Explain the computer networks, issues, limitations, options available
- Configure basic LAN
- Connect computers to LAN
- Justify the care that needs to be taken while developing computer networks

Course Content:

UNIT NO.	CONTENT	TIME ALLOTTED (HRS.)
I	Introduction to computer networks; Network Models- OSI Reference Model, TCP/IP Model;	5
II	Transmission Media – principles, issues and examples; Wired Media – Coaxial, UTP, STP, Fiber Optic Cables; Wireless Media – HF, VHF, UHF, Microwave, Ku Band; Network topologies; Data Link Layer – design issues, example protocols (Ethernet, WLAN, Bluetooth); Switching Techniques;	8
III	Network Layer - design issues, example protocols (IPv4); Routing - principles/issues, algorithms (Distance-vector, Link-state) and protocols (RIP, OSPF);	7
IV	Transport Layer - design issues, example protocols (TCP); Application Layer Protocols (SMTP, DNS).	6
V	Functioning of Network Devices – NIC, Hub, Switch, Router, WiFi Devices; Network Management System and example protocol (SNMP).	4

Reference Books:

1. Computer Networks, 4th Edition (or later), Andrew S. Tanenbaum, PHI
2. TCP/IP Illustrated, Volume-1, W. Richard Stevens, Addison Wesley
3. Data and Computer Communications, William Stallings, PHI
4. An Engineering Approach to Computer Networking, S. Keshav, Addison Wesley/Pearson
5. An Integrated Approach to Computer Networks, Bhavneet Sidhu, Khanna Publishing House

SSAD/SOFTWARE ENGINEERING

L	T	P		Course Code No.: CAPC210
2	0	0		
Total Contact hrs.: Lecture: 30 Tutorial: 0 Practical: 0 Credit : 2			Total marks: 100	Theory: End Term Exam.:60 P.A: 40

Rationale:

This course is to inculcate essential technology and software engineering knowledge and skills essential to build a reasonably complex usable and maintainable software iteratively. It emphasizes on structured approach to handle software development and enhance communication skills.

Course outcomes:

After completion of the course, students will be able to

- Explain the introductory concepts of software engineering and techniques
- Work in a small team to deliver a software system.
- Demonstrate various software technologies, process and project management skills
- Apply the knowledge of software engineering for real life cases

Course Content:

As per the course design, concepts learned as part of this course will/should be used in the Minor Project (Proj.202). These two courses should go hand in hand to be effective

UNIT NO.	CONTENT	TIME ALLOTTED (HRS.)
I	Introduction to Software Engineering, Lifecycle, Process Models - Traditional v/s Agile processes.	5
II	Development Activities - Requirements Gathering and Analysis, Design Concepts, Software architecture and Architectural styles, Basic UI design, Effective Coding and Debugging techniques.	9
III	Software Testing Basics, Unit, Integration, System and Acceptance Testing, Introduction to various testing techniques (e.g. Stress testing), Writing and executing test cases, Quality Assurance.	8
IV	Project Management - Project management concepts, Configuration and Release Management, Version Control and its tools (Git), Release Planning, Change Management, Software Maintenance, Project Metrics.	8

Reference Books:

1. Software Engineering – A Practitioner’s Approach, 7th Edition, Roger Pressman.
2. Software engineering, Ian Sommerville, Pearson Education
3. An Integrated Approach to Software Engineering, Pankaj Jalote, Springer Verlag
4. Software Engineering, Nasib Singh Gill, Khanna Book Publishing Co. India.
5. Software Engineering, K. K. Agarval, Yogesh Singh, New Age International Publishers

MULTIMEDIA LAB

L	T	P		Course Code No.: CAPC212
0	0	4		
Total Contact hrs.: Lecture: 0 Tutorial: 0 Practical: 60 Credit : 2			Total marks: 100	Practical: End Term Exam.:40 P.A: 60

Rationale:

This course introduces students to the domain of Multimedia Technologies, which explain the technologies underlying digital images, videos and audio contents, including various compression techniques and standards, and the issues to deliver multimedia content over the Internet.

Course outcomes:

After completion of the course, students will be able to

- Demonstrate the use of Multimedia tools
- Design and edit graphics and photos
- Develop 2D animation
- Develop web applications

Course Content:

Sl. No.	Topics for Practice
1	Sound capturing & editing using tools like SOUNDFORGE
2	Image editing using tools like Adobe Photoshop
3	Creating/editing motion video/animation clips (using tools like Flash / Adobe Premier)
4	Creation of Content using HTML (basic tags, table form, frame, link to other Image)
5	Creating stylesheet using DHTML
6	Home Page creation using HTML, DHTML.

Reference Books:

1. Adobe, Adobe Photoshop 6.0: Classroom in a book Pearson Ed.
2. Anushka Wirasinha, Flash in a Flash- Web Development, PHI
3. Macromedia Flash5 fast and easy Web Development, Design, PHI
4. Castro, HTML4 for the World Wide Web, Pearson Ed.
5. Schurman & Purdi, Dynamic HTML in Action, Second Edition, PHI
6. Lozano, Multimedia- Sound & Video , PHI

DBMS LAB

L	T	P		Course Code No.: CAPC214
0	0	4		
Total Contact hrs.: Lecture: 0 Tutorial: 0 Practical: 60 Credit : 2			Total marks: 100	Practical: End Term Exam.:40 P.A: 60

Rationale:

This Lab course is intended to practice whatever is taught in theory class of ‘Introduction to DBMS’. A few sample case studies are listed with some suggested activities. More case studies may be added to this list. Students need to develop these case studies, apply all relevant concepts learnt in theory class as the course progress, identify activities/operations that may be performed on the database. It will be a good idea to also use concepts learnt in the course on Software Engineering/SSAD.

Course outcomes:

After completing the course, the students will be able to

- Design various Databases
- Explain the database design and manipulation techniques
- Apply various techniques for data manipulation
- Demonstrate the use of database in real life cases

Course Content:

Sl. No.	Topics for Practice
1	Case Study-1: Employee database – ‘Create’ employee table, ‘Select’ and display an employee matching a given condition, ‘Delete’ duplicate records, delete rows using triggers, insert and update records, find net salary, etc.
2	Case Study-2: Visitor Management database
3	Case Study-3: Students Academic database
4	Case Study-4: Inventory Management System database
5	Case study-5: Bank Operations database
6	Case Study-6: Bus Operator (Roadways) – Do related activities such as prepare E-R Model, Relational Model, do Normalisation, Create Tables, Insert data, Delete Data, Query database, create stored procedures, etc.

This is a skill course. More student practice and try to find solution on their own, better it will be.

Reference Books:

1. Elmasri & Navathe, Fundamentals of Database Systems, Pearson Education
2. Raghurama Krishnan, Johannes Gehrke, Database Management Systems, Tata McGraw-Hill, New Delhi, India.
3. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, McGraw- Hill, New Delhi, India.
4. Introduction to Database Systems, C.J.Date, Pearson Education
5. Introduction to SQL, Rick F.Vander Lans, Pearson Education

COMPUTER NETWORKS LAB

L	T	P		Course Code No.: CAPC216
0	0	4		
Total Contact hrs.: Lecture: 0 Tutorial: 0 Practical: 60 Credit : 2			Total marks: 100	Practical: End Term Exam.:40 P.A: 60

Rationale:

This Lab course is intended to practice whatever is taught in theory class of 'Computer Networks'. Some of the things that should necessary be covered in lab are listed below:

Course outcomes:

After completion of the course, students will be able to

- Explain the computer networks, issues, limitations, options available.
- Configure basic small LAN
- Connect computers to the LAN.
- Demonstrate various computing devices

Course Content:

Sl. No.	Topics for Practice
1	Showing various types of networking cables and connectors, identifying them clearly
2	Looking at specifications of cables and connectors of various companies on Internet, find out differences.
3	Making patch cords using different types of cables and connectors - crimping, splicing, etc.
4	Demonstration of different type of cable testers, using them for testing patch cords pre-pared by the students in Lab and standard cables prepared by professionals
5	Configuring computing devices (PC, Laptop, Mobile, etc) for network, exploring different options and their impact – IP address, gateway, DNS, security options, etc
6	Showing various networking devices – NICs, Hub, Switch, Router, WiFi access point, etc.
7	Looking at specifications of various networking devices various companies on Internet, find out differences.
8	Network simulation tool (e.g. Cisco Packet Tracer)
9	Setting up a small wired LAN in the Lab
10	Setting up a small wireless LAN in the Lab

This is a skill course. More student practice and try to find solution on their own, better it will be.

Reference Books:

1. Cisco press books on CCNA
2. User manual of networking devices available in the lab
3. Wiki pages on networking devices

OPEN ELECTIVE

ECONOMIC POLICIES IN INDIA

L	T	P		Course Code No.: CAOE202A
3	0	0		
Total Contact hrs.: Lecture: 45 Tutorial: 0 Practical: 0 Credit : 3			Total marks: 100	Theory: End Term Exam.:60 P.A: 40

Rationale:

The objective of this course is to familiarize the students of different streams with the basic concepts, structure, problems and issues concerning Indian economy.

Course outcomes:

After completion of the course, students will be able to

- Explain Indian economics policy, planning strategies
- Enable students to comprehend theoretical and empirical development across countries and region for policy purposes
- Development Economics as a discipline encompasses different approaches to the problems of unemployment, poverty, income generation, industrialization from different perspectives
- Identify the problems and capable to decide the application for future development
- Analyze economic issues and find solutions to complex economic problems and take correct economic judgment

Course Content:

UNIT NO.	CONTENT	TIME ALLOTTED (HRS.)
I	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.	7
II	Sectoral composition of Indian Economy: Issues in Agriculture sector in India, land reforms Green Revolution and agriculture policies of India,	5
III	Industrial development, small scale and cottage industries, industrial Policy, Public sector in India, service sector in India.	5

IV	Economic Policies: Economic Planning in India, Planning commission v/s	7
	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	
V	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.	6

Reference Books:

1. Dutt Rudder and K.P.M Sunderam (2017). Indian Economy. S Chand & Co. Ltd. New Delhi.
2. Mishra S.K & V.K Puri (2017). Indian Economy and –Its Development Experience. Himalaya Publishing House.
3. Singh, Ramesh, (2016): Indian Economy, Tata-McGraw Hill Publications, New Delhi.
4. Dhingra, I.C., (2017): March of the Indian Economy, Heed Publications Pvt. Ltd.
5. Karam Singh Gill, (1978): Evolution of the Indian Economy, NCERT, New Delhi
6. Kaushik Basu (2007): The Oxford Companion to Economics of India, Oxford University Press.

RENEWABLE ENERGY TECHNOLOGIES

L	T	P		Course Code No.: CAOE202B
3	0	0		
Total Contact hrs.: Lecture: 4 5 Tutorial: 0 Practical: 0 Credit : 3			Total marks: 100	Theory: End Term Exam.:60 P.A: 40

Rationale:

The aim of this course is to provide students an opportunity to study renewable energy and energy efficiency. A detailed study of bioenergy, solar energy, wind energy, and other sources are included in this course to provide a thorough understanding of the ideas and practises of renewable energy technology.

Course outcomes:

At the end of the course student will be able to

- Recognise present and future energy scenario of the world.
- Explain various methods of solar energy harvesting.
- Identify various wind energy systems.
- Evaluate appropriate methods for Bio energy generations from various Bio wastes.
- Identify suitable energy sources for a location.

Course Content:

UNIT NO.	CONTENT	TIME ALLOTTED (HRS.)
I	Introduction: World Energy Use; Reserves of Energy Resources; Environmental Aspects of Energy Utilisation; Renewable Energy Scenario in India and around the World; Potentials; Achievements / Applications; Economics of renewable energy systems.	5
II	Solar energy: Solar Radiation; Measurements of Solar Radiation; Flat Plate and Concentrating Collectors; Solar direct Thermal Applications; Solar thermal Power Generation Fundamentals of Solar Photo Voltaic Conversion; Solar Cells; Solar PV Power Generation; Solar PV Applications.	7
III	Wind Energy: Wind Data and Energy Estimation; Types of Wind Energy Systems; Performance; Site Selection; Details of Wind Turbine Generator; Safety and Environmental Aspects.	6
IV	Bio-Energy: Biomass direct combustion; Biomass gasifiers; Biogas plants; Digesters; Ethanol production; Bio diesel; Cogeneration; Biomass Applications.	6

v	Other Renewable Energy Sources: Tidal energy; Wave Energy; Open and Closed OTEC Cycles; Small Hydro-Geothermal Energy; Hydrogen and Storage; Fuel Cell Systems; Hybrid Systems.	6
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Reference Books:

1. O.P. Gupta, Energy Technology, Khanna Publishing House, Delhi (ed. 2018)
2. Renewable Energy Sources, Twidell, J.W. & Weir, A., EFN Spon Ltd., UK, 2006.
3. Solar Energy, Sukhatme. S.P., Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997.
4. Renewable Energy, Power for a Sustainable Future, Godfrey Boyle, Oxford University Press, U.K., 1996.
5. Fundamental of Renewable Energy Sources, GN Tiwari and MK Ghoshal, Narosa, New Delhi, 2007.
6. Renewable Energy and Environment-A Policy Analysis for India, NH Ravindranath, UK Rao, BNatarajan, P Monga, Tata McGraw Hill.
7. Energy and The Environment, RA Ristinen and J J Kraushaar, Second Edition, John Willey & Sons, New York, 2006.
8. Renewable Energy Resources, JW Twidell and AD Weir, ELBS, 2006.

MINOR PROJECT

L 0	T 0	P 4		Course Code. No.: PR202
Total Contact hrs.: Practical : 60 Credit: 2			Total Marks: 100	Practical: End Term Exam. :40 P.A. : 60

RATIONALE

Minor Project offers students an opportunity to apply theoretical knowledge in a practical setting, thereby enhancing their technical skill and problem solving skill. This course has been designed for students to understand the basics of carrying out any engineering project which includes Literature survey, methodology, setting up objective and scope of the project work.

COURSE OUTCOMES:

After completing this course, student will be able to:

- Identify the objective and scope of work
- Undertake interdisciplinary literature survey.
- Prepare methodology of the project work.
- Demonstrate necessary field and laboratory experiments.
- Handle necessary equipment.

COURSE CONTENT DETAILS

UNIT NO.	CONTENT	HOURS
UNIT –I	Objective and Scope of work <ul style="list-style-type: none"> • Introduction to the project. • Clear statement of project objectives. • Explanation of the scope and limitations of the project. • Justification for why the project is important or relevant. 	12
UNIT –II	Literature Survey <ul style="list-style-type: none"> • Review of existing literature and research related to the project. • Identification of gaps in current knowledge. • Discussion of relevant theories, models, and previous work in the field. • Proper citations and references to sources. 	12
UNIT –III	Methodology <ul style="list-style-type: none"> • Detailed explanation of the research methods and approaches to be used. • Description of data collection techniques (if applicable). • Explanation of any experiments or simulations to be conducted. • Ethical considerations and research ethics, if applicable. 	12
UNIT –IV	Handling of Instruments and Experiments <ul style="list-style-type: none"> • Description of the tools, equipment, or software to be used. • Details on how experiments or simulations will be conducted. • Safety precautions and protocols, if relevant. • Data collection and analysis methods. 	12

UNIT –V	Comprehensive Progress Presentation <ul style="list-style-type: none"> • Regular progress reports or presentations to track the development of the project. 	12
	<ul style="list-style-type: none"> • Presentation of findings, data, and results obtained so far. • Discussion of any challenges encountered and how they were addressed. • Feedback received from mentors or advisors and any adjustments made to the project plan. 	

ESSENCE OF INDIAN KNOWLEDGE AND TRADITION

L	T	P		Course Code No.: AU202
2	0	0		
Total Contact hrs.:				Progressive Assessment only
Lecture: 30				
Credit : 0				

Rationale:

Considering the need of protecting Indian knowledge and tradition, the diploma level students of Automobile Engineering should be facilitated the concepts Indian traditional knowledge and to make them understand the importance of roots of knowledge system and methods of application in today's life and how to protect traditional knowledge system. Interpretation of the concepts of Intellectual property to protect the traditional knowledge as well as importance of Traditional knowledge in Agriculture and Medicine must be known

Course Outcome:

On successful completion of the course, students will be able to:

- Discuss the concepts of traditional Indian knowledge and roots of knowledge system and indigenous knowledge system
- Explain the technique of protection of traditional Indian knowledge
- Discuss legal frameworks of traditional knowledge
- State intellectual property rights
- State traditional knowledge in Different Sectors

Course content details

UNIT	TOPIC/SUB-TOPIC	HRS.
1	Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge (Unani / Siddha/ Ayurveda), Indigenous Knowledge (IK), characteristics, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge of Meghalaya	07
2	Protection of traditional knowledge (TK): The need for protecting traditional knowledge, Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.	07
3	Legal framework and TK: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act); The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016.	06

4	Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, Geographical Indications (GI).	04
5	Traditional Knowledge in Different Sectors: Traditional knowledge and engineering, Traditional medicine system, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK	06

Reference

Books:

1. Traditional Knowledge System in India, by Amit Jha, 2009.
2. "Knowledge Traditions and Practices of India" Kapil Kapoor.
3. Madhya Himalayi Sanskriti mein Gyan, Vigyan evam Paravigyan by Prof PC Pandey.

Suggested Online Link:

Web Links:

1. <https://www.youtube.com/watch?v=LZP1StpYEPM>
2. <http://nptel.ac.in/courses/12110600/>