CHRIST COLLEGE (AUTONOMOUS), IRINJALAKUDA

DEGREE OF B.Voc. I .T

BACHELOR OF VOCATION IN INFORMATION TECHNOLOGY

(CHOICE BASED CREDIT AND SEMESTER SYSTEM FOR UNDERGRADUATE CURRICULUM)

UNDER THE FACULTY OF VOCATIONAL STUDIES

SYLLABUS

(FOR THE STUDENTS ADMITTED FROM THE ACADEMIC YEAR 2021-'22 ONWARDS)
BOARD OF VOCATIONAL STUDIES IN IT [UG]

CHRIST COLLEGE (AUTONOMOUS), IRINJALAKUDA – 680125, KERALA, INDIA

JUNE, 2021

CURRICULUM AND SYLLABUS

For

B.Voc. (Information Technology)

CHOICE BASED CREDIT AND SEMESTER SYSTEM FOR VOCATIONAL UNDER GRADUATE (CBCSSVUG 2021) (U.O.No. 7135/2021/Admn; Dated, 19.07.2021)

Effective from 2021-'22 admission

Pattern of the question papers, scheme of evaluation and credit distribution have been included.

ADMISSION CRITERIA

ELIGIBILITY CRITERIA FOR ADMISSION

a) The admission to this programme will be as per the rules and regulations of the University for UG admissions.

b) Candidates who have passed (Eligible for Higher Studies) the HSE of the Kerala State Board of Higher Secondary Examination or any other examination recognized as equivalent thereto with Mathematics/Computer Science/Computer Application/ Information Technology/ Informatics Practice/Informatics/WebTech/Additional Mathematics are eligible for admission.

c) Index Mark:

    1. Total Part III + marks secured for Mathematics in the case of Science group with Mathematics as one of the subject AND Total Part III + marks secured for Computer Science/Computer Application/ Information Technology/ Informatics Practice/ Informatics/ Web Technology/ Additional Mathematics in the case of other combinations without Mathematics as one of the subject. If the Candidates has studied both Mathematics and any one of the following subjects Computer Science/Computer Application/ Information Technology/Informatics Practice/Informatics/ Additional Mathematics, then the marks secured for Mathematics or Computer Science/Computer Application/ Information Technology/ Informatics Practice/ Informatics/ Web Technology/ Additional Mathematics whichever is higher will added.

    2. An additional 25 marks will be awarded for VHSE/HSE with vocational (NSQF course) pass out students.

d) Tie Break: If there is a tie in the index marks priority must be given to Mathematics/Computer Science as the case may be. If there is a tie again the marks of the second subsidiary subject marks of English and then the marks for second language will be considered before going to general conditions.

e) Separate rank lists shall be drawn up for reserved seats as per the existing rules.

f) Grace Marks may be awarded to a student for meritorious achievements in co-curricular activities such as Sports/Arts/ NSS/NCC/ Student Entrepreneurship.

g) The eligibility criteria for admission shall be as announced by the University from time to time. The admission to this programme will be as per the rules and regulations of the University for UG admissions.

COURSE STRUCTURE

| Semester | Credit Distribution | | | | | | Total |
| | Common courses | | General courses | Total for Gen. & Comm. | Skill Component courses | Total for Skill | |
	English	Second Language					
I	3+3	4		10	4+4+4+4*+4*	20	**30**
II	4+4	4		12	2+3+4+5*+4**	18	**30**
III		-	4+4	8	3+3+3+4*+5*+4*	22	**30**
IV		-	4+4	8	3+4+3+4*+4*+4**	22	**30**
V					4+2+5+3+3+4+4*+5*	30	**30**
VI					2+28**	30	**30**
Total	**14**	**8**	**16**	**38**		**142**	**180**

*Practical **I.V. /Project/Internship

(1 credit = 15h: 30 credit = 450 hours: 1 semester = 90 days: 18 weeks of 5 working days consisting of six hours. For internship/I.V./field-work/self-learning, the credit weightage for equivalent hours shall be 50% of that for lectures/practical). All aspects pertaining to Common courses and General courses, including syllabus and evaluation pattern, will be based on B.Voc regulation 2021 (CBCSSVUG) of University of Calicut.

MARK DISTRIBUTION AND INDIRECT GRADING SYSTEM

Indirect Grading System based on a 10 -point scale is used to evaluate the performance of students. Mark system is followed for the evaluation of answer scripts. After external and internal evaluations, mark lists are submitted to the office of the Controller of Examinations. All other calculations, including grading, will be done by the college CE using the appropriate software.

Mark Distribution

Sl. No.	Course	Marks
1	English	350
2	Additional Language	200
3	General courses	400
4	Skill Component courses	3250
Total Marks		**4200**

Ten point Indirect Grading System

% of Marks (IE + ESE)	Grade	Interpretation	Grade Point Average	Range of Grade points	Class
95 and above	O	Outstanding	10	9.5 - 10.0	First Class with distinction
85 to below 95	A+	Excellent	9	8.5 - 9.49	
75 to below 85	A	Very good	8	7.5 - 8.49	
65 to below 75	B+	Good	7	6.5 - 7.49	First Class
55 to below 65	B	Satisfactory	6	5.5 - 6.49	
45 to below 55	C	Average	5	4.5 - 5.49	Second Class
35 to below 45	P	Pass	4	3.5 - 4.49	Third Class
Below 35	F	Fail	0	0	Fail
Incomplete	I	Incomplete	0	0	Fail
Absent	Ab	Absent	0	0	Fail

An aggregate of P grade with 35 % of marks (after external and internal put together) is required in each course for a pass (Except for project*) and also for awarding a degree/ diploma. Appearance for Internal Assessment and End Semester Evaluation are compulsory and no grade shall be awarded to a candidate if she/he is absent for Internal Assessment / End Semester Evaluation or both. A student who fails to secure a minimum grade for a pass in a course is permitted to write the examination along with the next batch. After the successful completion of a semester, Semester Grade Point Average (SGPA) of a student in that semester is calculated using the formula given below. For the successful completion of a semester, a student should pass all courses. However, a student is permitted to move to the next semester irrespective of SGPA obtained.

Note: *For project/Internship the minimum for a pass shall be 50% of the total marks assigned to the respective examination.

SGPA = Sum of the credit points of all courses in a semester
                    Total credits in that semester

The Cumulative Grade Point Average (CGPA) of the student is calculated at the end of a programme. The CGPA of a student determines the overall academic level of the student in a programme and is the criterion for ranking the students. CGPA can be calculated by the following,

CGPA = Total credit points obtained in six semesters
                    Total   credits   acquired   (**180**)

SGPA and CGPA shall be rounded off to two decimal places.

OUTCOMES AND OUTCOME BASED EDUCATION (OBE)

Outcomes are what the students are expected to be able to do at the end of a unit of learning. The unit of learning is three year formal programme. OBE establish the conditions and opportunities within the system that enable and encourage all students to achieve those essential outcomes. There are three levels of Outcomes that are: 1) Programme Outcomes (POs), 2) Programme Specific Outcomes (PSOs), 3) Course Outcomes (COs)

An Outcome:

Should unambiguously state what the student should be able to do/perform.

What the students do or perform are observable and assessable?

Students should be able to understand what it means (comprehensible). Should

be able to provide guidance to students in planning their learning.

1) Programme Outcomes (POs)

Programme Outcomes (POs) indicate the generic knowledge, skills and attitudes that every student graduating from a UG programme should attain. While every course of the programme can address only a subset of POs, all the core courses together should be able to address all the POs.

PO1. To provide skill training in a specific fields with appropriate content of general education for professional excellence.

PO2. To provide vertical mobility for higher secondary pass outs in vocational education in the university system without any age restriction.

PO3. To integrate NSQF at undergraduate level in order to enhance employability of the graduates who are equipped with industry requirements to become the workforce with local, national and global demand.

PO4. To ensure that the students have adequate knowledge and skills, so that they are work ready at different exit points of the programme and can help them in their entrepreneurship journey.

2) Programme Specific Outcomes (PSOs)

PSOs are specific to a programme and are to be attained at the time of graduation from the programme. They are to be identified by a committee with representation from all stakeholders.

PSO1. To familiarize Database Management Systems, with an emphasis on how to organize, maintain and retrieve information from a DBMS efficiently and effectively. Also learn how to use NoSQL database like MongoDB to store structured, semi-structured, and unstructured data.

PSO2. To develop adequate skills in computer programming and get trained in implementation

of various applications using 'Python' and 'R'.

PSO3. To provide students with knowledge and skills in data science, statistics for data-intensive problem solving and use data visualisation tools like Tableau, Power BI, Qlikview that enable users to connect to a wide variety of data sources and create reports and dashboards.

PSO4. To study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model, connectivity, networking and communication protocols used in IoT and to learn the working of Raspberry Pi, its features, how various components can be used with Pi; to construct IoT systems and use cloud services for processing and storage of the Big data produced by the IoT devices.

PSO5. To enable the students to design and implement user interfaces and layouts of Android application, to describe Embedded Linux OS architecture and Linux kernel modules and to implement the middle level programming and interfacing concepts in 8051.

PSO6. To be able to utilize contemporary computing technologies such as machine learning, AI, parallel and distributed computing and to solve practical problems characterized by Big data. Also able to use Mapreduce in Hadoop to analyze big data stored in HDFS.

3) Course Outcomes (COs)

Course outcomes are statements that describe significant and essential learning that the learners have achieved and can reliably demonstrate at the end of the course. Course outcomes are what the student should be able to do at the end of the course. They are listed along with the detailed syllabus of each course.

CREDIT AND MARK DISTRIBUTION IN EACH SEMESTER
Total Credits: 180; Total Marks: 4200

Semester	Course	Credit	Marks
I	ENG1A01	3	75
	ENG1A02	3	75
	MAL1A07 (3) or HIN1A07(3)	4	100
	Introduction to IOT and Electronics	4	100
	Python programming	4	100
	Database management system with MongoDB	4	100
	Practical 1 - Python programming	4	100
	Practical 2 - RDBMS	4	100
	Total	30	750
II	ENG1A03	4	100
	ENG1A04	4	100
	MAL2A08 (3) or HIN2A08(3)	4	100
	Problem solving using C	3	75
	Microsoft Excel with VBA and Business Analytics	3	75
	Data science with Python	4	100
	Practical 3- Microsoft Excel with VBA and Python for Data science	4	100
	Mini project/Internship	4	100
	Total	30	750
III	Basic Mathematics and General Awareness A11	4	100
	Professional Business Skills A12	4	100
	Introductory Statistics	3	75
	Probability Theory	3	75
	Computer networks for IOT	4	100
	Circuit design for IOT with Raspberry Pi	4	100
	Practical 4 - Computer networks for IOT and C programming	4	100
	Practical 5 - Electronics and IOT with Raspberry Pi	4	100
	Total	30	750
	Entrepreneurship Development A13	4	100
	Public Health, Sanitation and Safety A14	4	100

IV	Probability distributions and sampling theory		3	75
	Embedded Linux OS and Android Programming		4	100
	Data science with R programming		3	75
	Practical 6 - Data science with R and Data Visualization using Qlik view & Power Bi		4	100
	Practical 7 - Linux OS and Android Programming		4	100
	Mini project/Internship		4	100
	Total		30	750
V	Statistical Inference		4	100
	Statistical data analysis using SPSS		4	100
	Microcontroller and applications		4	100
	Artificial intelligence		3	75
	Machine learning using Python		3	75
	Big data and Cloud platform for IOT		4	100
	Practical 8 - Hadoop & NOSQL Database		4	100
	Practical 9 - Machine learning using Python, Data visualization using Tableau and SPSS		4	100
	Total		30	750
VI	Project/Product development and/or Industrial training and/or Internship	28	200
				200
	Term Paper		2	50
	Total		30	450
	Grant Total		180	4200
	Total Practical credits (Minimum 72)		75	

CODES AND INSTRUCTIONAL DETAILS OF SKILL COURSES

Semesters	Code	Course Title	Instructional hours/ week	Instructional hours/ Sem
I	SDC1IE01	Introduction to IOT and Electronics	4	**60**
	SDC1PP02	Python programming	4	**60**
	SDC1DB03	Database management system with MongoDB	4	**60**
	SDC1PP01P	Practical 1 - Python programming	4	**60**
	SDC1RD02P	Practical 2 - RDBMS	4	**60**
II	SDC2PC04	Problem solving using C	3	**45**
	SDC2ME05	Microsoft Excel with VBA and Business Analytics	3	**45**
	SDC2DS06	Data science with Python	4	**60**
	SDC2ME03P	Practical 3- Microsoft Excel with VBA and Python for Data science	4	**60**
	SDC2MP01Pr	Mini Project/Internship	4	**60**
III	SDC3IS07	Introductory Statistics	3	**45**
	SDC3PT08	Probability Theory	3	**45**
	SDC3CN09	Computer networks for IOT	4	**60**
	SDC3CD10	Circuit design for IOT with Raspberry Pi	4	**60**
	SDC3CN04P	Practical 4 - Computer Networks for IOT and C programming	4	**60**
	SDC3EI05P	Practical 5 - Electronics and IOT with Raspberry Pi	4	**60**
	SDC4PD11	Probability Distributions and sampling Theory	3	**45**
	SDC4LS12	Embedded Linux OS and Android Programming	4	**60**

IV	**SDC4DS13**	**Data Science with R programming**	**3**	**45**
	SDC4DS06P	Practical 6 - Data science with R and Data Visualization using QlikView & Power BI	4	**60**
	SDC4LS07P	Practical 7 - Linux OS and Android Programming	4	**60**
	SDC4MP02Pr	Mini project/Internship	4	**60**
V	SDC5SI14	Statistical Inference	4	**60**
	SDC5SD15	Statistical Data Analysis using SPSS	4	**60**
	SDC5MC16	Microcontroller and applications	4	**60**
	SDC5AI17	Artificial Intelligence	3	**45**
	SDC5ML18	Machine learning using python	3	**45**
	SDC5BD19	Big Data and Cloud platform for IOT	4	**60**
	SDC5HN08P	Practical 8 - Hadoop & NOSQL Database	4	**60**
	SDC5TML09P	Practical 9 - Machine learning using Python, Data visualization using Tableau, SPSS	4	**60**
VI	SDC6MP03Pr	Major Project, Product development and/or Industrial training and/or Internship	28	**900**
	SDC6TT20	**Term Paper**	**2**	

CODES AND INSTRUCTIONAL DETAILS OF ALL COURSES
Total Credits: 180; Total Marks: 4200

C. No	Course Code	Course Name	Credit	Marks			Hours/Week			Total Hrs. / Sem
SEMESTER I										
				Int	Ext	Total	L	P	Total	
1.1	**A01**	ENG1A01	3	15	60	75	3	0	3	45
1.2	**A02**	ENG1A02	3	15	60	75	3	0	3	45
1.3	**A07(3)**	MAL1A07	4	20	80	100	4	0	4	60
	A07(3)	HIN 1A07								
1.4	**SDC1IE01**	Introduction to IOT and Electronics	4	20	80	100	4	0	4	60
1.5	**SDC1PP02**	Python Programming	4	20	80	100	4	0	4	60
1.6	**SDC1DB03**	Database management system with MongoDB	4	20	80	100	4	0	4	60
1.7	**SDC1PP01P**	Practical 1-Python Programming	4	20	80	100	0	4	4	60
1.8	**SDC1RD02P**	Practical 2- RDBMS	4	20	80	100	0	4	4	60
		Total Credits	**30**			**750**				
SEMESTER II										
2.1	**A03**	ENG2A03	4	20	80	100	4		4	60
2.2	**A04**	ENG2A04	4	20	80	100	4		4	60
2.3	**A08(3)**	MAL2A08 (3)	4	20	80	100	4		4	60
	A08(3)	HIN 2A08 (3)								
2.4	**SDC2PC04**	Problem solving using C	3	15	60	75	3	0	3	45
2.5	**SDC2ME05**	Microsoft excel with VBA and Business Analytics	3	15	60	75	3	0	3	45
2.6	**SDC2DS06**	Data science with Python	4	20	80	100	4	0	4	60

2.7	SDC2ME03P	Practical 3- Microsoft excel with VBA and Python for Data science	4	20	80	100	0	4	4	60
2.8	SDC2MP01Pr	Mini Project/ Internship	4	20	80	100	0	4	4	60
		Total Credits	**30**			**750**				
		SEMESTER III								
3.1	**A11**	Basic Mathematics and General Awareness	4	20	80	100	4		4	60
3.2	**A12**	Professional Business Skills	4	20	80	100	4		4	60
3.3	SDC3IS07	Introductory statistics	3	15	60	75	3	0	3	45
3.4	SDC3PT08	Probability Theory	3	15	60	75	3	0	3	45
3.5	SDC3CN09	Computer Networks for IOT	4	20	80	100	4	0	4	60
3.6	SDC3CD10	Circuit design for IOT with Raspberry Pi	4	20	80	100	4	0	4	60
3.7	SDC3CN04P	Practical 4 - Computer Networks for IOT and C programming	4	20	80	100	0	4	4	60
3.8	SDC3EI05P	Practical 5 - Electronics and IOT with Raspberry Pi	4	20	80	100	0	4	4	60
		Total Credits	**30**			**750**				
		SEMESTER IV								
4.1	**A13**	Entrepreneurship Development	4	20	80	100	4		4	60
4.2	**A14**	Public Health, Sanitation and Safety	4	20	80	100	4		4	60
4.3	**SDC4PD11**	Probability distributions and sampling theory	3	15	60	75	3	3	3	45

4.4	**SDC4LS12**	Embedded Linux OS and Android Programming	4	20	80	100	4	4	4	60
4.5	**SDC4DS13**	Data science with R programming	3	15	60	75	3	0	3	45
4.6	**SDC4DS06P**	Practical 6 - Data science with R and Data Visualization using QlikView & Power BI	4	20	60	100	4	0	4	60
4.7	**SDC4LS07P**	Practical 7 - Linux OS and Android Programming	4	20	80	100	0	4	4	60
4.8	**SDC4MP02Pr**	Mini project	4	20	80	100	0	4	4	60
		Total Credits	**30**			**750**				
		SEMESTER V								
5.1	**SDC5SI14**	Statistical Inference	4	20	80	100	4	0	4	60
5.2	**SDC5SD15**	Statistical Data analysis using SPSS	4	20	80	100	4	0	4	60
5.3	**SDC5MC16**	Microcontroller and applications	4	20	80	100	4	0	4	60
5.4	**SDC5AI17**	Artificial Intelligence	3	15	60	75	3	0	3	45
5.5	**SDC5ML18**	Machine learning using python	3	15	60	75	3	0	3	45
5.6	**SDC5BD19**	Big data and Cloud platform for IOT	4	20	80	100	0	4	4	60
5.7	**SDC5HN08P**	Practical 8 - Hadoop & NOSQL Database	4	20	80	100	0	4	4	60
5.8	**SDC5ML09P**	Practical 9 - Machine learning using Python, Data visualization using Tableau, SPSS	4	20	80	100	0	4	4	60
		Total Credits	**30**			**750**				

			SEMESTER VI							
6.1	SDC6MP03Pr	Project, Product development and/or Industrial training and/or Internship	28	40 40	16 0 16 0	200 200	0	28	28	900
6.2	SDC6TT20	Term Paper	2	50	0	50				
		Total Credits	**30**			**450**				

AUDIT COURSES/ABILITY ENHANCEMENT COURSES

These are courses which are mandatory for a programme but not counted for the calculation of SGPA or CGPA. There shall be one Audit course each in the first four semesters. These courses are not meant for class room study. The students can attain only pass (Grade P) for these courses. At the end of each semester, there shall be examination conducted by the college from a pool of questions (Question Bank). The Question paper shall be of MCQ type with 100 marks maximum and the examination may be conducted through Learning Management System. The students can also attain these credits through online courses like SWAYAM, MOOC etc (optional). The list of passed students must be sent to the University from the colleges at least before the fifth semester examination. The lists of courses in each semester with credits are given below.

Sl. No	*Course*	*Semester*	*Credit*
1	Environment Studies	I	4
2	Disaster Management	II	4
3	*Human Rights /Intellectual Property Rights /Consumer Protection-	III	4
4	*Gender Studies/Gerontology	IV	4
*Opt any one of the courses.			

EVALUATION SCHEME FOR THEORY COURSES

The evaluation scheme for each course contains two parts: *viz.,* internal evaluation and external evaluation. Mark system is followed instead of direct grading for each question. For each course in the semester letter grade and grade point are introduced in 10-point indirect grading system

1. INTERNAL EVALUATION

20% of the total marks in each course are for internal evaluation. The Department shall send only the consolidated marks obtained for internal evaluation to the office of CE of the College.

Table 1 : Components of Evaluation (Theory)

Sl. No	Components	Maximum internal marks 15 (2/3 credit courses – Type1)	Maximum internal marks 15 (4/5 credit courses – Type2)
1	Attendance (Refer Table 1a for the matrix)	3	4
2	Assignment (Refer Table 1b for the matrix)	3	4
3	Test paper (Refer Table 1c for the matrix)	6	8
4	Seminar (Refer Table 1d for the matrix)	3	4
Total Marks		**15**	**20**

Table 1a : Percentage of attendance and eligible internal marks (Classroom Participation - CRP)

% of attendance	Marks (Type 1)	Marks (Type 2)
85 and above	3	4
75 to below 85	2	2
50 to below 75	1	1
Below 50	0	0
A candidate shall be permitted to appear for the Semester-End examinations only if he/she secure not less than 75% attendance in the total number of working hours in each semester.		

Table 1b: Assignment

Assignments can be home work, problem solving, group discussions, quiz, literature survey, seminar, team project, software exercises, etc. As decided by the faculty handling the course, and regularity in the class. Assignments of every semester shall preferably be submitted in Assignment Book, which is a bound book similar to laboratory record.

Sl. No	Criteria	Marks (Type 1) Max-3	Marks (Type 2) Max-4
1	Submission on time	1	1
2	Content	2	3
3	Total	3	4

Table 1c: Pattern of test papers

Type 1 (2/3 credit courses)					
Duration	Pattern	Total number of questions	Number of questions to be answered	Marks for each question	Ceiling of Marks
1.0 Hours	Short answer	6	6	2	10
	Paragraph	3	3	5	10
	Essay	2	1	10	10
Total Marks					30
Type 2 (4/5 credit courses)					
Duration	Pattern	Total number of questions	Number of questions to be answered	Marks for each question	Ceiling of Marks
1.5 Hours	Short answer	6	6	2	10
	Paragraph	5	5	5	20
	Essay	2	1	10	10
Total Marks					40

Table 1c: Eligible internal marks from test paper

% of marks in test paper	Marks (Type 1) Max-6	Marks (Type 2) Max-8
85 and above	6	8
65 to below 85	5	6
55 to below 65	4	4
45 to below 55	3	3
35 to below 45	2	2
Below 35	1	1

Table 1d: Eligible internal marks from Seminar

Sl. No	Criteria	Marks (Type 1) Max-3	Marks (Type 2) Max-4
1	Presentation	1	1
2	Content	1	2
3	Time management	1	1
4	Total	3	4

2. EXTERNAL EVALUATION

External evaluation carries 80% marks. External examinations will be conducted at the end of each semester.

Question paper type 1 (2 and 3 credit courses)

The external QP with 60 marks and Internal examination is of 15 marks. Duration of each external examination is 2 Hrs. The pattern of External Examination is as given below. The students can answer all the questions in Sections A & B. But there shall be Ceiling in each section.

Section A
      Short answer type carries 2 marks each   -   12 questions
                                              Ceiling - 20
Section B
      Paragraph/ Problem type carries 5 marks each   -   7 questions
                                              Ceiling - 30
Section C
      Essay type carries 10 marks (1 out of 2)   1x10 = 10

                                            Total = 60

Question paper type 2 (4 and 5 credit courses)

The external QP with 80 marks and Internal examination is of 20 marks. Duration of each external examination is 2.5 Hrs. The pattern of External Examination is as given below. The students can answer all the questions in Sections A & B. But there shall be Ceiling in each section.

Section A
      Short answer type carries 2 marks each   -   15 questions
                                              Ceiling - 25
Section B
      Paragraph/ Problem type carries 5 marks each   -   8 questions
                                              Ceiling - 35
Section C
      Essay type carries 10 marks (2 out of 4)   2 x10 = 20

                                            Total = 80

EVALUATION SCHEME FOR PRACTICAL COURSES

Practical evaluation will be conducted at the end of 1st 2nd 3rd 4th and 5th semesters including the respective internship/mini projects. The evaluation scheme for each course contains two parts: *viz.,* internal evaluation and external evaluation.

Table 1 : Internal evaluation for practical

Sl. No	Criteria	Marks
1	Evaluation in the lab and Rough Record	8
2	Test Paper	4
3	Viva voce	4
4	Regularity in Class Room Participation (Refer Table 1a for the matrix)	4
Total Marks		**20**

Note: No candidate will be permitted to attend the end-semester practical examination unless he/she produces certified record of the laboratory works.

Table 1a: Percentage of attendance and eligible internal marks

% of attendance	Eligible Marks
85 and above	4
75 to below 85	2
50 to below 75	1
Below 50	0

Table 2: External evaluation for practical

Sl. No	Type of question	Question number	Nature of question	Marks
1	Theory/ Algorithm/Flow diagram			20
2	Implementation			30
3	Result/Output			10
4	Record			10
5	Viva voce			10
Total Marks				**80**

EVALUATION SCHEME FOR PROJECT/INTERNSHIP

The major project/internship evaluation will be conducted at the end of 6th semester

Table 1: Mark distribution for internship (Internal - 20% and External - 80%)

Sl. No	Criteria	Marks	
		External	Internal
1	Content of report	100	30
2	Viva voce	60	10
Total Marks		**160**	**40**

Table 1: Mark distribution for Project (Internal - 20% and External - 80%)

Sl. No	Criteria	Marks	
		External	Internal
1	Theory/Algorithm/Flow Chart	40	10
2	Implementation	80	20
3	Result/Output	20	4
4	Record	10	3
5	Viva voce	10	3
6	Term Paper	-	**50***
Total Marks		**160**	**90**

* Internal evaluation only

Internship and the major project should be carried out in the industry, not necessarily with industry partner. The major idea for internship is to implement the things learned and to get a real life experience. Every student will be assigned an internal guide, allotted from the parent department concerned or an expert available in the college appointed by the principal. The student has to make regular discussions with the guide while choosing the subject/area and throughout the life time of the project. At least three reviews should be conducted to evaluate the progress of work. An evaluation team is constituted for conducting the evaluation. The team consist of external examiner, representative from the industry and a faculty of the concerned department. Students should submit a report of their work. A valid certificate from the organization should be produced as a proof that the work is carried out in the respective organization. Students are required to make the presentations of their work before the panel of examiners. A viva will be conducted based on the report and students are supposed to clarify the queries regarding their work.

Semester I

SDC1IE01: INTRODUCTION TO IOT AND ELECTRONICS

Number of Credits-4

Course Outcomes:
- To define the terms IoT and cloud computing
- To describe the evolution that has led to cloud computing
- To discuss the importance of IoT devices
- To study basics of semiconductor & devices and their applications in different areas.
- To study different biasing techniques to operate transistor, FET, MOSFET and operational amplifier in different modes.
- Analyse output in different operating modes of different semiconductor devices.
- Compare design issues, advantages, disadvantages and limitations of basic electronics.

Course Outline:

MODULE 1 [12T]

Semiconductor diode and applications: p-n junction diode, characteristics and parameters, diode approximations, DC load line analysis, Half-wave rectifier, Two diode-full wave rectifier, Bridge rectifier, Capacitor filter circuit, Zener diode voltage regulators: Regulator circuit with no load, Loaded Regulator. Numerical examples as applicable.

Bipolar Junction Transistors: BJT operation, BJT Voltages and Currents, BJT amplification, Common Base, Common Emitter and Common Collector Characteristics, Numerical examples as applicable.

Introduction to Operational Amplifiers: Ideal OPAMP, Inverting and Non-Inverting OPAMP circuits, OPAMP applications: voltage follower, addition, subtraction, integration, differentiation; Numerical examples as applicable.

MODULE 2 [15T]

Number Systems: Non-positional Number System, Positional Number System, Decimal Number System, Binary Number System, Octal Number System, Hexadecimal Number System, Conversion between Number Systems, Binary Arithmetic, Boolean Algebra, The principle of Duality, Theorems of Boolean Algebra.

Digital Circuits: Logic gates, NOT Gate, AND Gate, OR Gate, XOR Gate, NAND Gate, NOR Gate, X-NOR Gate. Algebraic Simplification, NAND and NOR Implementation: NAND Implementation, NOR Implementation. Half adder, Full adder.

Flip-Flops: Introduction to Flip-Flops, SR Flip Flop, D Flip Flop, JK Flip-Flop, T Flip- Flop, Level- Triggered and Edge-Triggered flip flops, Excitation Tables.

MODULE 3 [12T]

Logic families - DTL, RTL, TTL, ECL, CMOS, I²L, performance criteria -comparison,

application, advantages.

Computer architecture: Computer generations, Processor and memory, memory organization (hierarchy), input output organization, Design of control unit-hardwired & micro- programmed control unit, programming the basic computer (machine, assembly, high level languages), parallel processing.

Microcontrollers: Introduction to Microcontrollers, 8051 Microcontroller Architecture.

MODULE 4 [9T]

Introduction to IoT - Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs.

IoT & M2M Machine to Machine, Difference between IoT and M2M, Software define Network. Network & Communication aspects Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination.

MODULE 5 [12T]

Challenges in IoT - Design challenges, Development challenges, Security challenges, Other challenges. Domain specific applications of IoT Home automation, Industry applications, Surveillance applications, Other IoT applications.

Developing IoTs Introduction to Python, Introduction to different IoT tools, Developing applications through IoT tools, Developing sensor based application through embedded system platform, Implementing IoT concepts with python.

References:

1. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 5th Edition, 2008.
2. D.P. Kothari, I. J. Nagrath, "Basic Electronics", McGraw Hill Education (India) Private Limited, 2014.
3. Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach"
4. Waltenegus Dargie,Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice"
5. Computer system architecture -M Morris Mano, Third edition.

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SDC1PP02: PYTHON PROGRAMMING

Number of Credits-4

Course Outcomes:

- To understand Problem solving and programming capability in Python
- Develop the skill of designing Graphical user Interfaces in Python
- To develop the ability to write database applications in Python

Course Outline:

MODULE 1[15 T]

Introduction to digital computer – Digital and analog computers, Characteristics of computer, Classification of computer, Details of functional units of a computer. Central Processing Unit (CPU), Computer Memory, Input and Output Devices, Programming languages - high level language, assembly language and machine language, Types of software, Application Software, System software, Operating systems – objectives of operating systems, Functions of OS, Translator software— compiler, assembler and interpreter.

MODULE 2[9 T]

Computer programming fundamentals: Problem Definition, Problem analysis, Problem Solving, Approaches in problem solving and program design, Program development life cycle, Algorithm, Flowchart, Pseudo code, Programming paradigms, Types of errors in programming, Characteristics of a good program.

Examples for algorithms and flow charts - At least 10 problems Starting with non- numerical examples, and numeric problems like factorial, largest among three numbers, largest among N, Fibonacci.

MODULE 3[12 T]

Introduction to Python – Variables, Expressions and Statements, Evaluation of Expressions, Operators and Operands, Order of precedence, String Operations, Control statements, Boolean Expressions and logical operators, conditional and alternative executions, Nested Conditionals, Recursion. Iteration - Multiple Assignment, The While Statement, Tables, Two Dimensional Tables. Encapsulation and generalization, Local Variables.

MODULE 4[12 T]

Functions, Calling functions, Type conversion and coercion, composition of functions, Mathematical functions, User-defined Functions, Parameters and Arguments. Strings and Lists – string traversal and comparison with List operations with Examples, Tuples and dictionaries – Operations and Examples.

MODULE 5[12 T]

Files and exceptions - Text files, Directories, Python – Modules, Python – JSON, Python- PIP, Lambda. Classes/Objects-Create class, Create Object, The init () Function,

Python Object Oriented Principles, Object Methods, Self-Parameter, Python Exception Handling, Python MySQL.

References:

1. Downey, A. et al., How to think like a Computer Scientist: Learning withPython, John Wiley, 2015
2. Goel, A., Computer Fundamentals, Pearson Education
3. Lambert K. A., Fundamentals of Python - First Programs, Cengage Learning India, 2015

4. Jeyapoovan T., Fundamentals of Computing and Programming in C, 2015
5. Rajaraman, V., Computer Basics and C Programming, Prentice-Hall India
6. Dromy, R. G., How to solve it by Computer, Pearson India
7. Sprankle , M., Problem Solving & Programming Concepts, Pearson India
8. Website URL - https://www.w3schools.com/python

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SDC1DB03: DATABASE MANAGEMENT SYSTEM WITH MONGODB

Number of Credits-4
Course Outcomes:

- Understand the use of Structured Query Language (SQL) and SQL syntax.
- Apply normalization techniques to normalize the database
- Understand the needs of database processing and to get trained in techniques for controlling the consequences of concurrent data access
- Skilled in data modelling using the entity relationship and developing database designs.
- Understand the relational model of data and usage of Relational Algebra.
- To discuss the basics of Mongo DB

Course Outline:
MODULE 1[8T]
Database System concepts and applications Introduction to databases, File Systems vs. DBMS, Advantages and Disadvantages of using DBMS Approach, Database administrators and user, Data Models, Schemas, and Instances, Types of Data Models, Three Schema Architecture and Data Independence, Database Languages and Interfaces.

MODULE 2[12 T]
Entity-Relationship Model - Conceptual Data Models for Database Design Entity Relationship Models, Concept of Entity, Entity Sets, Relationship Sets, Attributes, Domains, Constraints, Keys, Strong and Weak Entities, Concepts of EER. Relational Data Model Relations, Domains and Attributes, Tuples, Keys. Integrity Rules, Relational Algebra and Operations, Relational Calculus and Domain Calculus, Relational Database Design using ER to Relational Mapping.
MODULE 3[13 T]
Relational Database Design - Relational database design Anomalies in a Database, Normalization Theory, Functional Dependencies, First, Second and Third Normal Forms,

Relations with more than one Candidate Key, Good and Bad Decompositions, Boyce Codd Normal Form, Multivalued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form.

MODULE 4[14 T]

SQL Concepts: Basics of SQL, DDL, DML, DCL, Tables – Create, Modify and Delete table structures, Rename and Drop tables, Defining constraints – Primary

key, foreign key, unique, not null, check, IN operator Select Command, Logical Operators, Functions - aggregate functions, Built-in functions –numeric, date, string functions, set operations, sub-queries, correlated sub-queries, Use of group by, having, order by, join and its types, Exist, Any, All. View - Creation, Renaming the column of a view, destroys view.

MODULE 5[13 T]

Transaction Management and Concurrency Control - Transaction Properties (ACID), states, Commit, Rollback; Concurrency Control Lost update problems, Locks, two phase locking. Introduction to MongoDB and its Features, Database, Collection and Documents, Various Data Types in MongoDB, Introduction to mongo shell.

References:

1. Abraham Silberschatz, Henry F Korth, S.Sudharshan, Database System Concepts, 6th Edition
2. W. Gilmore, Beginning PHP and PostgreSQL 8: From Novice to Professional, Goels Computer Hut (2007), ISBN: 9788181286000
3. CJ Date, Introduction to Database Systems, Addison Wesley.
4. Karl Seguin,The little MongoDB Book
5. CJ Date, Introduction to Database Systems, Addison Wesley. MongoDBOnline References:
6. http://mdslab.unime.it/sites/default/files/mongodb_tutorial.pdf
7. https://pdfs.semanticscholar.org/presentation/066b/ 600837053e0172ea3e514efaaa3bd8485e46.pdf

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SDC1PP01P PRACTICAL I: PYTHON PROGRAMMING

Course Outcomes:

- Understand the basics of Python programming
- Learn the Decision Making and Functions in Python
- Learn and practice Object Oriented Programming and files handling in Python
- Understand the GUI Programming and Databases operations in Python

List of Exercises:

1. Program to demonstrate basic data type in python
2. Program to demonstrate operators in python.
3. A cashier has currency notes of denominations 10, 50, and 100.If the amount to be withdrawn is input through the keyboard using input () function in hundreds, find the total number of currency notes of each denomination the cashier will have to give to the withdrawer.
4. Program to demonstrate list and tuple in python.
5. Write a program in Python, A library charges a fine for every book returned late. For first 5 days the fine is 50 paisa, for 6-10 days fine is one rupee and above 10 days fine is 5 rupees. If you return the book after 30 days your membership will be cancelled. Write a program to accept the number of days the member is late to return the book and display the fine or the appropriate message
6. Write a program to calculate overtime pay of 10 employees. Overtime is paid at the rate of Rs.12.00 per hour for every hour worked above 40 hours. Assume that employee do not work for fractional part of an hour.
7. Two numbers are entered through the keyboard; write a program to find the value of one number raised to the power of another.
8. Write a function that receives marks received by a student in 3 subjects and returns the average and percentage of these marks. Call this function from main () and print the result in main
9. Write a program to read a file and display its contents.
10. Write a program to demonstrate database connectivity in python.
11. Write a program to compute distance between two points taking input from the user(Pythagorean Theorem)
12. Write a program add.py that takes 2 numbers as command line arguments and prints its sum.
13. Write a Program for checking whether the given number is an even number or not.
14. Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, ¼.
15. Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero
16. Write a Python program to print Fibonacci series.
17. Write a program to count the numbers of characters in the string and store them in a dictionary data structure.
18. Write a program to use split and join methods in the string and trace a birthday with a dictionary data structure.

19. Write a program combine lists that combines these lists into a dictionary.
20. Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file.
21. Write a program to print each line of a file in reverse order.
22. Write a program to compute the number of characters, words and lines in a file.
23. Write a function ball collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding.
24. Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radius If (distance between two balls centers) $<=$ (sum of their radii) then (they are colliding) Find mean, median, mode for the given set of numbers in a list.
25. Write a function nearly equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.
26. Write a function dups to find all duplicates in the list.
27. Write a function unique to find all the unique elements of a list.
28. Write a function cumulative product to compute cumulative product of a list of numbers.
29. Write function to compute gcd and lcm of two numbers.
30. Write a function reverse to reverse a list. Without using the reverse function.
31. Write a program that defines a matrix and prints.
32. Write a program to perform addition of two square matrices.
33. Write a program to perform multiplication of two square matrices.
34. Write a Python Program to connect to MySQL database.
35. Write a Python Program to insert and delete records.
36. Write a Python Program to search and update records.

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SDC1RD02P PRACTICAL 2 - RDBMS

Course Outcomes:

- Students get practical knowledge on designing and creating relational database systems.
- Understand various advanced queries execution such as relational constraints, joins, set operations, aggregate functions, trigger, views and embedded SQL.

- Use of various software to design and build ER Diagrams, UML, Flow chart for related database systems.
- Students will be able to design and implement database applications on their own

List of Exercises:

RDBMS

1. Create a table customer (cust_no varchar (5), cust_name varchar (15), age number, phone varchar(10))
   a) insert 5 records and display it
   b) add new field d_birth with date datatype
   c) create another table cust_phone with fields cust_name and phone from customer table
   d) remove the field age
   e) change the size of the cust_name to 25
   f) delete all the records from the table
   g) rename the table cutomer to cust
   h) drop the table
2. Create a table salesman (salesman_no primary key, s_name not null, place, phone unique)
   Create table salesorder (order_no primary key, order_date not null salesman_no foreign key references salesman_no in salesman del_type values should be either P or F (check constraints) order_status values should be 'In process','Fullfilled', 'Backorder', 'Cancelled' (check constraints))
   a) Insert few records in both tables
   b) Delete primary key from sales_man table
   c) Delete Foreign key and Check constraints from sales_order table
   d) Add primary key in sales_man using ALTERTABLE
   e) Add foreign key and CHECK constraints in sales_order table using ALTER TABLE
3. Create a table Hospital with the fields (doctorid,doctorname,department,qualification, experience).
   Write the queries to perform the following.
   a) Insert 5 records
   b) Display the details of Doctors
   c) Display the details of doctors who have the qualification 'MD'
   d) Display all doctors who have more than 5 years' experience but do not have the

qualification 'MD'

    e) Display the doctors in 'Skin' department

    f) update the experience of doctor with doctored='D003' to 5

    g) Delete the doctor with DoctorID='D005'

4. Create the following tables Bank_customer (accno primary key, cust_name, place) Deposit (accno foreign key, deposit_no, damount) Loan (accno foreign key loan_no, Lamount)

   Write the following queries

    a) Display the details of the customers

    b) Display the customers along with deposit amount who have only deposit with the bank

    c) Display the customers along with loan amount who have only loan with the bank.

    d) Display the customers they have both loan and deposit with the bank

    e) Display the customer who have neither a loan nor a deposit with the bank

5. Create a table employee with fields (EmpID, EName, Salary, Department, and Age).

   Insert some records. Write SQL queries using aggregate functions and group by clause

    a) Display the total number of employees.

    b) Display the name and age of the oldest employee of each department.

    c) Display the average age of employees of each department

    d) Display departments and the average salaries

    e) Display the lowest salary in employee table

    f) Display the number of employees working in purchase department

    g) Display the highest salary in sales department;

    h) Display the difference between highest and lowest salary

6. Create a table product with the fields (Product_code primarykey, Product_Name, Category, Quantity, Price).

   Insert some records Write the queries to perform the following.

    a) Display the records in the descending order of Product_Name

    b) Display Product_Code, Product_Name with price between 20 and 50

    c) Display the details of products which belongs to the categories of 'bathsoap', 'paste', or 'washing powder'

    d) Display the products whose Quantity less than 100 or greater than 500

    e) Display the products whose names starts with 's'

    f) Display the products which not belongs to the category 'paste'

    g) Display the products whose second letter is 'u' and belongs to the Category 'washing powder'

7. Consider the employee database given below. Give an expression in SQL for each of the following queries:

   EMPLOYEE (Employee-Name, City)

   WORKS (Employee-Name, Company-Name, Salary)

   COMPANY (Company- Name, City)

   MANAGES (Employee-Name, Manager-Name)

    a) Find the names of all employees who work in Infosys.

    b) Find the names and cities of residence of all employees who works in Wipro

c) Find the names, and cities of all employees who work in Infosys and earn more than Rs. 10,000.
d) Find the employees who live in the same cities as the companies for which they work.
e) Find all employees who do not work in Wipro Corporation.
f) Find the company that has the most employees.

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Semester II

SDC2PC04 - PROBLEM SOLVING USING C

Number of Credits- 3

Course Outcome

- To equip the students with fundamental principles of Problem Solving aspects.
- To learn the concept of programming
- To study C language
- To equip the students to write programs for solving simple computing problems

Course Outline:

Module 1[7 T]

Introduction to C Programming - Overview and Importance of C, C Program Structure, Sample programs.

Familiarization of Integrated Development Environment - Invoking IDE, Opening a new window in IDE, Writing, Saving and Compiling a C program, making an Executable File. Elements of C Language and Program Constructs: Character Set, C Tokens, Keywords and Identifier, Constants, Variables, Data types, Variable Declaration and Assignment of Values, Symbolic Constant Definition.

Module 2[6 T]

C Operators - Arithmetic operators, relational operators, and logical operators, assignment operators, increment and decrement operators, conditional operators, special operators, arithmetic expressions, evaluation of expressions, precedence of arithmetic operators, Type conversion in expressions, operator precedence and associativity, Mathematical Functions, I/O operations - Library functions.

Module 3[7 T]

Data input output functions - Simple C programs – Flow of Control - Decision making with IF statement, Simple IF statement, If-else statement, Nesting of If-else and else-if Ladder, Switch statement, Conditional operator, goto statement. Looping - While loop, Do-While, and For Loops, Nesting of loops, jumps in loop, skipping of loops.

Module 4 [15 T]

Arrays and Strings - One dimensional array, two dimensional and multi-dimensional arrays, strings and string manipulation functions.

The Concept of modularization and User defined functions - Definition - Multifunction Program, proto-types, Passing arguments, calling functions, various categories of functions, Nesting of functions and recursion, functions and arrays, scope and lifetime of variables in functions, multi-file programs.

Structures & Union structure definition - giving values to members, structure initialization, comparison of structure variables, arrays of structures, arrays within structures, structures within arrays, structures and functions, Unions, bit fields.

Module 5 [10 T]

Pointers - Understanding pointers, accessing the address of a variable, declaring and initializing pointers, accessing a variable through its pointer, pointer expressions, pointer and arrays, pointer and character string, pointers and functions, pointers and structures, pointer to pointer dynamic memory allocation.

Files: Creating, Processing, Opening and Closing a data file, command line operations.

References

Balaguruswami. E, Programming in ANSI C, Tata McGraw-Hill Education, 2008

Brian W. Kernighan & Dennis M. Ritchie, The C Programming Language, Prentice Hall, 2nd Edition 1998

Yashavant P. Kenetkar, Let us C

Byran Gotfried, Schaums Outline series Programming with C

Ashok N. Kamthane, Programming in C, Pearson, 2nd Edition

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SDC2ME05 - MICROSOFT EXCEL WITH VBA AND BUSINESS ANALYTICS

Number of Credits:3

Course Outcome:

- To get skilled in Data Analysis and Data Visualization,
- To be able to think critically about the business implications, meaningfulness and applicability of observed data patterns and analytical inferences
- To understand how to integrate information technologies with data science methods to extract value from data sets.
- To understand how to select appropriate analytic tools for specific managerial issues
- Identify general components of VBA and their appropriate use in solving business solutions.
- Record VBA macros to automate repetitive tasks.

Course Outline:

MODULE 1[10 T]

Introduction to Spreadsheets, Understanding Microsoft Excel, Workbook, Cells, Range in Excel, Selecting Cells, Auto Fill, Cell Referencing- Using Absolute and Relative References, creating new worksheet, Formulas and **Functions**---Mathematical Functions: SUM, PRODUCT, SQRT. ROMAN and ROUND -Statistical Functions: AVERAGE, MEDIAN, MODE, STDEV, CORREL and FORCAST, Financial Functions: DB, SLN, SYD, PMT, NPER, IPMT, PMT, (Annuity Functions, Investment analysis functions, Bond Functions, Depreciation Functions) PV, NPV, XNPV, IRR, MIRR and XIRR Database Functions: DMAX, MIN, DAVERAGE, DCOUNT and DSUM. Defining Names in Excel, Excel-Formatting of Excel Sheets, Sorting Data, Using Excel Tables & formula, Filtering Data in Excel, Understand Charts, Chart Design Options, Sensitivity Analysis using Excel-Scenario Manager, Other Sensitivity Analysis Features, Goal Seek, Data Tables, What-If Analysis, Introduction to functions such as the IF, nested IF, VLOOKUP and HLOOKUP in Excel.

MODULE 2[9T]

Quick Analysis--Quick Analysis with TOTALS, Sum, Average, Count, %Total, Running Total, Sum of Columns, Sorting, Filtering. Subtotals with Ranges-Subtotals, Nested Subtotals, Introduction to charts and graphs in Excel. Constructing various Line, Bar and Pie charts. Using the Pivot chart features of Excel, Understanding and constructing Histograms and Scatterplots, Data Filter and Sort, Importing Data into Excel. VBA-OVERVIEW, VBA- EXCEL, VBA─EXCEL TERMS- Modules, Procedure, VBA ─ MACRO COMMENTS VBA─MESSAGEBOX, VBA─INPUTBOX, VBA─VARIABLES, Data Types VBA ─ CONSTANTS, VBA─OPERATORS-- The Arithmetic Operators, The Comparison Operators, The Logical Operators, The Concatenation Operators VBA, VBA ─ DECISIONS- If Statement, If Else Statement, If Elseif - Else statement, Nested If Statement, Switch Statement,

MODULE 3[10 T]

VBA ─ LOOPS, For Loop, For Each Loops, While Wend Loops, Do While Loops, Do Until Loops, Loop Control Statements, Exit For, Exit Do, VBA ─ STRINGS -- Instr, InString Reverse, LCase, UCase, Left, Right, Mid, Ltrim , Rtrim, Trim , Len , VBA─DATE-TIME FUNCTION ,VBA─ARRAYS , VBA – USER-DEFINED FUNCTIONS – Function, Definition Calling a Function, VBA ─ SUB PROCEDURE- Calling Procedures, VBA─ EVENTS- Worksheet Events, Workbook Events, Worksheet Events.

MODULE 4[8T]

Error Trapping , Understanding error handling , Understanding VBA's error trapping options , Trapping errors with the on error statement , Understanding the error object , Writing an error handling routine , Working with inline error handling Debugging the Code , Defining errors , Working with debugging tools , Determining breakpoints , How to step through code , Working with break mode during run mode , Identifying the value of expressions

MODULE 5[8T]

Introduction to business analytics: IT in business (CRM, Fraud Detection), Business Analytics

vs data science, Introduction to Business Analytics applications-Data visualization tools, Business Intelligence, Self -service analytics, Big data. Web and Mobile Analytics: Text Analytics, Click Analytics, Sentiment Analytics, Google Analytics, CASE STUDIES: Population Census, Marketing, Banking, Retail, Industrial, Mining Patterns, Making models, Model selection and validation.

References:

1. Excel 2010 power programming with VBA-John Walkenbach
2. Excel 2007 with VBA-John Green,Rob Bovey
3. Business Analytics by James Evans
4. Introduction to Business Analytics Using Simulation by JonathanPinder

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SDC2DS06 - DATA SCIENCE WITH PYTHON

Number of Credits-4

Course Outcome:

- An understanding of problems solvable with data science and an ability to attack them from a statistical perspective.
- An understanding of when to use supervised and unsupervised statistical learning methods on labelled and unlabelled data-rich problems.
- Gain an in-depth understanding of data structures and data analysis to explore and visualise data for meaningful insights and identify relationships between large data sets.
- Gain the skills and knowledge required to manage data science and analytics teams or projects at your organization
- Understand the nuances and applications of descriptive, predictive, and prescriptive analytics to enhance analytical skills and make real-time, data-driven business decisions.

- To discuss the basics of data science.

- Learn to write, test and debug Python 3 code with confidence, including working with Containers, Conditionals & Loops, Functions & Modules and Error Handling.

- Learn the fundamentals of some of the most widely used Python packages; including NumPy, Pandas and Matplotlib, then apply them to Data Analysis and Data Visualization projects.

- Build and code a Graphical User Interface (GUI) to run a program.

Course Outline:
MODULE 1[12 T]
Introduction: What is Data Science, Big Data and Data Science hype and getting past the hype Why now. Datafication, Current landscape of perspectives, Skill sets needed, Statistical Inference, Populations and samples, Statistical modeling, probability distributions.

MODULE 2[8 T]

Exploratory Data Analysis and the Data Science Process, Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA, The Data Science Process Case Study: Real Direct (online real estate _rm), Three Basic Machine Learning Algorithms, Linear Regression, k-Nearest Neighbors (k-NN), k-means.

MODULE 3[13 T]

Introduction to NumPy: Understanding Data Types in Python, The Basics of NumPy Arrays, Computation on NumPy Arrays: Universal Functions, Aggregations: Min, Max, and Everything in Between, Computation on Arrays: Broadcasting, Comparisons, Masks, and Boolean Logic, Fancy Indexing, Sorting Arrays, Structured Data: NumPy's Structured Arrays.

MODULE 4[12 T]

Data Manipulation with Pandas, Installing and Using Pandas, Introducing Pandas Objects, Data Indexing and Selection, Operating on Data in Pandas, Handling Missing Data, Hierarchical Indexing, Combining Datasets: Concat and Append, Combining Datasets: Merge and Join, Aggregation and Grouping, Pivot Tables, Vectorized String Operations, Working with Time Series, High-Performance Pandas: eval () and query ().

MODULE 5[15 T]

Visualization with Matplotlib, General Matplotlib Tips, Two Interfaces for the Price of One, Simple Line Plots, Simple Scatter Plots, Visualizing Errors, Density and Contour Plots, Histograms, Binnings, and Density, Customizing Plot Legends, Customizing Color bars, Multiple Subplots, Text and Annotation, Customizing Ticks, Customizing Matplotlib: Configurations and Stylesheets, Three-Dimensional Plotting in Matplotlib, Geographic Data with Basemap, Visualization with Seaborn. Machine learning, Neural Networks, Natural Language Processing, Networks and Analysis.

References

1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk from The Frontline. O'Reilly. 2014.
2. Data Science from Scratch First Principle with Python
3. Luca Massaron and John Paul Mueller. Python® for Data Science for Dummies®, A Wiley Brand.
4. Laura Igual and Santi Seguí, Introduction to Data Science A Python Approach to Concepts, Techniques and Applications.

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SDC2ME03P -PRACTICAL 3: MICROSOFT EXCEL WITH VBA AND PYTHON FOR DATA SCIENCE

No. of Credits:4

Course Outcomes:

- To get skilled in Data Analysis and Data Visualization
- Gain skill to write VBA code to create VBA subroutines and functions.

- Understand about various programming elements to solve problems through code, including variables, objects, conditional statements, and loops.
- Understand how to eliminate, avoid, or handle errors in VBA code, and optimize its performance

Course Outline:

PART A: MICROSOFT EXCEL WITH VBA

List of Exercises:

1. How To Access The Excel Range And Show The Value Using Message Box
2. How To Enter Data into a Cell
3. How To Change The Background Color Of A Particular Range
4. How To Change The Font Color And Font Size Of A Particular Range
5. How To Change The Text To Upper Case Or Lower Case
6. How To Copy Data From One Range To Another Range
7. How To Select And Activate Worksheet
8. How To Get The Active Sheet Name And Workbook Name
9. How To Add New Worksheet And Rename A Worksheet and Delete Worksheet
10. How To Create New Workbook, Add Data, Save And Close The Workbook
11. How To Hide And Unhide Rows And Columns
12. How To Insert And Delete Rows And Columns
13. How To Set The Row Height And Column Width
14. How To Merge and UnMerge Cells
15. How To Compare Two Values – A Simple Example On If Condition
16. How To Print 1000 Values – A Simple Example On For Loop
17. Write a macro which asks for your name using INPUTBOX and then displays a welcome message using MSGBOX.
18. Use input boxes in Excel VBA to ask a user to enter details for a dating agency application.
19. Write a macro to input a dinosaur name using an INPUTBOX, find it on a spreadsheet and then display the height of the dinosaur using MSGBOX.
20. Use MsgBox to display a message asking user whether they want to continue or not, and process answer.
21. Use the On Error statement in a VBA procedure to prevent users entering an invalid date into an input box.
22. Create functions to turn feet/inches into kilograms, stones/pounds into metres and then calculate body mass index.
23. Write VBA code in Excel to loop over a collection of cells to pick a set of six random numbers to use in a lottery.
24. Write code to change the colour of cells and sink ships in a rudimentary version of Battleships.
25. A macro to loop over the 100 x 100 grid that is Wimbledon Common and find and report on all of the Wombles found (ie the non-blank cells).
26. Create an Excel VBA user form to allow users to apply to a dating agency.

27. Create a macro which opens a Word document and puts mail merge fields at the right bookmark locations.
28. Record a macro to change the colours of various parts of a house - including adding command buttons.
29. A macro to loop over shapes on a worksheet changing their line colour - lots of hints given.
30. Display various messages for a workbook after various events (eg trying to close the workbook, clicking on a cell).
31. Using Microsoft Excel to record macros to take the strain out of repetitive tasks.
32. Converting English sentences into Visual Basic, using properties, methods, objects and collections.
33. Use For Each loops to split a single table of data into three separate worksheets.

PART B : PYTHON FOR DATA SCIENCE

List of Exercises:
1. Program to stack two arrays vertically and horizontally.
2. Program to remove items from one array that exist in another.
3. Program to extract all numbers between a given range from a numpy array.
4. Program to swap two columns in a 2d numpy array.
5. Program to create a 2D array containing random floats between 5 and 10.
6. Program to print numpy array with three places.
7. Program to print the full numpy array without truncating.
8. Program to import a dataset with numbers and texts keeping the text intact in python numpy.
9. Program to extract a particular column from 1D array of tuples.
10. Program to compute the mean, median, standard deviation of a numpy array.
11. Program to find the percentile scores of a numpy array.
12. Program to insert values at random positions in an array.
13. Program to find the position of missing values in numpy array.
14. Program to find the correlation between two columns of a numpy array.
15. Program to get the second largest value of an array when grouped by another array.
16. Program to remove rows from a dataframe that are present in another dataframe.
17. Program to create a new column that contains the row number of nearest column by Euclidean distance.
18. Program to find and cap outliers from a series or dataframe column.
19. Program to get the last n rows of a dataframe with row sum > 100.
20. Program to find the position of the nth largest value greater than a given value.
21. Program to filter every nth row in a dataframe.
22. Program to format all the values in a dataframe as percentages.
23. Program to format or suppress scientific notations in a pandas dataframe.
24. Program to change the order of columns of a dataframe.
25. Program to count the number of missing values in each column.
26. Program to rename a specific column in a dataframe.
27. Program to compute the autocorrelations of a numeric series.

Semester III

SDC3IS07: INTRODUCTORY STATISTICS

No. of Credits: 3

Course Outcome:
1. Able to describe the consistency of the data.
2. Able to apply Time series in practical life.
3. Apply in practical situations.

Course Outline:

Module 1[5T]

Official statistics: The Statistical system in India: The Central and State Government organizations, functions of the Central Statistical Office (CSO), National Sample Survey Organization (NSSO) and the Department of Economics and Statistics.

Module 2[20T]

Introduction to Statistics: Nature of Statistics, Uses of Statistics, Statistics in relation to other disciplines, Abuses of Statistics. Concept of primary and secondary data. Designing a questionnaire and a schedule. Concepts of statistical population and sample from a population, quantitative and qualitative data, Nominal, ordinal and time series data, discrete and continuous data. Presentation of data by table and by diagrams, frequency distributions by histogram and frequency polygon, cumulative frequency distributions (inclusive and exclusive methods) and ogives. Measures of central tendency (mean, median, mode, geometric mean and harmonic mean) with simple applications. Absolute and relative measures of dispersion (range, quartile deviation, mean deviation and standard deviation) with simple applications. Co-efficient of variation, Box Plot. Importance of moments, central and non-central moments, and their interrelationships. Measures of skewness based on quartiles and moments and kurtosis based on moments.

Module 3[10T]

Correlation and Regression: Scatter Plot, Simple correlation, Simple regression, two regression lines, regression coefficients. Fitting of straight line, parabola, exponential, polynomial (least square method).

Module 4 [10T]

Time series and Index Numbers: Introduction and examples of time series from various fields, Components of times series, Additive and Multiplicative models. Trend and Seasonal Components: Estimation of trend by linear filtering (simple and weighted moving averages) and curve fitting (polynomial and exponential)

Index numbers: Meaning and definition-uses and types, problems in the construction of index numbers-simple aggregate and weighted aggregate index numbers.

References:

1. S.C. Gupta and V.K.Kapoor. *Fundamentals of Mathematical Statistics*, Sultan Chand & Sons, New Delhi
2. Goon. A.M, Gupta M.K, Das Gupta.B. *Fundamentals of Statistics*, Vol-I, the World Press Pvt.Ltd., Kolkata.
3. Hoel P.G. *Introduction to mathematical statistics*, Asia Publishinghouse.
4. Chatfield.C. The Analysis of Time Series: An Introduction, Chapman & Hall
5. *Statistical System in India,* C.S.O.
6. M.R.Saluja : Indian Official Statistics. ISI publications.
7. www.mospi.gov.in
8. www.ecostat.kerala.gov.in

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SDC3PT08 - PROBABILITY THEORY

No. of Credits: 3

Course Outcome:
1. Able to learn different probability measures.
2. Understand bivariate randome variables.

Course Outline:

Module 1[15T]
Introduction to Probability: Random experiment, Sample space, events, classical definition of probability, statistical regularity, field, sigma field, axiomatic definition of probability and simple properties, addition theorem (two and three events), conditional probability of two events, multiplication theorem, independence of events-pair wise and mutual, Bayes theorem and its applications.

Module 2[10T]
*Random variable*s: Discrete and continuous, probability mass function (pmf) and probability density function (pdf)-properties and examples, Cumulative distribution function and its properties, change of variables (univariate case only)

Module 3[8T]
Mathematical expectations (univaraite): Definition, raw and central moments (definition and relationships), moment generation function and properties, characteristic function (definition and use only), Skewness and kurtosis using moments

Module 4[12T]
Bivariate random variables: Joint pmf and joint pdf, marginal and conditional probability, independence of random variables, function of random variable. Bivariate Expectations,

conditional mean and variance, covariance, Karl Pearson Correlation coefficient, independence of random variables based on expectation.

References :

1. V. K. Rohadgi, *An Introduction to Probability Theory and Mathematical Statistics*, Wiley Eastern.
2. S.C.Gupta and V. K. Kapoor, *Fundamentals of Mathematical Statistics*, Sultan Chand and Sons.
3. A.M. Mood, F.A. Graybill and D C Bose, *Introduction to Theory of Statistics*, McGraw Hill.
4. John E Freund, *Mathematical Statistics*, Pearson Edn, New Delhi
5. Hoel P.G. *Introduction to mathematical statistics*, Asia Publishinghouse.

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SDC3CN09- COMPUTER NETWORKS FOR IOT

Number of Credit: 4
Course Outcome

- Understand the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model.
- Understand Application layer and Presentation layer paradigms and protocols.
- Understand different protocols used in IOT
- Get skilled in Network layer routing protocols and IP addressing
- To get skilled in reading the fundamentals and basics of Physical layer, and will apply them in real time applications.

Course Outline:
MODULE 1[3 + 5 T]
Introduction: Overview, Objectives, Networking Connectivity Network Extension, Network Topologies, Protocols, Programs and Processes, Protocol Layering Concepts, The OSI Model Layers: The Physical Layer, The Data Link Layer, The Network Layer, The Transport Layer, The Session Layer, The Presentation Layer, The Application Layer

MODULE 2[5 + 5 T]
LAN Architecture: Transmission Methods and Media LAN Protocols, Ethernet, Token Ring, Token Bus, Fiber Distributed Data Interface (FDDI), Wireless LANs, LAN Protocols. Interrnetworking: Relays, Repeaters, Bridges, Routers, Gateways, Hubs, Switches, Network Management and SNMP, Network layer: forwarding & routing algorithms (Link, DV), IP-addresses, DNS, NAT, and routers.

MODULE 3[10+ 2 T]
Data & Network Layer Protocols in IOT- PHY/MAC Layer (3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART, Z-Wave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7, Network Layer: IPv4, IPv6, 6LoWPAN, 6TiSCH, ND, DHCP, ICMP, RPL, CORPL, CARP.

MODULE 4[12+3 T]

Transport & Session layer Protocols in IOT-Transport Layer: TCP, MPTCP, UDP, DCCP, SCTP-TLS, DTLS, Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT, SERVICE LAYER, PROTOCOLS & SECURITY, Service Layer: oneM2M, ETSI M2M, OMA, BBF, Security in IoT Protocols, MAC 802.15.4, 6LoWPAN, RPL, Application Layer

MODULE 5[15 T]

Mobile Networking: roaming and handoffs, mobile IP, and ad hoc and infrastructure less networks Wireless Sensor Networks: Introduction, WSN Coverage & Placement, Topology Management in Wireless Sensor Networks, Medium Access Control in Wireless Networks, Routing in Wireless Sensor Networks, Congestion and Flow Control, Security of Wireless Sensor Networks, Hardware Design of Sensor Node, Case studies, e.g. sensor body- area-network and control of a smart home

References:

1. Data Communications and Networking by Behrouz A. Forouzan
2. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications
3. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on Approach)", 1st Edition, VPT, 2014
4. Waltenegus Dargie, Christian Poellabauer , "Fundamentals of Wireless Sensor Networks, Theory and Practice", Wiley Series on wireless Communication and Mobile Computing, 2011
5. Kazem Sohraby, Daniel manoli, "Wireless Sensor networks- Technology, Protocols and Applications", Wiley InterScience Publications 2010.
6. Bhaskar Krishnamachari, " Networking Wireless Sensors", Cambridge University Press, 2005
7. C.S Raghavendra, Krishna M.Sivalingam, Taiebznati , "Wireless Sensor Networks", Springer Science 2004.
8. Mobile Communications, Second Edition by Jochen Schiller

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SDC3CD10 - CIRCUIT DESIGN FOR IOT WITH RASPBERRY Pi

Number of Credits-4

Course outcome

*   To understand the definition and significance of the Internet of Things
*   To be able to analyze various protocols for Internet of Things
*   To be able to design a portable Internet of Things using Raspberry Pi

Course outline:

MODULE 1[10 T]

Preparing our IoT Projects -Creating the sensor project, creating the actuator project, creating a controller, Creating a camera. The HTTP Protocol-HTTP basics, Adding HTTP support to the sensor, Adding HTTP support to the actuator, Adding HTTP support to the controller.

MODULE 2[12 T]

The UPnP Protocol-Introducing UPnP, creating a device description document, Creating the

service description document, providing a web interface, Creating a UPnP interface, Implementing the Still Image service, Using our camera. The CoAP Protocol- Making HTTP binary, Adding CoAP to our sensor, Adding CoAP to our actuator, Using CoAP in our controller

MODULE 3[12 T]

The MQTT Protocol-Publishing and subscribing, Adding MQTT support to the sensor, Adding MQTT support to the actuator, Adding MQTT support to the controller, The XMPP Protocol- XMPP basics, Adding XMPP support to a thing, providing an additional layer of security, Adding XMPP support to the actuator, Adding XMPP support to the camera, Adding XMPP support to the controller, Connecting it all together.

MODULE 4[16 T]

Using an IoT Service Platform-Selecting an IoT platform, The Clayster platform, Interfacing our devices using XMPP, Creating our control application.

Creating Protocol Gateways, understanding protocol bridging, Using an abstraction model, The basics of the Clayster abstraction model, Understanding the CoAP gateway architecture. Security and Interoperability-Understanding the risks, Modes of attack, Tools for achieving security, The need for interoperability

MODULE 5[10 T]

Sensors

Definition, Types, Basic principle and applications of Resistive, Inductive, Capacitive, Piezoelectric and their Dynamic performance. Fiber optic sensors, Bio-chemical sensors, Hall-Effect, Photoemissive, Photo Diode/ Photo Transistor, Photovoltaic, LVDT, Strain Gauge Digital transducers: Principle, Construction, Encoders, Absolute and incremental encoders, Silicon micro transducers.

References

1. Learning Internet of Things, Peter Waher.
2. Raspberry Pi IoT Projects, Prototyping Experiments for Projects, John C Shovic
3. Ramakant A. Gayakwad- "Op Amps and Linear integrated circuits" – PHI2008
4. D. Roy Choudhury, Shail B Jain – "Linear Integrated circuits", New Age international (P)Ltd,2010
5. Kennedy's Electronic communication system – George Kennedy, Bernard Davis, S RM Prasanna,5e, Mc Graw Hill Education
6. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 5th Edition, 2008.
7. D.P. Kothari, I. J. Nagrath, "Basic Electronics", McGraw Hill Education (India) Private Limited, 2014.

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SDC3CN04P- PRACTICAL 4: COMPUTER NETWORKS FOR IOT AND C PROGRAMMING

Number of Credits-4
Course Outcome:

- Understand and apply different network commands
- To get familiar with the basic network administration commands.
- Learn to analyze different networking functions and features for implementing optimal solutions.

List of Exercises:

PART A: COMPUTER NETWORKS FOR IOT

1. Implement functions that send and receive Ethernet packet.
2. Implement functions that send and receive ARP packets.
3. Implement an end-host version of the Internet Protocol
4. Implement the sending and receiving of UDP datagrams.
5. Implement the Microprotocol Blast
6. Implement TCP/IP Connectivity
7. Implement UDP Connectivity
8. Implement Distance Vector routing algorithm
9. Implement Zigbee protocol, Bluetooth protocol
10. Implement z-wave protocol, 6LowPAN protocol
11. Implement WiFi protocol, Cellular protocol
12. Implement NFC protocol, Sigfix protocol
13. Implement MQTT protocol, TR-069 protocol
14. Implement JSON-LD protocol, Homekit protocol
15. Implement DNS-SD protocol, EPC protocol
16. Cost–Benefit Analysis for a Networking Project:
17. Simulate network using Hubs
18. Simulate Server-Based LAN D esign
19. Simulate IP Subnet Addressing
20. Simulate Internetworking using routers
21. Simulate Dynamic routing using RIP
22. Simulate routing using OSPF, PING,
23. Simulate routing using IGMP, SNMP
24. Simulate static routing
25. Simulate packet tracer
26. Simulate access lists

PART B : C PROGRAMMING

1. Find roots of a quadratic equation
2. Find the area and nature of a triangle
3. Find the sum of digits and reverse of a number
4. Find the factorial of a number
5. Find Sin(x)
6. Find Cos(x)
7. Display pyramid using '*'
8. Check for leap year
9. To display count of +ves, -ves and zeros in a set of N numbers
10. Find first n prime numbers
11. Find LCM and HCF of 2 numbers

12. To print Armstrong numbers within range
13. Evaluate the series $1 + x + x^2/2! + x^3/3! + \ldots + x^n/n!$
14. Convert a decimal number to a new base
15. Find the decimal equivalent of a number (base other than 10)
16. Calculate percentage of marks obtained for N students appeared for examination in M subjects.
17. To calculate standard deviation of N numbers.
18. To merge two arrays
19. To find N^{th} Fibonacci number
20. To find row and column totals of a matrix
21. Matrix addition, multiplication and transpose
22. To find the trace of a square matrix
23. To sort n numbers
24. Find the strings end with a particular character
25. Find the number of words in a given sentence
26. To check whether given string is palindrome or not
27. Swapping of two numbers using function
28. Reverse a string using recursion
29. Find the number of vowels in a string
30. To find length of a string using pointer
31. To count the occurrence of a word in a sentence.
32. To generate mark list of N students in a class using array of structures.
33. To insert an element at the correct position in a sorted array
34. To store and read from a text file
35. Write odd and even numbers into two files

SDC3EI5P PRACTICAL 5 - ELECTRONICS AND IOT WITH RASPBERRY PI

Number of Credits-4
Course Outcome:

- To give knowledge of some basic electronic components and circuits.
- To expose the students to working of some power electronic devices, transducers and application of transducers.

- Build computer using Raspberry Pi platform.
- Work with DHT sensors to detect humidity and temperature.
- Setup IoT connectivity using a remote desktop
- Understand Raspbian OS, Python programming, SMTP and API

List of Exercises:
PART A: ELECTRONICS
1. Plot the input and output characteristics of an NPN transistor in common emitter configuration and to calculate the dynamic input resistance, dynamic output resistance and common emitter current gain β.
2. To plot the V-I characteristics of silicon PN junction diodes, and calculate their

static and dynamic resistances.

3. Characteristics of Zener diode and construction of voltage regulator.
4. Design and setup an RC integrator and study its response to pulse and square waves
5. Half adder using NAND gates and decade counter.
6. Verification of De-Morgan's theorem using basic gates.
7. Construction of full wave, Centre tapped and bridge rectifiers.
8. Construct logic gates NOT, OR and AND using discrete components.
9. Design, set up and study clipping circuits using series and shunt clippers
10. Study clamping circuits using diodes
11. Design and setup an RC phase shift oscillator using op-amp for a frequency of 1kHz
12. Operational Amplifier – inverting, noninverting voltage follower
13. Design and set up an a stable multivibrator using BJT to generate a square wave for a given frequency, amplitude and duty cycle.
14. Construct a voltage doubler and tripler and to verify the voltages.

PART B: IOT WITH RASPBERRY PI
1. Configure Raspberry Pi.
2. Implement WAP for LED blink using Raspberry Pi.
3. Implement Zigbee Protocol using Raspberry Pi.
4. To demonstrate the basic linux commands on Raspberry pi.
5. To create a database & Store the value in Raspberry Pi.
6. To Setup RPi first time without using screen, mouse, keyboard

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Semester IV

SDC4PD11 - PROBABILITY DISTRIBUTIONS AND SAMPLING THEORY

Number of Credit: 3
Course Outcome

- Equip the students with knowledge of various distributions and to develop greater skills and understanding of various inequalities for further studies.
- Understand the basic knowledge of various sampling techniques and sampling distributions.

Course Outline:
Module 1[15T]

Standard distributions: Discrete type - Bernoulli, Binomial, Poisson, Geometric. Continuous type - Exponential and Normal (definition, properties and applications); Gamma (mean, variance, mgf); Beta.

Module 2[10T]

Limit theorems: Chebyshev's inequality, Sequence of random variables. Convergence in probability (definition and example only), weak law of large numbers (iid case), Bernoulli law of large numbers, Convergence in distribution (definition and examples only), Central limit theorem (Lindberg levy-iid case)

Module 3[8T]

Sampling methods: Simple random sampling with and without replacement, systematic sampling (Concept only), stratified sampling (Concept only), Cluster sampling (Concept only)

Module 4[12T]

Sampling distributions: Statistic, Standard error, Sampling from normal distribution, distribution of sample mean, sample variance, chi-square distribution, t- distribution, and F distribution (definition, derivations and relationships only).

References:

- V. K. Rohatgi, *An Introduction to Probability Theory and Mathematical Statistics*, Wiley Eastern.
- S.C.Gupta and V. K. Kapoor, *Fundamentals of Mathematical Statistics*, Sultan Chand and Sons

- A.M. Mood, F.A. Graybill and D C Bose, *Introduction to Theory of Statistics*, McGraw Hill
- John E Freund, *Mathematical Statistics*, Pearson Edn, New Delhi
- William G. Cochran, *Sampling Techniques*, 3rd Edition, Wiley IndiaPvt

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SDC4LS12: EMBEDDED LINUX OS AND ANDROID PROGRAMMING

No. of Credits: 4
Course Outcome:

- Understand hardware and software design requirements of embedded systems
- Understand Android platform and architecture as well as UI designing.
- Understand the embedded systems' specification and develop software programs
- To integrate multimedia, camera and Location based services in Android Application
- To get skilled with SQLite Database and content providers

Course Outline:
MODULE 1 [7 T]
Introduction, Processor Basics, The Linux Kernel - An Introduction, Kernel Initialization, System Initialization. Bootloaders, Device Driver Basics, File Systems, MTD Subsystem, BusyBox. Development environment and Tools: Basics regarding Kernel Space and its interface to User Space, Shell and basic shell commands, Basic IP Filters, Linux Memory Model, Linux Scheduling and priorities.

MODULE 2[8 T]
Comparing Linux to other RTOS, Porting considerations from other RTOS (VxWorks) to Linux, Tools chain Overview, POSIX Threads, Synchronization and Communication, C Signals, /proc and /sys for Kernel 2.6, dynamic Modules and Procs, Kernel Debugging, Embedded Linux Applications, Development Tools, Porting Linux, User Mode Linux

MODULE 3[15 T]
Introducing the android computing platform, History of android, an- droid software stack, Developing end user application using Android SDK, Android java packages, Setting up the development environment, Installing android development tools (ADT), Fundamental components, Android virtual devices, Running on real device, Structure of android application, Application life cycle. Understanding android resources - String resources, Layout resources, Resource reference syntax, Defining own resource IDs - Enumerating key android resources, string arrays, plurals, Color resources, dimension resources, image resources, Understanding content providers - Android built in providers, exploring databases on emulator, architecture of content providers, structure of android content URIs, reading data using URIs, using android cursor, working with where clause, inserting updates and deletes, implementing content, Async Task class- Create Services, Services Using AsynTask.

MODULE 4[15 T]

Create Broadcast Receivers, Understanding intents basics of intents, available intents, exploring intent composition, Rules for Resolving Intents to Their Components, ACTION PICK, GET CONTENT, pending intents User interfaces development in android - building UI completely in code, UI using XML, UI in XML with code, Android's common controls - Text controls, button controls, checkbox control, radio button controls, image view, date and time controls, map view control, understanding adapters, adapter views, list view, grid view, spinner control, gallery control, styles and themes, Understanding layout managers - linear layout manager, table layout manager, relative layout manager, frame layout manager, Constraint layout manager, Absolute layout manager ,grid layout manager. Android menus - creating menus, working with menu groups, responding to menu items, icon menu, sub menu, context menu, dynamic menus, loading menu through XML, popup menus, option menus, Fragments in Android structure of fragment, fragment life cycle, fragment transaction and back stack, fragment manager, saving fragment state, persistence of fragments, communications with fragments, startActivity() and setTargetFragment(), using dialogs in android, dialog fragments, working with toast.

MODULE 5[15 T]

Implementing action bar - tabbed navigation action bar activity, implementing base activity classes, tabbed action bar and tabbed listener, debug text view layout, action bar and menu interaction, list navigation action bar activity, spinner adapter, list listener, list action bar, standard navigation action bar activity, action bar and search view, action bar and fragments. Android Advanced Concepts-Drag and Drops, Notification, Sending SMS and Email, Phone Calls, Location Based Services- Google Map, Persisting data - Files, saving state and preferences - saving application data, creating, saving and retrieving shared preferences, preference framework and preference activity, preference layout in XML, native preference controls, preference fragments, preference activity, persisting the application state, including static files as resources, Working with file system, SQLite - SQLLite types, database manipulation using SQLLite, SQL and database centric data model for Android, Android database classes, Introduction to API, Publishing Android Application.

References
1. Embedded Linux Primer: APractical Real-world Approach by Christopher Hallinan
2. Building Embedded Linux Systems by Karim Yaghmour
3. Linux: Embedded Development by Alex Gonzalez and Chris Simmonds
4. Pro Android 4, SatyaKomatineni& Dave MacLean,Apress.
5. Professional Android 4 Application Development, Retomeier,Wrox.
6. Programming Android, ZigurdMednieks, Laird Dornin, G. BlakeMeike, and Masumi Nakamura, O'Reilly.
7. https://developer.android.com

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SDC4SDS13 - DATA SCIENCE WITH R PROGRAMMING

Number of Credits-3

Course outcome:

- Understand the basics in R programming in terms of constructs, control statements, string functions
- Understand the use of R for Big Data analytics
- Learn to apply R programming for Text processing
- Able to appreciate and apply the R programming from a statistical perspective
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Course Outline:

MODULE 1[8 T]

History and Overview of R: What is R?, What is S?, The S Philosophy, Back to R, Basic Features of R, Free Software, Design of the R System, Limitations of R, R Resources, Getting Started with R:- Installation, Getting started with the R interface, R Nuts and Bolts: Entering Input, Evaluation, R Objects, Numbers, Attributes, Creating Vectors, Mixing Objects, Explicit Coercion, Matrices, Lists, Factors, Missing Values, Data Frames, Names.

MODULE 2[10 T]

Getting Data In and Out of R: Reading and Writing Data, Reading Data Files with read.table(), Reading in Larger Datasets with read.table, Calculating Memory Requirements for R Objects, Using the readr Package, Using Textual and Binary Formats for Storing Data:- Using dput() and dump(), Binary Formats, Interfaces to the Outside World:- File Connections, Reading Lines of a Text File, Reading From a URL Connection.

MODULE 3[7 T]

Subsetting R Objects: Subsetting a Vector, Subsetting a Matrix, Subsetting Lists, Subsetting Nested Elements of a List, Extracting Multiple Elements of a List, Partial Matching, Removing NA Values, Vectorized Operations:- Vectorized Matrix Operations, Dates and Times:- Dates in R, Times in R, Operations on Dates and Times, Managing Data Frames with the dplyr package:- Data Frames, The dplyr Package, dplyr Grammar, Installing the dplyr package, select(), filter(), arrange(), rename(), mutate(), group_by(), %>%.

MODULE 4[9 T]

Control Structures: if-else, for Loops, Nested for loops, while Loops, repeat Loops, next, break, Functions: Functions in R, Your First Function, Argument Matching, Lazy Evaluation, The ... Argument, Arguments Coming After the ... Argument, Scoping Rules of R, Loop Functions:- Looping on the Command Line, lapply(), sapply(), split(), Splitting a Data Frame, tapply, apply(), Col/Row Sums and Means, Other Ways to Apply, mapply(), Vectorizing a Function.

MODULE 5[11 T]

Data Manipulation (dplyr, reshape2 packages), String Operations (stringr package), Packaging, Debugging and Object-Oriented Programming, Exploratory Data Analysis, Clustering, Classification, Regression- Linear Regression, Multiple Regression, Logistic Regression, Data Visualization (ggplot2 package).

References

- R Programming for Data Science, by Roger D. Peng
- Using R for Introductory Statistics, by John Verzani, Chapman & Hall/CRC, 2004, ISBN 1584884509
- Advanced R, by Hadley Wickham, ISBN 9781466586963.
- Big data:The black book ,Dream Tech Press, 2017 Edition,ISBN 9789351199311
- Data Science From Scratch First Principle with Python
- R Programming For Data Science by Roger D. Peng
- Python Data Science Handbook Essential Tools For Working With Data by Jake VanderPlas
- R for Data Science Import, Tidy, Transform, Visualize, and Model Data by Hadley Wickham and Garrett Grolemund.

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SDC4DS06P - PRACTICAL 6 - DATA SCIENCE WITH R AND DATA VISUALISATION USING QLIK VIEW & POWER BI

Number of Credits-4
Course Outcome:

- Understand what is QlikView and its work
- Use multiple tables and charts to resolve the synthetic keys
- Gain rich experience in generating data using scripts and creating dashboards
- Gain a competitive edge in creating customized visuals and deliver a reliable analysis of vast amount of data using Power BI.
- Learn to install and load add-in packages in R
- Learn to import external data into R for data processing and statistical analysis

List of Exercises:

PART A:
1. Write a R program to find the given number is odd or even.
2. Write a R Program to find factorial of a number using recursion.
3. Write a R Program to find the given number is prime or not
4. Write a R Program to find the given number is armstrong or not.
5. Write a R program to check a number is palindrome or not.
6. Write a R program to print fibonacci series upto n using function and without function.
7. Write a R program to find the given year is leap year or not, using function and without function.
8. Write a R program to make a simple calculator with add, substract, multiply, divides, modulus.
9. Program to find the sum of the digits of the number.
10. Write a R program to find the frequency of a digit in the number.
11. Write a R program to create a matrix. Also write code for the following.
    - i.   Change from column-wise to row-wise representation.
    - ii. Change the names of rows and columns of matrix.

      iii.   Select all rows except first.

      iv.   Modify the elements of a matrix.

12. Write a R program to create a Data Frame. Also write code for the following.
    i.   Get the Structure of the Data Frame
    ii.   Summary of Data in Data Frame
    iii.   Extract the first two rows and then all columns.
    iv.   Extract 3rd and 5th row with 2nd and 4th column.
    v.   Add new column to the data frame
13. Write a R program to create a vector. Also find the code for the following.
    i.   Test whether a given vector contains a specified element.
    ii.   Find common elements from multiple vectors.
    iii.   Find second highest value in a given vector.
    iv.   Find the elements of a given vector that are not in another given vector.
14. Write a R program to create a list containing a vector, a matrix and a list and give names to the elements in the list. Access the first and second element of the list.
15. Write a R program to find the factors of a given number.
16. Perform matrix multiplication using following data frames.

      Data frame1   Data frame2

      var1 var2   var1 var2 var3

        1 2   1   2   3

        3 4   4   5   6

        5 6

17. Perform following queries on given dataset using the functions under dplyr package.

   Queries

- Selecting random 'n' rows.
- Selecting random functions of rows
- Selecting the variables from state to Y2018.
- Dropping the variables Index and State from the dataset.
- Selecting or dropping variables State with "Y".
- Rename/change the variable name Index to Index1.
- List the row value from the dataset whose Index=A.
- List the row values from the dataset whose Index=A,C.
- List the row values from the dataset whose index=A,C and income greater than or equal to13lakhs in Y2002.
- Calculate the mean and median for the variable Y2015.
- Calculate the mean and median of the variables Y2005, Y2006.
- Sort the variable State in descending order.
- Select the 10 random observation of 2 variables (Index,State) from the dataset using pipe operator.
- Calculate the count and mean of the variables 2011,2012 by variable Index.

PART B- DATA VISUALISATION USING QlikView AND Power BI

1. Program to get data from excel files.

2. Program to load data from multiple sources.
3. Program to remove unwanted columns from tables.
4. Program to combine multiple tables.
5. Implement and format area chart
6. Implement and format Donut chart.
7. Implement and format clustered column chart.
8. Implement and format multi-row card.
9. Implement and format filled map.
10. Implement R script.
11. Implement slicer.
12. Implement filters on measures.
13. Implement page level filters.
14. Implement report level filters.
15. Implement drill through filters.
16. Create a Dashboard and implement Dashboard actions.
17. Program to add web content to Dashboard.
18. Program to upload excel files Dashboard.
19. Program to pin workbook to Dashboard.
20. Program to get insights of a Dataset.
21. Display data from a QVD file.
22. Import data from Excel to QlikView.
23. Implement aggregate functions in the dataset.
24. Implement match, rank, peek, range, sum functions.
25. Implement List Box to filter the data present in Charts.
26. Implement Multi Box to filter the data present in Charts.
27. Implement table Box to filter the data present in Charts.
28. Create Bar Chart in QlikView.
29. Create Block Chart in QlikView.
30. Create Funnel Chart in QlikView.
31. Create grid Chart in QlikView.
32. Create line Chart in QlikView.
33. Create Mekko Chart in QlikView.
34. Create Pie Chart in QlikView.
35. Create Radar Chart in QlikView.
36. Create Scatter Chart in QlikView.
37. Create Dashboard in QlikView.
38. Implement rotating table.
39. Implement mapping/ lookup table.
40. Create a Master calendar in QlikView

SDC4LS07P - PRATICAL 7 - LINUX OS AND ANDRIOD PROGRAMMING

Number of Credits-4
Course Outcome:

- Design and develop user Interfaces for the Android platform

- Develop Android applications related to mobile related server-less database like SQLITE

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- Ability to write Shell Programming using Linux commands.
- Ability to design and write application to manipulate internal kernel level Linux File System.

PART A: ANDROID

List of Exercises:

1. Simple User Interface to display a message
2. Android program to add two numbers
3. Build a sample android application to display a message on button click
4. Program to demonstrate the use of string.xml file
5. Android program to demonstrate Activity life cycle
6. Android program to change the background color of your Activity
7. Program to implement the use of Event handling on Button click
8. Program to Start another activity from your own activity using Intent
9. Program to understand basic logic operations
10. Android program to create login screen with two Activity
11. Program to demonstrate passing data using Intent
12. Program to Dial a number the using Implicit Intent
13. Program to demonstrate the use of content provider
14. Program to launch the existing camera application to capture an image and display the result in the form of bitmap.
15. Program to change the image displayed on the screen using Frame layout
16. Program to demonstrate Toast in an application
17. Program to Demonstrate Dialogue box in an application
18. Program to demonstrate Radio Group application
19. Program to demonstrate the use of Checkbox control
20. Program to demonstrate the use of Date time Control
21. Create an Android Application to implement custom Styles and Themes
22. Program to get IPAddress
23. Create a Calculator APP in Android
24. Create your own Android application using List View
25. program to Display Images in Grid view
26. Program to Demonstrate the use of Spinner Control
27. Android program to create option menu
28. P:rogram to demonstrate the use of Context menu
29. Create an Android Application to create a pop-up menu
30. Program to demonstrate the use of Submenu
31. Program to Start a service from your own activity
32. Create an Android Application to Play music using Service
33. Create an Android Application to download a file by Service using AsyncTaskClass
34. Android Application to Display Battery low notification using broadcast Receiver Class
35. Program to demonstrate the use of fragment
36. Program to setup Action bar with search option
37. Create an Android Application to send SMS

38. Create a Sample app with location Finder
39. Create a sample Sample app with Notification
40. Create a sample App with Location basedservices
41. Create a sample App to work with Drag and Drop
42. Program to demonstrate sending Email using AndroidApp
43. Create an Android Application to store and display data using SharedPreferences
44. Create an Android Application to store ,Filter and Display data using SQLLite
45. Android login App withApi

PART B: LINUX

1. Write a shell script program to display list of user currently logged in.
2. Write a shell script program to display "HELLO WORLD".
3. Write a shell script program to develop a scientific calculator.
4. Write a shell Script program to check whether the given number is even or odd.
5. Shell script Program to search whether element is present is in the list or not.
6. Shell script program to check whether given file is a directory or not.
7. Shell script program to count number of files in a Directory.
8. Shell script program to copy contents of one file to another.
9. Create directory, write contents on that and Copy to a suitable location in yourhome directory.
10. Use a pipeline and command substitution to set the length of a line in file to a variable.
11. Write a program using sed command to print duplicated lines of Input.
12. Write a grep/egrep script to find the number of words character, words and lines in a file.
13. Write an awk script to develop a Fibonacci series.
14. Write a perl script to compute the power of a given number.
15. Write an awk script to display the pattern of given string or number.
16. Write a perl script to check a number is prime or not.
17. Write an egrep script to display list of files in thedirectory.
18. Write a shell script program to display the process attributes.
19. Write a shell script to change the priority of processes.
20. Write a shell script to change the ownership of processes.
21. Write a program to send back a process from foreground.
22. Write a program to retrieve a process frombackground.
23. Write a program to create a Zombieprocess.
24. Write a program to create a child process and allow the parent to display "parent" and the child to display "child" on the screen.
25. Write a shell script program to check variable attributes of file and processes.
26. Write a shell script program to check and list attributes of processes.
27. Shell Script program to implement read, write, and execute permissions.
28. Shell Script program for changing process .
29. To execute programs using gdb to utilize its various features like breakpoints, conditional breakpoints.
30. Write a shell script program to include verbose Debug option for debugging.
31. Write a shell script program to include xtrace Debug option for debugging.
32. Write a shell script program to include verbose and trace Debugoption
33. Create and compile your own cross-compiling toolchain for the uClibc C library

34. Create and set upserial communication, compile and install the U-Boot bootloader, use basic U-Boot commands, set up TFTP communication with the development workstation.
35. Get the kernel sources and patch them
36. Cross-compile a kernel for an ARM targetplatform.
37. Create a tiny yet full featured embedded system
38. configure and boot an embedded Linux system relying on block storage
39. Implement flash and flash file systems usage and their integration on the target
40. Build a Linux system with libraries and make it work on the board.
41. Compile and run your own ncurses application on thetarget.
42. Use strace to diagnose program issues. Use gdbserverand a cross-debugger to remotely debug an embedded application

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SEMESTER V

SDC5SI14: STATISTICAL INFERENCE

Number of Credit: 4
Course Outcome

- Introduce estimation as well as hypothesis testing in practical life.
- Introduce parametric and non-parametric test to draw conclusions from the sample.

Course outline
Module 1[20T]

Estimation theory: Parametric space, sample space, point estimation. Neyman Factorization criteria, Requirements of good estimator: Unbiasedness, Consistency, Efficiency, Sufficiency.

Methods of estimation: Maximum likelihood estimation and Moment estimation methods (Detailed discussion with problems); Properties of maximum likelihood estimators (without proof).

Interval estimation: Confidence interval (CI); CI for mean and variance of Normal distribution; Confidence interval for binomial proportion and population correlation coefficient when population is normal.

Module 2[12T]

Testing of Hypothesis: Level of significance, Null and Alternative hypotheses, simple and composite hypothesis , Types of Errors, Critical Region, Level of Significance, Power and p- values. Most powerful tests, Neyman-Pearson Lemma (without proof)

Module 3[15T]

Large sample tests: Test for single mean, equality of two means, Test for single proportion, equality of two proportions. Small sample tests: t-test for single mean, unpaired and paired t-test. Chi-square test for equality of variances, goodness of fit, test of independence and association of attributes. Testing means of several populations: One Way ANOVA, Two

Module 4[13T]

*Non-parametric methods***:** Advantages and drawbacks; Test for randomness, Median test, Sign test, Mann-Whiteny U test, Wilcoxon test; Kruskal Wallis test (Concept only)

References:

1. V. K. Rohatgi, *An Introduction to Probability Theory and Mathematical Statistics*, Wiley Eastern.
2. Gupta, S.P. *Statistical Methods*. Sultan Chand and Sons: New Delhi.
3. S.C.Gupta and V. K. Kappor, *Fundamentals of Mathematical Statistics*, Sultan Chand and Sons
3. A.M. Mood, F.A. Graybill and D C Bose, *Introduction to Theory of Statistics*, McGraw Hill
4. John E Freund, *Mathematical Statistics*, Pearson Edn, NewDelhi

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SDC5SD15: STATISTICAL DATA ANALYSIS USING SPSS

Number of credit-4
Course Outcome

- To train students in SPSS Software
- To expose the students to the analysis of statistical data

Course outline
Module 1[8T]

Data handling: open SPSS data file – save – import from other data source – data entry – labeling for dummy numbers - recode in to same variable – recode in to different variable – transpose of data –insert variables and cases – merge variables and cases.

Module 2[8T]

Data handling: Split – select cases – compute total scores – table looks – Changing column – font style and sizes

Module 3[12T]

Diagrammatic representation: Simple Bar diagram – Multiple bar diagram – Sub-divided Bar diagram - Percentage diagram - Pie Diagram – Frequency Table – Histogram – Scatter diagram – Box plot.

Module 4[16T]

Descriptive Statistics - Mean, Median, Mode, SD- Skewness- Kurtosis. Correlation – Karl Pearson's and Spearman's Rank Correlation, Regression analysis: Simple and Multiple Regression Analysis [Enter and stepwise methods]

Module 5[16T]

<mark>Testing of Hypothesis: Parametric – One sample – Two sample Independent t – test – Paired t –test. Non – parametric: One sample KS test- Mann-Whitney U test – Wilcoxon Signed Rank test -Kruskal Wallis test – Friedman test- Chi- square test. Analysis of variance: One way and Two way ANOVA.</mark>

References:

- Clifford E.Lunneborg (2000). Data analysis by resampling: concepts and applications. Dusbury

  Thomson learning. Australia.
- Everitt, B.S and Dunn, G (2001). Applied multivariate data analysis. Arnold London. Books for reference:
- Jeremy J. Foster (2001). Data analysis using SPSS for windows. New edition. Versions 8-10.
  Sage publications. London.
- Michael S. Louis – Beck (1995). Data analysis an introduction, Series: quantitative application in the social sciences. Sage. Publications. London.

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SDC5MC16 - MICROCONTROLLER AND APPLICATIONS

Number of Credit: 4

Course Outcome

- To equip the students with basic understanding of Microcontrollers and its applications
- To learn the basics of microcontrollers
- To learn the assembly language programs of 8051

Course outline

Module I [12T]

Comparison between microprocessor and Microcontroller. Architecture of 8051 microcontroller. Internal memory (ROM) organization. Important Registers .Internal RAM organization. Register banks, Byte and bit addressable area. Flags and flag register (PSW). Program counter and data pointer. Stack and Stack pointer. Special Function Registers. 8051 Ports and I/O pins, control signals. External memory interfacing signals

Module 2[13T]

8051 instruction set, Data transfer (internal and external), Arithmetic and Logic, Shifting and rotating, Branching/Jump. Bit related instructions and operations. Addressing modes. External memory related instruction. Stack and subroutine. Call and return instructions. Push

and Pop instructions. Delay generation, calculation and programs.8051 Interrupts.

Module 3[13T]

Counters and Timers: Timer / counter interrupts – Delay using Timer - Modes of Operation - Counting .RS232 Communication standard. Serial data input of serial data output: Serial data interrupt - Data transmission Data reception - serial data transmission interrupts : Times Flag interrupt - Serial port interrupt - External interrupt - Reset -Interrupt concept - interrupt priority - interrupt destination - software generated interrupts.

Module 4[10T]

Key board interfacing program, key debouncing, matrix keypad. Display interface - 7 segment multiplexed display, scanning. 16X2-LCD Basics, program to display character.

A/D and D/A interfacing. Stepper Motor interface, program to rotate motor. Relay and Traffic interface.

Module 5[12T]

Embedded systems: Overview, Design challenges- Optimising design metrics, Common design metrics- Processor technology- General purpose processors, Single purpose processors and Application specific processors. Memory: Write-ability and storage permanence. Common memory types, Composing memories, memory hierarchy and cache- Cache mapping techniques: replacement, write techniques, Interfacing: Basic protocol concepts, Microprocessor interfacing: I/O addressing, interrupts, DMA, State machine model: finite-state machines, FSM with datapath model FSMD, Hierarchical/Concurrent state machine model (HCFSM) and the State charts language, Program- state machine model (PSM).

References:

1. The 8051 microcontroller and embedded systems using assembly and C-Kenneth.J.Ayala - CENGAGE Learning.
2. 8051 Microcontroller and applications – Ali Mazidi
3. Microprocessors and micro-controllers (8085,8051)– Krishna Kant -PHI India
4. Frank Vahid and Tony Givargis, Embedded System Design: AUnified Hardware/Software Introduction, Wiley India, 2002.

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SDC5AI17: ARTIFICIAL INTELLIGENCE

Number of Credits: 3

Course outcome

- To understand the various characteristics of Intelligent agents
- To learn the different search strategies in AI
- To learn to represent knowledge in solving AIproblems
- To understand the different ways of designing software agents

Course Outline:

Module I INTRODUCTION (5T)

Introduction–Definition – Future of Artificial Intelligence – Characteristics of Intelligent

Agents–Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.

Module II PROBLEM SOLVING METHODS (10 T)

Problem solving Methods – Search Strategies- Uninformed – Informed – Heuristics – Local Search Algorithms and Optimization Problems -Searching with Partial Observations – Constraint Satisfaction Problems – Constraint Propagation – Backtracking Search – Game Playing – Optimal Decisions in Games – Alpha – Beta Pruning – Stochastic Games **Module III KNOWLEDGE REPRESENTATION (12 T)**

First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining- Backward Chaining – Resolution – Knowledge Representation – Ontological Engineering- Categories and Objects – Events – Mental Events and Mental Objects – Reasoning Systems for Categories -Reasoning with Default Information

Module IV SOFTWARE AGENTS (10 T)

Neural networks - introduction - motivation - notation - the backpropagation method Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reutation in Multi-agent systems.

Module V APPLICATIONS (8T)

AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing – Programming in LISP - basic LISP primitives - Predicates – conditionals and Binding - association lists - lambda expressions - macros - I/O in LISP Introduction to Prolog- Representing facts- Recursive Search- Abstract Data types- Meta Predicates, Matching and Evaluation, Meta Interpreters Semantic nets & frames in prolog

Text book

1. Nilsson N.J., Artificial Intelligence - A New Synthesis, Harcourt Asia Pte. Ltd.
2. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach, Prentice Hall, Third Edition, 2009.
3. Bratko, ―Prolog: Programming for Artificial Intelligence, Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.

Reference books

Luger G.F. & Stubblefield W.A., Artificial Intelligence, Pearson Education India.

Elain Rich & Kevin Knight, Artificial Intelligence, Tata McGraw Hill

Tanimotto S.L., The Elements of Artificial Intelligence, Computer Science Press

Winston P.H., LISP, Pearson Education India.

George F. Luger, Artificial Intelligence – Structures and strategies for complex problem solving, Pearson Education

Stuart Russell, Peter Norvig, Artificial Intelligence – A modern approach, Pearson Education

David L. Poole and Alan K. Mackworth, ―Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, 2010.

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SDC5ML18- MACHINE LEARNING USING PYTHON

Number of Credits: 3

Course outcome

- Explain Machine Learning concepts and write simple programs using python.
- Describe unsupervised learning concepts and dimensionality reduction techniques
- Discuss simple Machine Learning applications in a range of real-world applications using Python programming
- To introduce the major ideas, methods, and techniques of computer vision and pattern recognition

Course Outline:

MODULE 1[8T]

Machine learning and Python – Getting started, Introduction to NumPy, SciPy, and Matplotlib, Installing Python Chewing data efficiently with NumPy and intelligently with SciPy, Learning NumPy, Indexing, Handling non-existing values, Comparing runtime behaviors, Learning SciPy, Our first machine learning application, Reading in the data, Preprocessing and cleaning the data, Choosing the right model and learning algorithm, The Iris dataset, The first step is visualization, Building our first classification model, Evaluation – holding out data and cross-validation

MODULE 2[8T]

Learning How to Classify with Real-world Example, Building more complex classifiers, A more complex dataset and a more complex classifier, Learning about the Seeds dataset, Features and feature engineering, Nearest neighbor classification, Binary and multiclass classification, Clustering – Finding Related Posts , Measuring the relatedness of posts, Preprocessing – similarity measured as similar number, of common words, Converting raw text into a bag-of-words, Counting words, Normalizing the word count vectors, Removing less important words, Stemming, Installing and using NLTK, Extending the vectorizer with NLTK's stemmer, Stop words on steroids, Clustering, KMeans Clustering posts, Solving our initial challenge, Another look at noise, Tweaking the parameters, Topic Modeling, Latent Dirichlet allocation (LDA), Building a topic model, Comparing similarity in topic space, Modeling the whole of Wikipedia, Choosing the number of topics

MODULE 3[10T]

Classification: Detecting Poor Answers, Tuning the instance, Tuning the classifier, Fetching the data Slimming the data down to chewable chunks, Preselection and processing of attributes, Defining what is a good answer, Creating our first classifier, Starting with the k- nearest neighbor (KNN) algorithm, Engineering the features, Training the classifier, Measuring the classifier's performance, Designing more features, Deciding how to improve, Bias-variance and its trade-off, Fixing high bias, Fixing high variance, High bias or low bias, Using logistic regression, A bit of math with a small example, Applying logistic regression to our post classification problem, Classification II – Sentiment Analysis, Fetching the Twitter data, Introducing the Naive Bayes classifier, Getting to know the Bayes theorem, Being naïve, Using Naive Bayes to classify, Accounting for unseen words and other oddities, Accounting for arithmetic underflows, Creating our first classifier and tuning it Solving an easy problem first, Using all the classes, Tuning the classifier's parameters, Cleaning tweets, Taking the word types into account, Determining the word types.

MODULE 4[10T]

Predicting house prices with regression, Multidimensional regression, Cross- validation for regression, Penalized regression, L1 and L2 penalties, Using Lasso or Elastic nets in scikit- learn, P greater than N scenarios, An example based on text, Setting hyperparameters in a smart way, Rating prediction and recommendations, Improved recommendations, Using the binary matrix of recommendations, Looking at the movie neighbors, Combining multiple methods, Basket analysis Obtaining useful predictions Analyzing supermarket shopping baskets Association rule mining More advanced basket analysis. Fetching the music data, converting into a wave format, looking at music, Decomposing music into sine wave components, Using FFT to build our first classifier Increasing experimentation agility, Training the classifier, Using the confusion matrix to measure accuracy in multiclass problems, an alternate way to measure classifier performance using Receiver Operating Characteristics.

Computer Vision – Pattern Recognition, introducing image processing, Loading and displaying images, Basic image processing, Thresholding, Gaussian blurring, Filtering for different effects, adding salt and pepper noise, Putting the center in focus, Pattern recognition, Computing features from images, writing your own features, Classifying a harder dataset, Local feature representations.

MODULE 5[9T]

Dimensionality Reduction, Sketching our roadmap, Selecting features, Detecting redundant features using filters, Correlation, Mutual information, Asking the model about the features using wrappers, Other feature selection methods, Feature extraction, About principal component analysis (PCA), Sketching PCA, Applying PCA, Limitations of PCA and how LDA can help, Multidimensional scaling (MDS), Learning about big data, Using jug to break up your pipeline into tasks, About tasks, Reusing partial results, Looking under the hood, Using jug for data analysis.

References

1. Building Machine Learning Systems with Python - Willi Richert, Luis Pedro Coelho
2. http://scikit-learn.org/stable/
3. Introduction to machine learning with python - Andreas C. Müller and Sarah Guido

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SDC5BD19- BIG DATA &CLOUD PLATFORM FOR IOT

Number of Credits: 4

Course outcome

- Understand the specialized aspects of big data including big data application, and big data analytics.
- Develop Big Data Solutions using Hadoop Eco System.
- Explore the relationship between IoT, cloud computing, and big data
- Learn to transfer IoT data to the cloud and in between cloud providers

Course Outline:

MODULE 1[8 T]

Overview of big Data-big data stack - Business motivation and drivers for everything-big data analysis techniques - Introducing technologies for handling big data. Big data management- big data storage concepts and technology –polygot persistence -big data processing concepts. Understanding Hadoop Ecosystem- MapReduce Fundamentals and HBase-processing data with MapReduce- MapReduce execution and implementing MapReduce program

MODULE 2[8 T]

Data Science-utilizing data structures and algorithm - Integrating R and Hadoop for statistics - Predictive analytics with Mahout - Introduction to Mahout. Understanding Analytics and big Data- Analytical Approaches and tools to analyze data- Exploring Hive- Analyzing Data with Pig.

MODULE 3[15 T]

Cloud Computing definition, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public vs private clouds, role of virtualization in enabling the cloud; Business Agility: Benefits and challenges to Cloud architecture. Application availability, performance, security and disaster recovery; next generation Cloud Applications. Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages

MODULE 4[14T]

Reliability, availability and security of services deployed from the cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment; Cloud Economics: Cloud Computing infrastructures available for implementing cloud-based services. Economics of choosing a Cloud platform for an organization, based on application requirements, economic constraints and business needs (e.g Amazon, Microsoft and Google, Salesforce.com, Ubuntu and Redhat) Service creation environments to develop cloud-based applications. Development environments for service development; Amazon, Azure, Google App. Internet of Things Promises–Definition, Scope, IoT- An Architectural Overview–Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service (XaaS), M2M and IoT Analytics, Knowledge Management

MODULE 5[15 T]

Sensors for IoT Applications–Structure of IoT– IoT Map Device. The IoT Era - Scope of the Internet of Things - Components of IoT-Enabled Things - IoT World Forum Reference Model- ITU-T IoT Reference Model - IoTivity - Cisco IoT System – io Bridge - SDN and NFV over IoT Deployment. IOT PROTOCOLS Security Requirements in IoT Architecture - Security in Enabling Technologies - Security Concerns in IoT Applications. Security Architecture in the Internet of Things - Security Requirements in IoT. Cloud services and IoT – offerings related to IoT from cloud service providers – Cloud IoT security controls – An enterprise IoT cloud security architecture – New directions in cloud enabled IoT computing.

References:
1. Black book –BIG DATA, ISBN:978-93-5119-931-1.
2. Thomas Erl with Wajid Khattak and Paul Buhler, Big Data Fundamentals: Concepts: Drivers and Techniques.

3. Hurwitz, Alan Nugent, Fern Halper and Marcia Kaufman, Big Data For Dummies, ISBN:9781118504222.

4. Robert D. Schneider, Hadoop for Dummies, ISBN: 978-1-118-25051-8.

5. Alex Holmes, Hadoop in Practice, ISBN :9781617290237

6. Gautam Shroff, "Enterprise Cloud Computing Technology Architecture Applications", Cambridge University Press; 1 edition, [ISBN: 978-0521137355], 2010.

7. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach" McGraw-Hill Osborne Media; 1 edition [ISBN: 0071626948], 2009.

8. Dimitris N. Chorafas, "Cloud Computing Strategies" CRC Press; 1 edition [ISBN: 1439834539],2010.

9. Peter Waher, "Learning Internet of Things", PACKT publishing, BIRMINGHAM – MUMBAI

10. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer

11. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118- 47347-4, Willy Publications

12. Vijay Madisetti and ArshdeepBahga, "Internet of Things (AHands-on-Approach)", 1st Edition, VPT, 2014.

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SDC5HN08P: PRACTICAL 8 - HADOOP & NOSQL DATABASE

Number of Credits-4
Course Outcome:

- Learn HDFS Concepts and Interfacing with HDFS
- Manage Job Execution in Hadoop Environment
- Learn the benefits of using a NoSQL database such as MongoDB
- Gain an in-depth understanding of main features of MongoDB and their use cases

List of Exercises:
PART A: HADOOP

1. Lab on Manipulating files in HDFS pragmatically using the FileSystem API.Alternative Hadoop File Systems: IBM GPFS, MapR-FS, Lustre, Amazon S3 etc.

2. Lab on Write an Inverted Index MapReduce Application with custom Partitioner and Combiner Custom types and Composite Keys Custom

3. Comparators InputFormats and OutputFormats Distributed Cache MapReduce Design Patterns Sorting Joins.

4. Lab on Writing a streaming MapReduce job in Python YARN and Hadoop2.0.

5. Lab on Importing data from an RDBMS to HDFS using Sqoop.

6. Lab on Exporting data from HDFS to an Other data integration tools: Flume, Kafka, Informatica, Talend etc.

PART B: NOSQL
   1. Create a sample Database Student and create collection using MongoDB.
   2. Create a MongoDB array with 5 fields.
   3. Program to use find () in MongoDB
   4. Write a program to create Cursor inMongoDB
   5. Write a program to return the documents from a sample collection in ascending order
   6. Consider a sample collection and count the number documents in a collection, delete a particular document
   7. Consider a sample collection and update a particular document.
   8. Write a program for Mongodb authentication with Kerberos
   9. Create a sample database and perform createIndex(), getindexes (), dropindex () operations
   10. Consider a sample collection and retrieve documents based on a particular pattern.

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SDC5TML09P: PRACTICAL 9 - MACHINE LEARNING USING PYTHON, DATA VISUALISATION USING TABLEAU, SPSS

Number of Credits-4
Course Outcome:

- Analyze datasets visually using Tableau Desktop.
- Create static charts, interactive Dashboards and data stories using Tableau Desktop.
- To introduce students to the basic concepts and techniques of Machine Learning.
- To develop skills of using recent machine learning software for solving practical problems.

List of Exercises:

PART A: MACHINE LEARNING PYTHON

1. Plotting Cross Validated Predictions.
2. Concatenating multiple feature methods.
3. Pipelining: Chaining a PCA and a logisticregression.
4. Isotonic regression.
5. Inputting missing values before building an estimator.
6. Face completion with a multi-output estimators.
7. Selecting Dimensionality reduction with pipeline Grid search cv.
8. Multilabel classification
9. The Johnson-Lindenstrauss bound for embedding with random projections.
10. Comparison of kernel ridge regression and SVR,
11. Outlier detection on a real data set.
12. Faces recognition example using eigenfaces and SVMs.
13. Demonstrate how to generate a dataset and bicluster it using the Spectral Co-Clustering algorithm.
14. Demonstrate how to generate a checkerboard dataset and bicluster it using the Spectral Biclustering algorithm.
15. Demonstrate the Spectral Co-clustering algorithm on the twenty newsgroups dataset.
16. Comparison of Calibration of Classifiers.
17. Develop a program to display how well calibrated the predicted probabilities are and how to calibrate an uncalibrated classifier.
18. Develop a program to demonstrate the Probability calibration of classifiers.
19. Develop a program to demonstrate the Probability Calibration for 3-class classification.
20. Develop a program showing how the scikit-learn can be used to recognize images of hand-written digits.
21. Normal and Shrinkage Linear Discriminant Analysis for classification
22. Develop a program to implement Plot classification probability.
23. Develop a program to illustrate the nature of decision boundaries of different classifiers.
24. Develop a program to implement Linear and Quadratic Discriminant Analysis with covariance ellipsoid.
25. Develop a program to implement Feature agglomeration using clustering.
26. Develop a program to demonstrate the mean-shift clustering algorithm.
27. Develop a program to Demonstrate the k-means assumptions.
28. Develop a program to implement K-means Clustering.
29. Develop a program to implement Spectral clustering for image segmentation.
30. Develop a program to demonstrate Color Quantization using K-Means.
31. Develop a program to implement A demo of K-Means clustering on the handwritten digits data.
32. Develop a program to implement Sparse inverse covariance estimation.
33. Develop a program to implement The Digit Dataset.

34. Develop a program to plot randomly generated classification dataset.
35. Develop a program to demonstrate the Principal Component Analysis applied to the Iris dataset.
36. Develop a program to demonstrate Image denoising using dictionary learning.
37. Develop a program to demonstrate Decision Tree Regression with AdaBoost.
38. Develop a program to implement Pixel importance with a parallel forest of trees.
39. Develop a program to implement Feature importances with forests of trees.
40. Develop a program to implement Isolation Forest example.
41. Develop a program to Plot the decision boundaries of a VotingClassifier.
42. Develop a program to implement Prediction Intervals for Gradient Boosting Regression.
43. Develop a program for the Illustration of the effect of different regularization strategies for Gradient Boosting.
44. Develop a program to exercise regarding the use of classification techniques on the Digits dataset.
45. Develop a program to exercise Cross-validation with an SVM on the Digits dataset.
46. Develop a program to implement Cross-validation on diabetes Dataset Exercise.
47. Develop a program to demonstrate Recursive feature elimination.
48. Develop a program to implement Pipeline Anova SVM.
49. Develop a program to implement Gaussian process classification (GPC) on iris dataset.
50. Develop a program to implement the Comparison of kernel ridge and Gaussian process regression
51. Develop a program to Illustrate the Gaussian process classification (GPC) on the XOR dataset.
52. Develop a program to implement Logistic function.
53. Develop a program to illustrate the metric and non-metric MDS on generated noisy data.
54. Develop a program to Plot Validation Curves.
55. Demonstrate the resolution of a regression problem using a k-Nearest Neighbor and the interpolation of the target using both barycenter and constant weights.
56. Develop a program to implement the usage of Nearest Neighbors classification. It will plot the decision boundaries for each class.
57. Develop a program to implement the Visualization of MLP weights on MNIST.
58. Develop a program to implement Clustering text documents using k-means.
59. Develop a program to implement the Decision Tree Regression.
60. Develop a program to Perform binary classification using non-linear SVC with RBF kernel.

PART B: <mark>DATA VISUALISATION USING TABLEAU</mark>

1. To load and display dataset on tableau.
2. To join tables from single and multiple databases.
3. Implement Data Preparation using Blending
4. Implement Data Preparation using Metadata Grid.
5. Implement Data Preparation using Pivot.
6. Implement Data Preparation using Union.
7. Implement Data Preparation using Data Interpreter.
8. To build groups, hierarchies and sets.
9. Implement Sorting using measure.
10. Implement Sorting using header and legends.
11. Implement sorting using pill(use-case).
12. Implement Interactive Filter,
13. Implement Quick Filter.
14. Implement context filtering.
15. To plot a graph to show the Data in histogram.
16. To plot a bullet graph.
17. To plot a dual axis graph.
18. To plot an area graph with dual axis.
19. To show Data in TreeMap.
20. To build a Box plots.
21. To build a Gantt Bar Charts.
22. To build a Paretos.
23. To build a Sparklines.
24. Implement Grouping using Data Window and VisualGrouping,
25. Implement using all Functions (Number, String, Date, Logical, Aggregate).
26. Create quick table calculations.
27. Implement LOD calculations; types of LOD calculations.
28. Implement Ad-hoc calculations.
29. Implement mapping using Pan & Zoom.
30. Implement mapping using Filtering.
31. Implement mapping using Map layering.
32. Implement mapping using Custom territories.
33. Implement mapping using Lasso & Radial selection.
34. To modify locations within Tableau.
35. To import and manage custom geocoding.
36. Create a custom territory, building a polygon map.
37. To use a background image map
38. To use Geographic search.
39. Implement analytics using Reference Lines and Reference Bands.
40. Implement analytics using Trend Lines. and Trend Model.
41. Implement analytics using Forecasting using precise range.
42. Implement analytics using Drag & Drop Analytics and Box Plot.

43. Create a dashboard for publishing & sharing options.
44. Implement an interactive dashboard using actions (Filter, Highlight, URL).
45. Implement Device Designer to create a device.

PART C: SPSS

1. 8 Children selected at random from an elementary school were rated on a 7- point scale with regard to some of their personality traits. The rating work was first done by their family members and then by three teachers. Can you conclude that no significant difference exists between these two different sets of rating.

CHILDREN	A	B	C	D	E	F	G	H

	A	B	C	D	E	F	G	H
RATING OF SCORES OF FAMILY MEMBERS	6	18	14	10	20	17	18	8
RATING OF SCORES OF TEACHERS	3	15	16	12	13	11	8	9

2. For the following data perform median test.

Group I	6	6	14	13	15	6	8	7	10	14	10	14
Group 2	7	2	12	13	8	6	4	2	2	12		

3. There are two independent Samples A and B. Test whether that both samples have been drawn from the same population using Mann- Klitney U Test

Sample A	Sample B
8	9
6	7
10	11
5	8
	12

4. On a railway reservation window, there was long queue of Men (M) and women (W) standing in the order in which they have come as depicted in the following displayed matter. Confirm whether or not they were standing in a random order.

M	W	M	W	M	M	M	W	M	W	M	W	W	M	M	M	M	W	M	W	M
W		M	M	W	W	W	M	W	M	W	M	W	M	M	M	W	M	M	W	M	M
M	M	W	M	W	M	M															

5. Ten students have obtained the following scores on tests in history and Hindi. find the coefficient of correlation of and also Express these scores through scatter diagram.

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Individuals	A	B	C	D	E	F	G	H	I	J
Scores in History(X)	13	12	10	8	7	6	6	4	3	1
Scores in Hindi(Y)	7	11	3	7	2	12	6	2	9	6

6. A Group of five students obtained the following scores on two Achievement test X & Y

Student	A	B	C	D	E
Scores in X test	10	11	12	9	8
Scores in X test	12	18	20	10	10

a. Determine both the regression equation

b. If a student scores 15 in test X, predict his probable scores in test y.

7. Find the multiple regression equation for the following data.

Y	10	17	48	27	55	26	9	16
X1	2	3	4	1	5	6	7	8
X2	1	2	5	2	6	4	3	4

8. Two groups of 10 students each got the following scores on an attitude Scales:

Groups I	10	9	8	7	7	8	6	5	6	4
Groups II	9	8	6	7	8	8	11	12	6	5

Test the significance of the difference of means.

9. Apply K.S Test to the following data(N>20)

Scores	>=20	15-19	10-14	5-9	<=4
f	6	14	55	20	5

10. Two groups of students were rated on a 9-point scale for their habit of cleanliness. Do the 2 groups differ significantly in terms of their habit of cleanliness.

Scores on Scale	9	8	7	6	5	4	3	2	1
Group-A (f)	2	6	5	4	6	8	7	9	3
Group-B	4	11	8	5	7	10	6	4	5

11. The aim of an experimental study was to determine the effect of three different techniques of training on the learning of a particular skill. 3 groups, each consisting of seven students of a class IX, assigned randomly. We give training through different techniques. The scores obtained on a performance test we recorded as follows perform ANOVA.

Group-I	3	5	3	1	7	3	6
Group-II	4	5	3	4	9	5	5

Group-III	5	5	5	1	7	3	7

12. Use sign test to see if there is a difference b/w the no. of days until collection of an account receivable before & after a new collection policy.

Before	30	28	34	35	40	42	33	38	34	45	28	27	25	41	36
After	32	29	33	32	37	43	40	41	37	44	27	33	30	38	36

13. By using Kruskal-Wallis test whether the 3 methods are equally effective, in an inspection procedure

Method A: 80,83,79,85,90,68

Method B: 82,84,60,72,86,67,91

Method C: 93,65,77,78,88

14. Two random samples were drawn from two normal population and their values are:

A: 66 67 75 76 82 84 88 90 92

B: 64 66 74 78 82 85 87 92 93 95

Test whether the two populations have the same variance.

15. Find Mean

Marks	15-25	25-35	35-45	45-55	55-65	65-75	75-85
No of Students	3	5	12	15	9	9	7

16. Find Median

Marks	10-20	20-30	30-40	40-50	50-60	60-70
No of students	13	15	21	20	19	12

17. Find Mode

Size	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency	10	14	16	14	11	13	17

18. Find Range

size	10-20	20-30	30-40	40-50	50-60
Frequency	5	10	12	8	4

19. Find Q.D

Size	5	8	10	12	19	20	22
F	3	10	15	20	8	7	6

20. Find M.D

class	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency	18	16	15	12	10	5	2	2

21. Find S.D

Size	2	3	4	5	6	7	8
f	1	2	3	5	3	2	1

22. Calculate the Karl Pearson's coefficient of Skewness.

x	12.5	17.5	22.5	27.5	32.5	37.5	42.5	47.5
y	28	42	54	108	129	61	45	33

23. Compute Coefficient of Kurtosis for the following data.

X	4.5	14.5	24.5	34.5	44.5	54.5	64.5	74.5	84.5	94.5
Y	1	5	12	22	17	9	4	3	1	1

24. Below are given the gain in weights (in Kg) of pigs fed on two diets A & B

Diet A	25	32	30	34	24	14	32	24	30	31	35	25
Diet B	44	34	22	10	47	31	40	30	32	35	18	21

Test if the two diets differ significantly as regards their effect on increasing weights.

25. The life time of electric bulbs for a random sample of 10 from a large consignment gave the following data

Item	1	2	3	4	5	6	7	8	9	10
In '000 Hrs	4.2	4.6	3.9	4.1	5.2	3.8	3.9	4.3	4.4	5.6

Can we accept the hypothesis that the average life time of bulbs is 4000 hrs.

26. To the question "should women have competition with men in getting job", the replies received from a sample of 200 subjects of both sexes we as follow

	Yes	No	Total
Males	34	46	80
Females	72	48	120

Semester VI

Course Code: SDC6MP03Pr

No. of Credits: 28

Major Project, Product development and/or Industrial training and/or Internship

TERM PAPER:

Course Code: SDC6TT20

No. of Credits: 2

THIRD SEMESTER B.VOC DEGREE EXAMINATION DECEMBER 2021
   B.VOC – INFORMATION TECHNOLOGY
    SDC3CN11 - COMPUTER NETWORKS FOR IOT
   (2021 Admission Onwards)
Time: 2.5 Hours   Maximum: 80 Marks

PART A
Answer all the Questions. Each question carries 2 Marks   **(Ceiling -25 marks)**

1. Compare LAN, WAN and MAN?

2. What are Routers?

3. How a Switch is different from a Hub?

4. What are the 3 levels of hierarchy in IP Addressing?

5. What are the responsibilities of Session Layer?

6. What are the four main properties of HTTP?

7. Differentiate between a client and a server.

8. What are the challenges of wireless sensor networks?

9. Explain 6LowPAN Protocol.

10. Define network congestion.

11. What are the two sub layers in Data Link Layers?

12. Define MQTT Protocol.

13. What are the important topologies for networks?

14. What is Routing?

15. Which are the 4 Important layers used in IOT?

PART B
Answer all Questions. Each question carries 5 Marks   **(Ceiling-35 marks)**

16. What is Network? Explain the characteristics of networking?

17. What is the difference between the Internet, Intranet, and Extranet?

18. What are TCP and UDP?

19. Differences between Wireless Adhoc Network and Wireless Sensor Network.

20. Define various types of Internet connections?

21. Explain the comparison between IP Version 4 & IP Version 6 Protocol.

22. Briefly Explain any Four Session layer messaging Protocols in networks.

23. What is the difference between the Internet, Intranet, and Extranet?

PART C
Answer any Two Questions. Each question carries 10 Marks

24. Briefly Describe the Standard IOT Communication protocols.

25. Explain and describe different types of network topologies and brief their advantages?

26. What are the layers in OSI Reference Models? Describe each layer briefly.

27. Define routing & explain distance vector routing and link state routing.

(2 x 10 = 20 Marks)

Question Paper Type 1I

THIRD SEMESTER B.VOC DEGREE EXAMINATION DECEMBER 2021 B.VOC –

INFORMATION TECHNOLOGY
SDC2PC04: PROBLEM SOLVING USING C
(2021 Admission Onwards)

Time: 2 Hours   **Maximum: 60 Marks**

PART A
Answer all Questions. Each question carries 1 Mark   (Ceiling-20 marks)

1. List any three importance of C.
2. What are the rules for formulating variable names?
3. What is the difference between an integer constant and a float constant?
4. What is ternary operator?
5. Explain if else statement.
6. What is the purpose of go to statement?
7. What is mean by function argument, function call and return values?
8. What is fopen()?
9. What is command line argument?
10. What is global variable?
11. What are nested statements?
12. Compare break and continue statements.

PART B
Answer any Six Questions. Each question carries 5 Marks   (Ceiling-30 marks)

13. Write the basic structure of C program. Explain.

14. Explain the different types of constants and variables in C

15. Explain type conversions in C.

16. Differentiate structure and array.

17. Explain two-dimensional array with an example.

18. Explain pointer with suitable example.

19. Write a short note on file handling in C.

PART C
Answer any One Question. Each question carries 10 Marks

20.a) Explain different data types.

  b) What are C tokens? Explain.

21. Explain the different looping control structures available in C.

(1 x 10 = 10 Marks)

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Sl. No	Job Role	Qualification Packs	NSQF Level
1	**Junior Data Associate** **Alias - Data Scientist, Data Warehousing Engineer, Business Intelligence Engineer**	**SSC/Q0401**	**7**

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