Computer Science & Applications

Board of Studies

B.Sc - M. E. IoT

Internet of Things

2022-23

Government College Autonomous Rajahmundry

PROCEEDINGS OF THE PRINCIPAL
GOVERNMENT AUTONOMOUS COLLEGE, RAJAHMUNDRY

PRESENT: Dr.R. David Kumar, M.Sc., M.Phil.., Ph.D.

RC. NO. 152/GCRJY/ACAD. CELL//BOS/2021/, DATED. 05.07. 2022

Sub: GCRJY-**Conduct of BoS Meetings for the Academic Year 2022-23**   - Regarding
***

ORDER:

   With reference to the subject cited, the lecturers-in-Charge of all the departments are hereby informed to conduct their respective Board of Studies (BoS) meetings by the end of July 2022.

   You are also informed to intimate the date of your BoS meeting well in advance to the subject experts/University nominee/Industrial Nominee/members of BoS/Student nominee concerned to get their valuable views and suggestions in the deliberations to frame the concrete syllabi for your subjects keeping in view the objectives of the college and interest of the stake holders. The date should also be indicated to Academic Cell in advance.

   You are further suggested to utilize the academic autonomy in incorporating the additional modules in the syllabi and identify the pedagogical strategies to implement the same.

Please note that your BoS document should contain the following contents in order
 a) Proceedings of the Principal pertaining to BoS
 b) Composition of BoS
 c) Table showing the Allocation of Credits   in the following table for both theory and Lab in case of science subjects

S. No	Semester	Course Code	Title of the Course (Paper)	Max. Marks (SEE)	Marks in CIA	L	T	P	C

<div align="right">L= Lecture, T= Tutorial, P= Practical, C= Credits</div>

 d) Agenda wise Resolutions adopted in the meeting with detailed discussions
 e) Table showing Members present with signatures
 f) List of Examiners & Paper setters
 g) Syllabus for each course in the **Proforma given** (both theory & Practical in case of Science subjects) followed by model question papers (theory & practical)
 h) Unit wise Assignment questions at the end of syllabus of each course

   You are requested to submit a separate document regarding addition/deletion of specific topics from the syllabus in each course (paper) with justification, if any.

All the *new Courses/certificate courses* proposed for the calendar year 2022, Seminars/ workshops, field visits, study tours for 2022-23 should be placed before the respective Board and get them approved.

You are also requested to submit 2 hard copies & 2 soft copies (CDs) of BoS document to the Academic cell along with original bills and settle the bills after completion of the BoS meeting. You can approach the Academic Cell for necessary documents.

Most Important: You are requested to submit soft & hard copies of *Resolutions (including discussion)* separately to IQAC immediately after BoS meeting is completed.

PRINCIPAL
GOVERNMENT AUTONOMOUS COLLEGE
RAJAHMUNDRY

Copy to:
1. Lecturers-in-Charge of all the departments
2. File

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY

(Accredited by NAAC with "A+" Grade)

DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS

CONSOLIDATED REPORT OF BOARD OF STUDIES FOR THE YEAR 2022-23

The Meeting Board of Studies of Computer Science & Applications department was convened on _____ under the Chairmanship of Mr. Suneel Kumar Duvvuri Head / Lecturer-in-charge of Department of Computer Science and Applications. The following members are present

S.No.	Name	Designation	Signature
1.	Dr. V. Persis	University Nominee	
2.	Smt. E. Jyothi Kiranmayi	Local Nominee	
3.	Mr. R V Satyanarayana	Local Nominee	
4.	Sri Vasanth Kumar	Industrial Nominee	
5.	Smt U Sandhya Rani	Faculty Member	
6.	Mr Devaraju Hanumanthu	Faculty Member	
6.	Sri P. Narasinga Rao	Faculty Member	
7.	Sri. D. Seetha Ramulu	Faculty Member	
8.	Sri K.Ramesh	Faculty Member	
9.	Kum S.Jaya Lakshmi	Faculty Member	
10.	Smt B.Parameswari	Faculty Member	
11.	Smt Ch.Sujatha	Faculty Member	
12.	Smt N.Priyanka	Faculty Member	
13.	Smt M.Tejaswi	Faculty Member	
14.	Pikki Simhadri	Student	

The following documents are submitted to the Academic coordinator and Controller of Examinations:

- Resolutions of Board of Studies Meeting.
- Syllabus of All semesters under CBCS pattern for All UG Computer Science Programmes.
- Model Question Papers for All semesters under CBCS pattern
- List of Revised Examiners (if any)
- Any other new proposals. Date:
- Chairman Board of Studies
- Department of Computer Science & Applications

Date: Chairman
                                                        Board of Studies
                                    Department of Computer Science & Applications

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY

(Accredited by NAAC with "A+" Grade)

Board of Studies Dated:

DEPARTMENT OF COMPUTER SCIENCE & APPLICATION

Meeting of the Board of studies is held at in the Department of Computer Science & Applications, Govt. College (A), Rajahmundry with the following agenda.

Agenda

1. Curriculum Design for all the Semesters
2. Designing of Course Outcomes and Course Objectives
3. Identifying /inclusion of components of Skill Development, Employability and Entrepreneurship in the curriculum

Additional inputs into the curriculum

1. Designing Model Question Papers and identifying potential paper setters
2. Innovative Teaching – Learning Methodology (Learner Centric)
3. Curriculum for the Certificate Courses
4. Academic activities of the Department
5. Any other proposal with the permission of the chair

(Suneel Kumar Duvvuri)
CHAIRMAN
BOARD OF STUDIES

Government College (Autonomous), Rajahmundry

(Accredited by NAAC "A+" Grade)

BOARD OF STUDIES MEETING ON

DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS

LIST OF PAPER SETTERS AND EXAMINERS

S No	Name of the Lecturer /Reader/Professor	Papers	College	City
1.	Prof P Suresh Varma	ALL	Dept of CSE, AKNU	Rajahmundry
2.	Dr V Persis	ALL	Dept of CSE, AKNU	Rajahmundry
3.	Dr M Kamala Kumari	ALL	Dept of CSE, AKNU	Rajahmundry
4.	Dr P Venkateswara Rao	ALL	Dept of CSE, AKNU	Rajahmundry
5.	R V Satyanarayana	ALL	GDC (P R) KAKINADA	Kakinada
6.	G Balavenkata Padmanadh	ALL	GDC (P R) KAKINADA	Kakinada
7.	Dr N Sridhar	ALL	GDC TUNI	Tuni
8.	E Jyothikiranmayi	ALL	GDC (W) NIDADAVOLE	Niddadavole
9.	Rebba Ashok Kumar	ALL	GDC CHINTALPUDI	Chintalapudi
10.	Smt M Rajini	ALL	GDC (SCIM) TANUKU	Tanuku
11.	Dr K Satya Rajesh	ALL	GDC (CSTS) JANGAREDDIGUDEM	Jangareddigudem
12.	Vijayadeep gummadi	ALL	GDC KAIKAKULURU	Kaikakuluru
13.	T Jayakrishna	ALL	GDC (SRR & CVR) VIJAYAWADA	Vijayawaada
14.	D Meenakshi	ALL	GDC TIRUVURU	Tiruvuru
15.	Smt N Swarnajyothi	ALL	GDC (VRK) MOVVA	Movva
16.	U Sarala	ALL	GDC AVANIGADDA	Avanigadda
17.	Dr A Sivaprasad	ALL	GDC TEKKALI	Tekkali
18.	I Srilakshmi	ALL	GDC (W) SRIKAKULAM	Srikakulam
19.	Sri B Raghuram	ALL	GDC SEETHAMPETA	Seethampeta
20.	Sri B Srinivas	ALL	GDC (M) SRIKAKULAM	Srikakulam
21.	Dr K V Sobha Rani	ALL	GDC (P R) KAKINADA	Kakinada
22.	R Venakata phani Kumar	ALL	GDC (P R) KAKINADA	Kakinada
23.	G Satya suneetha	ALL	GDC (W) KAKINADA	Kakinada
24.	Smt U Subhashini	ALL	GDC RAVULAPALEM	Ravulapalem

25.	Dr N Manisha	ALL	GDC (ASNM) PALAKOL	Palakol
26.	Kum P Purnachandravathi	ALL	GDC MYLAVARAM	Mylavaram
27.	B Rajkumar	ALL	GDC (SRR & CVR) VIJAYAWADA	Vijayawada
28.	B Hemaraju	ALL	GDC TEKKALI	Tekkali
29.	P Jyothi	ALL	GDC PATHAPATNAM	Pathapatnam
30.	S Vani Kumari	ALL	GDC (W) SRIKAKULAM	Pathapatnam
31.	Simma Madhavi Latha	ALL	GDC (W) SRIKAKULAM	Pathapatnam
32.	V Chandrasekhar	ALL	GDC SEETHAMPETA	Seethampeta
33.	Smt J Sharmila Rani	ALL	GDC (M) SRIKAKULAM	Srikakulam
34.	Smt K Anusha Devi	ALL	GDC PADERU	Paderu

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY
DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
SCHEME OF EVALUATION

MODEL OF SEMESTER END EXAMINATION QUESTION PAPER (THEORY)

(As Approved in the BOS meeting held on __, _____)

EVALUATION SCHEME

Standard Operating Procedure for Continuous Internal Assessment (Internal Marks – 50)

The Internal marks in all the courses/subjects will be awarded based on continuous internal assessment made during the semester concerned. For each Courses/subject 50 marks are allotted for internal assessment and 50 marks are allotted for the End Semester Examination.

Continuous Internal Evaluation (CIA):

It has been decided to introduce Continuous Internal assessment marks for a total of **50 marks**, which are to be distributed as follows:

S.No.	Component			Distribution of Marks
1	CIE I (after completion of 50% of syllabus)			20
2	CIE II (Online Exam)			10
3	ATTENDANCE	Above 95%	5	5
		91% to 95%	4	
		86% to 90%	3	
		81% to 85%	2	
		75% to 80%	1	
		Below 75%	0	
Pedagogical Strategies				
4	ASSIGNMENT			5
5	Participation or Paper Presentation in Student Seminars/Workshops/Group Discussions/ Quiz/ Student Study Project/Field Visit/Survey			5
6	Viva-voce			5
TOTAL				50

Sections	Description	Marks
A	Short Answer Questions – Four questions are to be asked. Students has to answer any 2 questions Each questions carries 5 Marks	2Q X5M=10M
B	Essay type Questions – 4 Questions to be asked with Internal choice in each question (A or B) from each unit. Student has to answer all four questions choosing one (A or B) from each question. Each question carries 10 Marks	4Q X10M =40M
	TOTAL MARKS:	50M

a. Component I : CIE I & CIE II (20+10 = 30 Marks)

Two Internal Examinations, out of which one is Mandatorily Online examination, for each Course shall be conducted for assessment. These examinations will be conducted during August/September (CIE –I) and January/February (CIE-II). CIE-I carries 20 marks and CIE-II carries 10 marks. CIE- I will be conducted after completion of 50% of syllabus. The second internal examination, i.e., CIE –II, which is **mandatorily online examination** will cover the entire syllabus and consists of 20 multiple choice questions having ½ mark for each question. The sum of both the CIEs will be considered for awarding marks for CIA.

i. Suggestive Question Paper Pattern for CIE I & CIE II (Based on Blooms Taxonomy):

Though the faculties concerned are empowered to adopt their own pattern for question paper, a general and suggestive model for question paper is given below based on Blooms Taxonomy.

Q No	Learning Objective	Marks
1	Memory based (Remember)	2
2	Understand (Comprehension)	2
3	Application	3
4	Analysis	3
5	Evaluation	5
6	Creativity	5
	TOTAL	**20 marks**

The active verbs used to frame the question based on Blooms Taxonomy is given below for the convenience.

Active verbs developed based on Bloom's Taxonomy

Knowledge	Understand	Apply	Analyze	Evaluate	Create
define	explain	solve	analyze	reframe	design
identify	describe	apply	compare	criticize	compose
describe	interpret	illustrate	classify	evaluate	create
label	paraphrase	modify	contrast	order	plan
list	summarize	use	distinguish	appraise	combine
name	classify	calculate	infer	judge	formulate
state	compare	change	separate	support	invent
match	differentiate	choose	explain	compare	hypothesize
recognize	discuss	demonstrate	select	decide	substitute
select	distinguish	discover	categorize	discriminate	write
examine	extend	experiment	connect	recommend	compile
locate	predict	relate	differentiate	summarize	construct
memorize	associate	show	discriminate	assess	develop
quote	contrast	sketch	divide	choose	generalize
recall	convert	complete	order	convince	integrate
reproduce	demonstrate	construct	point out	defend	modify
tabulate	estimate	dramatize	prioritize	estimate	organize
tell	express	interpret	subdivide	find errors	prepare
copy	Identify	Manipulate	survey	grade	produce
discover	indicate	Paint	advertise	measure	rearrange
duplicate	Infer	Prepare	appraise	predict	rewrite
enumerate	relate	produce	Break down	rank	role-play

CIE II will consist of multiple choice questions (MCQs). Number of questions and distribution of marks is at the discretion of the faculty concerned. However, a half an hour exam consisting of 20 MCQs with ½ mark for each question is suggestible in view of the huge number of students. All the HoDs should supply a question bank of MCQs of all the courses covering the entire syllabus along with key to the Computer Science department to enable them to conduct the online examination in the designated laboratories. Alternatively, all the HoDs may upload the MCQs in the portal through their logins.

Further, all the HoDs should submit their schedule of CIE II to IQAC in advance to monitor the systematic conduct of the online examination.

Important Note:

Students who absent themselves from any CIE will lose the marks for the respective test. However, if a student is not able to write the CIE I / II because of his/her participation in an important event related to NSS/NCC or Games/Sports representing the College/University/health grounds, the student has to get the prior permission of the Principal through the proper channel and submit the same to the Office of the Controller of Examinations. Deadline is 7 days after the CIE. Applications submitted after the deadline will not be considered for the retest

b. Component III: Attendance (5 Marks)

Attendance mark will be awarded to the students based on their attendance percentage on a particular course. Faculty of each course has to award the attendance mark based on their subject attendance. The marks split-up is given below

Above 95%	5
91% to 95%	4
86% to 90%	3
81% to 85%	2
75% to 80%	1
Below 75%	0

C. Component IV: Assignment (5 Marks)

One Assignment for each course must be submitted by a student in each semester. The marks allotted to this component will be awarded based on the performance of the student. The assignment topic may be assigned either individually or group. Assignment should be submitted by the student in the first half of the semester. Also maximum of 7 days should be given to students to submit the assignment. Assignments should be evaluated by the faculty concerned and the same to be verified by the student. The assignment should be kept in department for the Academic Audit by IQAC and also for external academic audit conducted by office of Commissionerate of Collegiate Education. The marks should be awarded by the faculty.

d. Component V (Pedagogical Strategies):
Participation /Paper Presentation in Student Seminars/Workshops/Group Discussions/ Quiz/ Student Study Project/Field Visit/Survey (5 Marks)

For this component, the marks will be provided to student, if he/she participate/win in the external college technical events. To score marks, the student has to participate / present papers related to subject in the technical events organized in the other colleges/other departments in the college.

	Participation	Second Prize	First Prize / Best Paper
Workshop / Seminar / Technical Symposium	2	3	5
National / International Conference	3	4	5

In case of Classroom seminar, one seminar for each course must be presented by a student in each semester. Each student should be given individual topic for seminar, the student has to submit the seminar topic as assignment and the same will be presented minimum of 10 minutes in the class through ICT. The seminar presented by the student should be evaluated by the subject faculty and based on the performance of the presentation, the marks will be awarded.

Similarly, reports on field visits, educational tours, study projects in prescribed format will be considered for awarding marks in this component.

For a student who has not participated in any events in that semester, the student will be awarded "0" for this component. If a student participates more than one event and win prize, the best would be considered for the subject.

In case of Quiz, preferably online quiz, it should be conducted after the CIE II and well before the SEE. Faculty concerned has to announce the schedule for the quiz and create the quiz in the ERP (College Management System). The subject staff has to upload all the questions (unit-wise) in the ERP. Quiz should be created with 30 questions (ERP should choose 30 questions randomly out of 100 questions uploaded).The timing for quiz should be 30 minutes. No negative marking. Each question carries 1 mark. The marks secured should be converted to5.

2. Semester End Examinations (SEE)

The question paper is of 2 ½ duration for 50 marks. The suggestive question paper model given in section 1.1.1.may be used for framing the question. This kind of question paper will be helpful in CO-PO Mapping and thereby graduate attributes.

(Prepared by IQAC & Academic Cell and submitted to the Chairman, IQAC & Principal on 3 April 2019)

GOVERNMENT COLLEGE (AUTONOMOUS) : RAJAHMUNDRY
DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
SCHEME OF VALUATION
FOR PRACTICAL EXAMINATIONS

(As Approved in the BOS meeting held on   , 2022 For 2022-2023)

S.No.	Description	Marks
1.	Procedure Explanation with Coding (including Algorithm & Flowchart if any)	20
2.	Execution of Program	10
3.	VIVA VOCE	10
4.	RECORD **	10
	EXTERNAL PRACTICAL EXAM (at the end of II, IV& VI Semester)	50
5.	Internal Practical Exam (At the end of I, III & V Semester)	50
	GRAND TOTAL	100

** Award of marks for number of practicals recorded in the Record.

10 Practicals and Above 10	
Practicals	08
Practicals	06
Practicals	05
Less than 5	00

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

DEPARTMENT OF COMPUTER SCIENCE
B.Sc. M.E.IoT PROGRAMME – COURSE STRUCTURE

UNDER CBCS PATTERN

We have made significant changes to the following syllabus based on the feedback from learners and educators.

S. No	Semester	Course Code	Title of the course	Changes in the Syllabus
1	I	IOT-103	Fundamentals of Computer and C – Programming	1. Pointers, Structures and Unions is shifted from Additional Input to UNIT V
2	II	IOT-106	Fundamentals of IoT and Applications	1. Applications of IoT is shifted from Additional Input to UNIT V
3	III	IOT-104	Data Communications & Computer Networks	1. Network Layer is shifted from Additional Input to UNIT V
4	IV	IOT-105	RFID and Sensor Networks	1. Security in WSN is shifted from Additional Input to UNIT V
5	IV	IOT-116	Implementing IoT with Raspberry Pi	1. IoT Physical Servers and Cloud Offerings is shifted from Additional Input to UNIT V
6	V	**The following courses are introduced in V Semester**		
		IOT -117 6A: Machine Learning for IoT		
		IOT -118 7A: Computer Vision		
		IOT -119 6B: Java Programming for IoT		
		IOT -120 7B: Big Data and Analytics		
		IOT -121 6C: Web of Things		
		IOT -122 7C: Security in IoT		

B.Sc. Computer Science

Courses for the Academic Year 2022-23

B.Sc. PROGRAMME – COURSE STRUCTURE OF COMPUTER SCIENCE
UNDER CBCS PATTERN

S.No	Semester	Course Code	Title of the Course (Paper)		Max Marks (SEE)	Marks in CIA	L	T	P	C
1	SEM - I	IOT-103	Fundamentals of Computer and C – Programming		50	50	3	1	-	3
2		IOT-103P	C Programming Lab		50	--	-	-	3	2
3	SEM - II	IOT-106	Fundamentals of IoT and Applications		50	50	3	1	-	3
4		IOT-106P	Arduino Programming Lab		50	--	-	-	3	2
5	SEM-III	IOT-104	Data Communications & Computer Networks		50	50	3	1	-	3
6		IOT-104P	Network Simulation Lab		50	--	-	-	3	2
7	SEM-IV	IOT-105	RFID and Sensor Networks		50	50	3	1	-	3
8		IOT-105P	Network Simulation Lab using NS2/NS3		50	--	-	-	3	2
9		IOT-116	Implementing IoT with Raspberry Pi		50	50	3	1	-	3
10		IOT-116P	Raspberry Pi Lab		50	--	-	-	3	2
11	SEM-V	IOT-117	6A: Machine Learning for IoT	Elective - A	50	50	3	1	-	3
12		IOT-117P	Machine Learning for IoT Lab		50	--	-	-	3	2
13		IOT-118	7A: Computer Vision		50	50	3	1	-	3
14		IOT-118P	Computer Vision Lab		50	--	-	-	3	2
15		IOT-119	6B: Java Programming for IoT	Elective - B	50	50	3			3
16		IOT-119P	Java Programming for IoT Lab		50	0			3	2
17		IOT-120	7B: Big Data and Analytics		50	50	3			3
18		IOT-120P	Big Data and Analytics Lab		50	0			3	2
19		IOT-121	6C: Web of Things	Elective -C	50	50	3			3
20		IOT-121P	Web of Things Lab		50	0			3	2
21		IOT-122	7C: Security in IoT		50	50	3			3
22		IOT-122P	Security in IoT Lab		50	0			3	2

L= Lecture, T= Tutorial, P= Practical, C= Credits

B.Sc   (Internet of Things)
(For M.E.IoT)

Syllabus and Model Papers

	Government College (Autonomous) Rajahmundry	Program & Semester
		I B.Sc. M.E.IoT (I Sem)

Course Code IoT103	**TITLE OF THE COURSE** Fundamentals of Computer and C- Programming				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Basic Computer knowledge	3	1	-	3

Course Objectives:

1. To explore basic knowledge on computers
2. Learn how to solve common types of computing problems.
3. Learn basic constructs of computer programming languages
4. Learn data types and control structures of C
5. Learn to map problems to programming features of C.
6. Learn to write good portable C programs.

Course Outcomes:

On Completion of the course, the students will be able to-

CO1	Appreciate and understand the working of a digital computer
CO2	Analyze a given problem and develop an algorithm to solve the problem
CO3	Improve upon a solution to a problem
CO4	Use the 'C' language constructs in the right way
CO5	Design, develop and test programs written in 'C'

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

UNIT-I
Introduction to computers - Characteristics and limitations of computer, Block diagram of computer, types of computers, computer generations. Number systems: binary, hexadecimal and octal numbering system. **Input and output devices**: Keyboard and mouse, inputting data in other ways **Types of Software**: system software, Application software, commercial, open source, domain and free ware software, Memories: primary, secondary and cache memory.

UNIT-II

Problem Analysis and its Tools: Problem solving technique and Program Development Life Cycle, Problem Definition, Algorithm, Flow Charts, Types of Errors, Testing and Debugging. **Basics of C:** Historical development of C Language, Basic Structure of C Program, C Character Set, Identifiers and Keywords, constants, variables, Data types. **Operators and expressions:** Arithmetic, Relational, Logical, Assignment, Unary, Conditional and Bitwise operators. Type conversions. **Input and output statements:** getchar( ), getch( ), getche( ), putchar( ), printf( ), scanf( ), gets( ),puts( )

UNIT-III

Control statements: Decision making statements: if, if else, else if ladder, switch statements. Loop control statements: while loop, for loop and do-while loop. Jump Control statements: break, continue and goto. **Arrays:** one dimensional Array, two dimensional arrays. **Strings:** Input/ Output of strings, string handling functions, table of strings

UNIT-IV

Functions: Function Prototype, definition and calling. Return statement. Nesting of functions. Categories of functions. Recursion, Parameter Passing by address & by value. Local and Global variables. **Storage classes**: automatic, external, static and register.

UNIT-V

Pointers: Pointer data type, Pointer declaration, initialization, accessing values using pointers. Pointer arithmetic. Pointers and arrays, pointers and functions. **Structures and Unions** :Using structures and unions, use of structures in arrays and arrays in structures. Comparison of structure and Union.

Text Books:

1. E. Balagurusway, ―Programming in C‖, Tata McGrwal Hill.
2. Computer fundamentals and c programming in c by Reemathareja, oxford university press

Reference Books

1. Introduction to C programming by REEMA THAREJA from OXFORD UNIVERSITY PRESS
2. E Balagurusamy: ―COMPUTING FUNDAMENTALS & C PROGRAMMING – Tata McGraw-Hill, Second Reprint 2008, ISBN 978-0-07-066909-3.
3. Ashok N Kamthane: Programming with ANSI and Turbo C, Pearson Edition Publ, 2002.
4. Henry Mullish&HuubertL.Cooper: The Spirit of C An Introduction to modern Programming, Jaico Pub. House,1996.
5. Y kanithkar, let us C BPB, 13 th edition-2013, ISBN:978-8183331630,656 pages.

WebLinks:

1. https://nptel.ac.in/courses/106/105/106105171/
2. https://www.programiz.com/c-programming

CO-PO Mapping:

(1:Slight[Low];   2:Moderate[Medium];3:Substantial[High],   '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1													
CO2													
CO3													
CO4													
CO5													

Model Blue print for the question paper setter

Blue Print				
S.No.	**UNIT**	**Short 2 M**	**Essay 8 M**	**Percentage %**
1	UNIT - I	2	2	20.8
2	UNIT - II	2	2	20.8
3	UNIT - III	2	2	20.8
4	UNIT - IV	1	2	18.8
5	UNIT – V	1	2	18.8
		16	80	100

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM
(Accredited by NAAC "A" Grade)
DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
PAPER – I: Fundamentals of Computer and C-Programming
MODEL QUESTION PAPER (W.E.F 2022-2023) SEMESTER – I

Time: 2 ½ Hrs.   **Max Marks: 50 M**

SECTION - I

Answer Any <u>Five</u> Questions of the following   **5 X 2M=10 M**

1. Explain the characteristics and limitations of computers

2. Difference between system software, Application software

3. Explain about Structure of C Program

4. Write Input and output statements

5. Explain storage classes in C

6. Explain one dimensional Array

7. Write a short note on Nested Structures

8. How to declare Pointer

SECTION –II

Answer <u>ALL</u> Questions   **5 X 8M=40 M**

9. Define Computer? Explain the Block diagram of a computer with neat diagram
                                        (Or)
10. Discuss in detail primary, secondary and cache memory

11. Explain various Data types available in C ? Explain each with example
                                        (Or)
12. What is Decision Control Statement? Explain each with example

13. Write a C program to find the Multiplication of Two Matrices
                                        (Or)
14. Explain the String Handling functions with examples

15. Discuss the different categories of functions? Illustrate with example
                                        (Or)
16. List Storage classes with example

17. Comparison of structure and Union
                                        (Or)
18. What is a pointer and Structure? Explain with example program

	Government College (Autonomous) Rajahmundry	Program & Semester I B.Sc. M.E.IoT (I Sem)			
Course Code **IoT103P**	**TITLE OF THE COURSE** Hardware and C Programming Lab				
Teaching	Hours Allocated: 30 (Lab)	L	T	P	C
Pre-requisites:	Basic Computer Knowledge	0	0	3	2

Objectives:

1. To aim of this lab course is to equip the students with Basic Hardware and Programming Skills.

List of Experiments

Hardware Lab:
1. Identify various Memory components of the Computer.

2. Identify Various Cables and their uses

3. Identify various Network Devices.

4. Assembling and Disassembling of Computers.

C Programming Lab
1. Find the biggest of three numbers using C.

2. Write a c program to find the sum of individual digits of a positive integer.

3. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence.

4. Write a c program to check whether a number is Armstrong or not.

5. Write a program to perform various string operations.

6. Write a c program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

7. Write a c program that uses functions to perform the following: Addition of two matrices. Multiplication of two matrices.

8. Write a c program that implements searching of given item in given list.

9. Write a c program to sort a given list of integers in ascending order.

10. Write a c program to perform various operations using pointers.

11. Write a c program to read data of 10 employees with a structure of 1.employee id 2.aadar no, 3.title, 4.joined date, 5.salary, 6.date of birth, 7.gender, 8.department.

12. Write a program for concatenation of two strings.

13. Write a program for length of a string

Referencebooks:

1. Computer fundamentals and c programming in c by Reemathareja, oxford university press

Virtual LabLinks:

1. https://cse02-iiith.vlabs.ac.in/

2. http://ps-iiith.vlabs.ac.in/

	Government College (Autonomous) Rajahmundry	Program & Semester
Course Code **IoT106**	TITLE OF THE COURSE Fundamentals of IoT and Applications	I B.Sc. M.E.IoT (II Sem)

Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Basic Computer hardware	3	1	-	3

Course Objectives

1. To study fundamental concepts of IoT
2. To understand roles of sensors in IoT
3. To Learn different protocols used for IoT design
4. To be familiar with data handling and analytics tools in IoT
5. Appreciate the role of big data, cloud computing and data analytics in a typical IoT system.
6. Understand the role of IoT in various domains of Industry.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Understand the various concepts, terminologies and architecture of IoT systems.
CO2	Use sensors and actuators for design of IoT.
CO3	Understand and apply various protocols for design of IoT systems
CO4	Use various techniques of data storage and analytics in IoT
CO5	Understand various applications of IoT
CO6	Understand APIs to connect IoT related technologies

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

UNIT-I :

Fundamentals of IoT: Introduction, Definitions & Characteristics of IoT, IoT Architectures, Physical & Logical Design of IoT, Enabling Technologies in IoT, History of IoT, About Things in IoT, The Identifiers in IoT, About the Internet in IoT, IoT frameworks, IoT and M2M.

UNIT-II:

Sensors Networks : Definition, Types of Sensors, Types of Actuators, Examples and Working,

IoT Development Boards: Arduino IDE and Board Types, RaspberriPi Development Kit, RFID Principles and components, Wireless Sensor Networks: History and Context, The node, Connecting nodes, Networking Nodes, WSN and IoT

UNIT-III

Wireless Technologies for IoT: WPAN Technologies for IoT: IEEE 802.15.4, Zigbee, HART, NFC, Z-Wave, BLE, Bacnet, Modbus.

IP Based Protocols for IoT : IPv6, 6LowPAN, RPL, REST, AMPQ, CoAP, MQTT. Edge connectivity and protocols

UNIT-IV

Data Handling& Analytics: Introduction, Bigdata, Types of data, Characteristics of Big data, Data handling Technologies, Flow of data, Data acquisition, Data Storage, Introduction to Hadoop. Introduction to data Analytics, Types of Data analytics, Local Analytics, Cloud analytics and applications

UNIT-V

Applications of IoT: Home Automation, Smart Cities, Energy, Retail Management, Logistics, Agriculture, Health and Lifestyle, Industrial IoT, Legal challenges, IoT design Ethics, IoT in Environmental Protection.

Text Books:

1. HakimaChaouchi, ― ―The Internet of Things Connecting Objects to the Web‖ ISBN : 978-1-84821-140-7, Wiley Publications
2. Olivier Hersent, David Boswarthick, and Omar Elloumi, ― ―The Internet of Things: Key Applications and Protocols‖, WileyPublications
3. Vijay Madisetti and ArshdeepBahga, ― ―Internet of Things (A Hands-on-Approach)‖, 1st Edition, VPT, 2014.
4. J. Biron and J. Follett, "Foundational Elements of an IoT Solution", O'Reilly Media, 2016.
5. Keysight Technologies, ―The Internet of Things: Enabling Technologies and Solutions for Design and Test‖, Application Note, 2016.

References Books

1. 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

2. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press

Web Links:

1. https://onlinecourses.nptel.ac.in/noc17_cs22/course
2. http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.html

CO-PO Mapping:

(1:Slight[Low];   2:Moderate[Medium];   3:Substantial[High],   '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1													
CO2													
CO3													
CO4													
CO5													

Model Blue print for the question paper setter

Blue Print				
S.No.	UNIT	Short 2 M	Essay 8 M	Percentage %
1	UNIT - I	2	2	20.8
2	UNIT - II	2	2	20.8
3	UNIT - III	2	2	20.8
4	UNIT - IV	1	2	18.8
5	UNIT – V	1	2	18.8
		16	80	100

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM
(Accredited by NAAC "A+" Grade)
DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS
PAPER – II: IoT106: Fundamentals of IoT and Applications
MODEL QUESTION PAPER (W.E.F 2022-2023) SEMESTER – II

Time: 2 ½ Hrs.   Max Marks : 50 M

SECTION - I

Answer Any <u>Five</u> Questions of the following   5 X 2M=10 M

1. Discuss the Characteristics of IoT

2. What is Internet in IoT

3. Write the Types of Sensors

4. Write RFID components

5. Explain about IEEE 802.15.4

6. What is Local Analytics

7. Write a short note Characteristics of Big data Explain the characteristics and limitations of computers

8. Explain Legal challenges

SECTION –II

Answer <u>ALL</u> Questions   5 X 8M=40 M

9. Explain in detail Physical & Logical Design of IoT
                                        (Or)
10. Discuss how Enabling Technologies in IoT

11. Explain the Arduino IDE and Board Types
                                        (Or)
12. Describe the RFID Principles and components

13. Explain about WPAN Technologies for IoT
                                        (Or)
14. write a note on IP Based Protocols for IoT IPv6

15. What is Big data? Explain Data handling Technologies
                                        (Or)
16. What is data Analytics? Explain Types of Data analytics

17. List Applications of IoT
                                        (Or)
18. Explain IoT in Environmental Protection

	Government College (Autonomous) Rajahmundry		Program & Semester I B.Sc. M.E.IoT (I Sem)			
Course Code IoT106P	**TITLE OF THE COURSE** Arduino Lab					
Teaching	Hours Allocated: 30 (Lab)	L	T	P	C	
Pre-requisites:	Java Lab	0	0	3	2	

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code IoT104	**TITLE OF THE COURSE** Data Communications & Computer Networks	II B.Sc. M.E.IoT (III Sem)			
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Basic computer knowledge	3	1	-	3

Course Objectives:

1. Appreciate the use of computer networking in various walks of life, describe the types of networks, network configurations and network topologies. Also Write the OSI and TCP/IP reference models for networking.
2. Responsibilities of data link layer, its implementation and associated protocols, algorithms/pseudo codes.
3. The various techniques used to access a shared channel in the network and IEEE specifications for LANs.
4. Networking devices, backbone networks and Internet Protocol (IP) addressing.
5. Responsibilities of network, transport and application layers.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	computer networks, list network configurations, types, topologies, the applications of computer networks in different fields, network models and description of physical layer.
CO2	Reason the need for flow and error control at the data link layer and explain the associated protocols.
CO3	Enumerate the shared channel access methods, associated protocols and Wired & Wireless LAN standards and implementations.
CO4	the types of networking devices / equipments and also explain the addressing scheme used at the network layer.
CO5	how network layer, transport layer and application layer facilitates the transfer of message from one node to another in a global network

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

UNIT – I

Introduction to Data communications: Network Criteria, point-to-point and multi point connection, physical topology, Local Area Networks, Metropolitan Area Networks, Wide Area Networks, Wireless Networks, protocols and standards.

Network Models: Layered tasks, Connection-Oriented and Connectionless Services, Service Primitives, The OSI Reference Model, The TCP/IP Reference Model, Comparison of the OSI and TCP/IP Reference Models, addressing.

UNIT – II

Physical Layer: Basis for Data Communication: Transmission of digital signals: Bit rate, bit length, baseband and broadband transmission, transmission impairment, data rate limits, performance, Guided Transmission Media Twisted Pair Coaxial Cable and Fiber Optics

Data Link Layer: Framing, Error Control, Flow Control, Error-Detection and correction: Introduction, Error detection using CRC. Data Link Protocols: Simplest Protocol, Stop-and- Wait Protocol, Stop-and-Wait ARQ, Go Back-N ARQ, Selective Repeat ARQ, HDLC.

UNIT – III

Multiple Accesses, Random Access: ALOHA, Carrier Sense Multiple Access (CSMA) Protocols, CSMA with Collision Detection, CSMA with Collision Avoidance.

Controlled Access: Reservation, Polling and Token Passing. Channelization: FDMA, TDMA, CDMA.

Wired LAN: Ethernet, IEEE standards, Standard Ethernet. Changes in the standards, Fast Ethernet, Gigabit Ethernet, Wireless LAN (802.11).

UNIT – IV

Connecting LANs, Backbone and Virtual LANs: Connecting devices, Back bone Networks, Virtual LANs. Network Layer: Need for network layer, Logical addressing, Ipv4 addresses, Ipv6 addresses, Ipv4 and Ipv6 datagram, Transition from Ipv4 to Ipv6.

UNIT – V

Network Layer: Delivery, Forwarding, Types of Routing protocols, Unicast Routing Protocols.

The Transport Layer: Process to process Delivery, User Datagram Protocol (UDP) and TCP.

Application layer: Domain name space, Distribution of name space, Resolution.

Text Books:

1. Data communications and Networking-4th edition BeharouzA.Forouzan, TMH

Reference Books:

1. Data Communications and Computer Networks By Prakash C. Gupta, PHI Publishers.
2. Computer Networks By Andrew S.Tanenbaum, Pearson Education.
3. Wireless Technologies Circuits, Systems and Devices by Krzysztof Iniewski CRC Press.
4. Wireless Networking Technology: From Principles to Successful Implementationby Stephen A. Rackley

WebLinks:

1. https://nptel.ac.in/courses/106/105/106105082/
2. https://nptel.ac.in/courses/117/105/117105076/

CO-PO Mapping:

(1:Slight[Low];   2:Moderate[Medium];   3:Substantial[High],   '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1													
CO2													
CO3													
CO4													
CO5													

Model Blue print for the question paper setter

Blue Print				
S.No.	**UNIT**	**Short 2 M**	**Essay 8 M**	**Percentage %**
1	UNIT - I	2	2	20.8
2	UNIT - II	2	2	20.8
3	UNIT - III	2	2	20.8
4	UNIT - IV	1	2	18.8
5	UNIT – V	1	2	18.8
		16	80	100

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM
(Accredited by NAAC "A+" Grade)
II B.Sc Internet of Things (M.E.Internet of Things)
MODEL QUESTION PAPER (W.E.F 2022-2023)
PAPER – III: IOT-104: Data Communications & Computer Networks
SEMESTER – III

Time: 2 ½Hrs   **Max Marks: 50M**

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SECTION - I

Answer Any <u>Five</u> Questions of the following   **5 X 2M=10 M**

1. Explain various types of addressing

2. Write a short note on Connection-Oriented and Connectionless Services

3. Explain Transmission Impairment

4. What is HDLC

5. Explain FDMA, TDMA and CDMA

6. Write Token Passing

7. Explain about transition from IPV4 to IPV6

8. What is User Datagram Protocol (UDP)

SECTION –II

Answer <u>ALL</u> Questions   **5 X 8M=40 M**

9. Compare various categories of Network topologies
                              (Or)
10. Discuss the functions of various layers of OSI Model

11. Explain Stop and Wait, Stop and Wait ARQ Protocols
                              (Or)
12. What is Random Access? Explain about CSMA/CD Protocol

13. Write short notes on Wireless LAN (802.11) Standards
                              (Or)
14. What are Back bone Networks? Explain

15. What is logical addressing? Discuss IPV4 addressing
                              (Or)
16. Explain Distance Vector and Link State Routing Protocols

17. List the Routing protocols
                              (Or)
18. Explain User Datagram Protocol (UDP)

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	Government College (Autonomous) Rajahmundry	Program & Semester I B.Sc. M.E.IoT (III Sem)			
Course Code **IoT104P**	**TITLE OF THE COURSE** Network Simulation Lab				
Teaching	Hours Allocated: 30 (Lab)	L	T	P	C
Pre-requisites:	Data Communications	0	0	3	2

Objectives:

1. To understand the functioning of various protocols in Wired and Wireless Environment.

2. To perform real time experimentation using the existing infrastructure.

3. To impart programming to construct LAN, WLAN , and VLAN in a real- time environment.

List of Experiments (NS2/QUALNET/BWSIM/MATLAB)

1. Study Of Network Simulator (NS-2)

2. Simulation of Four Node Point To Point Network

3. Transmission Of Ping Message

4. Implement Bus Topology

5. Implement Star Topology

6. Simulation of Stop and Wait, Sliding Window Protocols

7. Simulation of Distance vector routing algorithm

8. Simple ESS With Wireless LAN

Reference books:

1. Teerawat Issariyakul and Ekram Hossain. 2011. Introduction to Network Simulator NS2 (2nd. ed.). Springer Publishing Company, Incorporated.

2. http://www.mathcs.emory.edu/~cheung/Courses/455/Syllabus/A3- NS/Book/Introduction-to-Network-Simulator-NS2-2012.pdf

Virtual LabLinks:

1. http://vlabs.iitkgp.ac.in/ant/1/theory/

	Government College (Autonomous) Rajahmundry	Program & Semester
Course Code IoT105	**TITLE OF THE COURSE** RFID and Sensor Networks	II B.Sc. M.E.IoT (IV Sem)

Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Data Communications and Computer Networks	3	1	-	3

Course Objectives:

1. Introducing RFID and related Architectures and to discuss the uses of RFID Principles, RFID Components and security issues.

2. Introducing Wireless Sensor Networks, Various Small Components, embedded systems, introducing various technologies.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Familiar with RFID technology, various components involved.
CO2	Familiar with various RFID standards, Students learn various Security issues involved in it
CO3	Learn about Wireless Sensor Networks
CO4	Familiar with WSN protocols routing algorithms.
CO5	Demonstrate Various Security issues involved in Wireless Sensor Networks.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

Unit-I
Introduction of RFID, Automatic Identification Systems, A Comparison of Different ID Systems, Components of an RFID System, Differentiation Features of RFID Systems, Transponder Construction Formats, Frequency, Range and Coupling , Active and Passive Transponders, Information Processing in the Transponder , Selection Criteria for RFID Systems, Fundamental Operating Principles.

Unit-II
Frequency Ranges and Radio Licensing Regulations, Coding and Modulation, Data Integrity, Multi-Access Procedures – Anticollision, Security of RFID Systems, Attacks on RFID Systems

Unit-III

Wireless Sensor Networks- Introduction, Challenges and Constraints, Applications, Node Architecture, Operating Systems, Physical Layer.

Unit-IV

Medium Access Control: Characteristics of MAC Protocols in Sensor Networks, Contention- Free MAC Protocols, Contention-Based MAC Protocols, Network Layer: Various Routing Protocols.

Unit-V
Security in WSN: Challenges of Security in Wireless Sensor Networks, Security Attacks in Sensor Networks, Protocols and Mechanisms for Security, IEEE 802.15.4 and ZigBee Security

Text Books:

1. RFID Handbook,KlausFinkenzeller,WILEY& SONS
2. Fundamentals of Wireless Sensor Networks: theory and practice byWaltenegusDargie, Christian Poellabauer

Reference Books

1. RFID and Sensor Networks Architecture, Protocols, Security and integration by Yan Zhang, Laurence T. Yang, Jining.
2. Wireless Sensor Networks Technology, protocols and applications by KAZEM SOHRABY, DANIEL MINOLI TAIEB ZNATI, JOHN WILEY & SONS, INC Publication.
3. REILLY, RFID Essentials By Bill Glover, Himanshu Bhatt.

WebLinks:

1. https://nptel.ac.in/courses/108/108/108108179/
2. https://nptel.ac.in/courses/106/105/106105160/

CO-PO Mapping:

(1:Slight[Low];   2:Moderate[Medium];   3:Substantial[High],   '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1													
CO2													
CO3													
CO4													
CO5													

Model Blue print for the question paper setter

Blue Print				
S.No.	UNIT	Short 2 M	Essay 8 M	Percentage %
1	UNIT - I	2	2	20.8
2	UNIT - II	2	2	20.8
3	UNIT - III	2	2	20.8
4	UNIT - IV	1	2	18.8
5	UNIT – V	1	2	18.8
		16	80	100

II B.Sc. IOT (M.E.IOT)
MODEL QUESTION PAPER (W.E.F 2022-2023)
PAPER – IV: RFID and Sensor Networks SEMESTER – IV

Time: 2 ½Hrs   **Max Marks: 50M**

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SECTION - I

Answer Any Five Questions of the following   **5 X 2M=10 M**

1. What is the difference between Active and Passive Transponders

2. Explain Criteria for RFID Systems

3. Discuss about Open issues in RFID Security?

4. Write a short on Data Integrity

5. Explain the application areas of WSN

6. What is Physical Layer

7. Write about Zigbee security Explain various types of addressing

8. Explain IEEE 802.15.4

SECTION –II

Answer ALL Questions   **5 X 8M=40 M**

9. Explain about Fundamental Operating Principles of RFID
                                        (Or)
10. Briefly discuss about Anti-collision procedures in RFID

11. Discuss about Security attacks in RFID
                                        (Or)
12. Write about various challenges and constraints of Wireless Sensor Networks

13. What are the various functional and non-functional aspects required for Operating System in WSN
                                        (Or)
14. Mention the Characteristics of MAC Protocols in WSN

15. Explain about Pro-active and reactive routing Protocols in WSN
                                        (Or)
16. Explain the defence mechanisms against DoS Attacks and Routing Attacks Compare various categories of Network topologies

17. What are Security Attacks in Sensor Networks, Protocols
                                        (Or)
18. Explain the detail Mechanisms for Security

	Government College (Autonomous) Rajahmundry	Program & Semester I B.Sc. M.E.IoT (III Sem)			
Course Code IoT105P	**TITLE OF THE COURSE** Network Simulator Lab using NS2/NS3				
Teaching	Hours Allocated: 30 (Lab)	L	T	P	C
Pre-requisites:	Data Communications	0	0	3	2

Objectives:

1. To understand the functioning of Wireless Technologies

List of Experiments (NS2/QUALNET/BWSIM/MATLAB)

1. Introduction to network simulators used for wireless Ad Hoc and Sensor Networks.
2. Introduction to TCL scripting: demonstration of one small network simulation script.
3. To study various trace file formats of network simulators.
4. To implement and compare various MAC layer protocols.
5. To implement and compare AODV and DSR routing algorithms in MANET.
6. To implement DSDV routing algorithms in MANET.
7. To implement signal strength based link management routing protocols.
8. To calculate and compare average throughput for various TCP variants.
9. To implement and compare various routing protocols for wireless sensor networks.
10. Using Virtual labs to simulate the Protocols: http://vlabs.iitkgp.ernet.in/

Reference books:

1. https://www.nsnam.org/docs/release/3.9/manual.pdf

Virtual LabLinks:

1. http://vlabs.iitkgp.ac.in/ant/5/procedure/

	Government College (Autonomous) Rajahmundry	Program & Semester
Course Code IoT114	**TITLE OF THE COURSE** Implementing IoT with Raspberry Pi	II B.Sc. M.E.IoT (IV Sem)

Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Foundations of IoT and Arduino	3	1	-	3

Course Objectives:

1. This program aims to train students to be equipped with a solid theoretical foundation, systematic professional knowledge and strong practical skills in the Raspberry Pi.
2. The course focuses on higher-level operating systems, advanced networking, user interfaces, multimedia and uses more computing intensive IoT applications as examples using Raspberry Pi running Linux as the platform of choice
3. After doing this course, students should be able to design and deploy multiple IoT devices that could connect to the gateway.
4. Acquainting students with the basic web app creation
5. Connecting and Using various IoT Cloud Based Platforms such as Blynk, Things peak, AWS IoT, Google Cloud IoT Core etc..
6. Working with Big Data Processing Techniques
7. Developing Mobile App for IoT applications

Course Outcomes:

On Completion of the course, the students will be able to-

CO1	Appreciate the development technology for IoT
CO2	Familiar with Basic Concepts of Linux
CO3	Design real time IoT Devices.
CO4	Familiar with basic foundations of Python Programming and libraries
CO5	Comprehend the basic concepts of Mobile Cloud Computing
CO6	Develop a Mobile App for IoT applications.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

UNIT-I

Getting Started with Raspberry Pi: Basic functionality of Raspberry Pi B+ board, setting up the board, configuration and use, implications of an operating system on the behavior of the Raspberry Pi as an IoT device, booting Raspberry Pi 3, Downloading an Operating System, format an SD card and booting the OS, Basics of Linux and its use, main features including navigating the file system and managing processes, text based user interface through the shell, overview of the graphic user interface for Raspbian Linux distribution.

UNIT-II

Interfacing Hardware with the Raspberry Pi: Raspberry Pi Remote Access, operate the RaspberryPi in ‑headless mode‖, Bash Command line, operating Raspberry Pi without needing a GUI interface. Basics of the Python programming language, programming on the Raspberry Pi. Python on Raspberry Pi, Python Programming Environment, Python Expressions, Strings, Functions and Function arguments, Lists, List Methods, Control Flow.

UNIT-III

Communication with devices through the pins of the Raspberry Pi: RPi.GPIO library, Python Functions, setting up the pins, General purpose IO Pins, Protocol Pins, GPIO Access, applying digital voltages, and generating Pulse Width Modulated signals, Tkinter Python library, accessing pins through a graphic user interface

UNIT-IV

IoT Design using Raspberry Pi IoT Applications based on Pi: LAMP Web-server, GPIO Control over Web Browser, Creating Custom Web Page for LAMP, Communicating data using on-board module, Home automation using Pi, Node-RED, MQTT Protocol, Using Node-RED, Visual Editor on Rpi

UNIT-V

IoT Physical Servers and Cloud Offerings: Introduction to Cloud Storage models and communication APIs. Webserver – Web server for IoT, Cloud for IoT, Python web application framework. Designing a RESTful web API. Connecting to APIs

Text Books:

1. Simon Monk, ―Programming the Raspberry Pi: Getting Started with Python‖, January 2012, McGraw Hill Professional

2. The official raspberry Pi Projects Book https://www.raspberrypi.org/magpi-issues/Projects_Book_v1.pdf

Reference Books

1. Eben Upton and Gareth Halfacree, ―Raspberry Pi User Guide‖, August 2016, 4th edition, John Wiley & Sons

2. Alex Bradbury and Ben Everard, ―Learning Python with Raspberry Pi‖, Feb 2014, JohnWiley& Sons

3. Michael Margolis, ―Arduino Cookbook‖, First Edition, March 2011, O'Reilly Media, Inc.

WebLinks:

1. https://nptel.ac.in/courses/106/105/106105166/

CO-PO Mapping:

(1:Slight[Low];   2:Moderate[Medium];   3:Substantial[High],   '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1													
CO2													
CO3													
CO4													
CO5													

Model Blue print for the question paper setter

Blue Print				
S.No.	**UNIT**	**Short 2 M**	**Essay 8 M**	**Percentage %**
1	UNIT - I	2	2	20.8
2	UNIT - II	2	2	20.8
3	UNIT - III	2	2	20.8
4	UNIT - IV	1	2	18.8
5	UNIT – V	1	2	18.8
		16	80	100

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM
(Accredited by NAAC "A+" Grade)

II B.Sc. IOT (M.E.IOT)
MODEL QUESTION PAPER (W.E.F 2022-2023)
PAPER – IV: Implementing IoT with Raspberry Pi SEMESTER – IV

Time: 2 ½Hrs   **Max Marks: 50M**

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SECTION - I

Answer Any Five Questions of the following   **5 X 2M=10 M**

1. What is the difference between Active and Passive Transponders

2. How to boot Raspberry Pi

3. Discuss about Open issues in RFID Security?

4. Write List Methods

5. Explain the application areas of WSN

6. Write about Zigbee security

7. What is MQTT Protocol

8. Explain Physical Server

SECTION –II

Answer ALL Questions   **5 X 8M=40 M**

9. Explain about Fundamental Operating Principles of RFID
<div align="center">(Or)</div>

10. Briefly discuss about Anti-collision procedures in RFID

11. Discuss about Security attacks in RFID
<div align="center">(Or)</div>

12. Write about various challenges and constraints of Wireless Sensor Networks

13. What are the various functional and non-functional aspects required for Operating System in WSN
<div align="center">(Or)</div>

14. Mention the Characteristics of MAC Protocols in WSN

15. Explain about Pro-active and reactive routing Protocols in WSN
<div align="center">(Or)</div>

16. Explain the defence mechanisms against DoS Attacks and Routing Attacks Explain about Fundamental Operating Principles of RFID

17. Explain about Cloud Storage models
<div align="center">(Or)</div>

18. Explain how to Connecting to APIs

<div align="center">@ @ @ @</div>

	Government College (Autonomous) Rajahmundry	Program & Semester II B.Sc. M.E.IoT (IV Sem)			
Course Code IoT114P	**TITLE OF THE COURSE** Raspberry Pi lab				
Teaching	Hours Allocated: 30 (Lab)	L	T	P	C
Pre-requisites:	Arduino, Basic Electronics	0	0	3	2

List of Experiments

1. Getting started with Raspberry Pi, Install Raspian on your SD card
2. Linux basic commands.
3. Coding simple programs in Python.
4. How to use Python-based IDE (integrated development environments) for the Raspberry Pi and how to trace and debug Python code on the device
5. How to have your Raspberry Pi interact with online services through the use of public APIs and SDKs
6. Understanding the connectivity of Raspberry-Pi with IR sensor. Write an application to detect obstacle and notify user using LEDs.
7. Design APP Using MIT App Inventor and Connect to Temperature Sensor

Virtual LabLinks:

1. https://ocw.cs.pub.ro/courses/iot/labs/01

	Government College (Autonomous) Rajahmundry	Program & Semester				
Course Code IoT117	**TITLE OF THE COURSE** 6A: Machine Learning for Internet of Things	III B.Sc. M.E.IoT (V Sem)				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C	
Pre-requisites:	Basic Electronics	3	1	-	3	

Course Objectives:

The main objective of this course is to introduce the students to the basics of Machine Learning Concepts applicable with Internet of Things.

- To learn and understand the basics of Machine Learning and IoT
- To get acquainted with machine learning for IOT Data Analysis.
- To learn and understand Machine learning and deep learning methods for IoT applications.
- To design IoT applications using ML , DL methods
- To understand the Internet of Things and its benefits for society

Course Outcomes:

Students after successful completion of the course will be able to -	
CO1	Identify and understand the machine learning elements and techniques
CO2	Implement data preprocessing methods for IoT using python
CO3	Compare Machine Learning and Deep Learning
CO4	Identify and understand Machine Learning accelerators for IoT Devices
CO5	Design & implement deep learning model for sensor data
CO6	Compare advanced machine learning techniques

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

Unit I   10 Hours

Overview of Machine Learning: Introduction to Machine Learning: Introduction to ML, Introduction to Statistical Learning Methods, Classic and adaptive machines, Machine-Learning Problem, Machine-Learning Techniques and Paradigms, Machine Intelligence, Elements of Machine Learning, Introduction to Advanced ML - Deep Learning, Reinforcement Learning.

Unit II   10 Hours

Predictive Analysis for IoT: IOT Data Pre-processing: Data Preparation for Predictive Maintenance Modeling, Cleaning and Standardizing IoT Data, Applying Advanced Data Exploration Techniques Feature Engineering: Exploring Feature Engineering, Applying Feature Selection Techniques, Feature set selection using ML, Machine learning for Internet of Things data analysis

Unit III   10 Hours

Machine learning (ML) methods for IoT Applications: Decision Trees (DTs), Support Vector Machines (SVMs), Bayesian theorem-based algorithms, kNearest neighbour (KNN), Random forest (RF), Association Rule (AR) algorithms, Ensemble learning (EL), k-Means clustering, Principal component analysis (PCA)

Unit IV   10 Hours

Deep learning (DL) methods for IoT Applications: Convolutional neural networks (CNNs), Recurrent neural networks (RNNs), Deep autoencoders (AEs), Restricted Boltzmann machines (RBMs), Deep belief networks (DBNs), Generative adversarial networks (GANs), Ensemble of DL networks (EDLNs)

Unit V   10 Hours

Machine Learning Accelerators for IoT Devices: Compact fast Machine Learning Accelerators for IOT devices: Edge Computing on IOT Devices, IOT Based Smart Buildings, Distributed Machine Learning

Deep Learning for IOT: Deep Learning Models For Sensor Data, Embedded Deep Learning, Real Time IOT Imaging with Deep Neural Network.

Applications of ML and IOT : Case Studies: IOT for Agriculture, Remote Patient Monitoring, Smart City, Smart Transportation, IOT Security using ML

Text Books:

1. Ethem ALPAYDIN, "Introduction to Machine Learning" ,The MIT Press, October 2004, ISBN 0-262-01211-1
2. Hantao Huang, Hao Yu, "Compact and Fast Machine Learning Accelerator for IoT Devices,"Edition: 1st ed. Publisher: Springer Singapore Year: 2019ISBN: 978-981-13-3323- 1

Reference Books:

1. Trevor Hastie Robert Tibshirani Jerome Friedman, "The Elements of Statistical Learning: Data Mining, Inference, and Prediction", Second Edition, Springer Series in Statistics, Feb 2009

2. Tom M. Mitchell , " Machine Learning", McGraw-Hill Science/Engineering/Math; (March 1, 1997)ISBN: 0070428077

3. Neeraj Kumar, Aaisha Makkar, " MACHINE LEARNING IN COGNITIVE IOT", https://www.routledge.com/Machine-Learning-in-Cognitive-IoT/KumarMakkar/p/book/9780367359164 ISBN 9780367359164 Published June 1, 2020 by CRC Press

4. Puneet Mathur, " IoT Machine Learning Applications in Telecom, Energy, and Agriculture, With Raspberry Pi and Arduino Using Python", ISBN 978-1-4842-5549-0

5. Nicolas Modrzyk, " Real-Time IoT Imaging with Deep Neural Networks - Using Java on the Raspberry Pi 4" , Apress Publication , Year: 2020, ISBN: 9781484257210, 978148425722

Web Links:

6. Predictive Analytics for IOT, by Microsoft on edx Link:

    https://www.edx.org/course/predictive-analytics-for-iotsolutions?source=aw&awc=6798_1594277292_cca42f86ac9afe29904595a53aad9e1c

7. INTERNET of Things and Machine Learning Training Link:

    https://shop.boltiot.com/products/internet-of-things-and-machine-learning-training

8. https://www.tutorialspoint.com/machine_learning/index.htm

9. https://ocw.mit.edu/courses/6-036-introduction-to-machine-learning-fall-2020/

10. https://www.edx.org/course/machine-learning

Co-Curricular Activities

a) **Mandatory:** *(Training of students by teacher in field related skills: (lab: 10 + field: 05) :*

1. **For Teacher**: Field related training of students by the teacher in laboratory/field for not less than 15 hours on Collecting various weather related data using sensors to develop a Campus weather report prediction model by applying various machine learning algorithms.

2. **For Student**: Students shall (individually) study various weather sensors and actuators and IoT prototype boards to develop a solution for the campus weather forecasting and submit a hand-written Fieldwork/Project work Report not exceeding 10 pages.

3. Max marks for Fieldwork/Project work//Projectwork Report: 05.

4. Suggested Format for Fieldwork/Project work:*Title page, student details, index page, details of place visited, observations, findings andacknowledgements*.

5. Unit tests (IE).

b) Suggested Co-Curricular Activities

1. Develop a solution for the case study identified.

2. Training of students by related industrial experts.

3. Assignments

4. Seminars, Group discussions, Quiz, Debates etc. (on related topics).

5. Presentation by students on best machine learning model for various scenarios

CO-PO Mapping:

(1:Slight[Low];   2:Moderate[Medium];   3:Substantial[High],   '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1													
CO2													
CO3													
CO4													
CO5													

Model Blue print for the question paper setter

Blue Print				
S.No.	UNIT	Short 2 M	Essay 8 M	Percentage %
1	UNIT - I	2	2	20.8
2	UNIT - II	2	2	20.8
3	UNIT - III	2	2	20.8
4	UNIT - IV	1	2	18.8
5	UNIT – V	1	2	18.8
		16	80	100

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM
(Accredited by NAAC "A+" Grade)

III B.Sc. IOT (M.E.IOT)
MODEL QUESTION PAPER (W.E.F 2022-2023)
PAPER- IOT 117- 6A: Machine Learning for Internet of Things SEMESTER – V

Time: 2 ½Hrs   **Max Marks: 50M**

……………………………………………………………………………...…………

SECTION - I

Answer Any <u>Five</u> Questions of the following   **5 X 2M=10 M**

1. What are the Applications of Machine Learning.

2. What is Machine Intelligence

3. Explain the Polynomial Regression

4. Write Features of Selection Techniques

5. Logistic Regression vs. Linear Regression

6. Explain Random forest

7. What is Multiclass Representation Explain Knowledge Hierarchy

8. What is Real Time IoT

SECTION –II

Answer <u>ALL</u> Questions   **5 X 8M=40 M**

9. Explain about Bayesian Method

(Or)

10. What are the Matrices and Vectors in Machine Learning

11. Explain the Linear Regression with multiple variables

(Or)

12. What is machine learning algorithm? Discuss the Prediction using Linear Regression

13. Explain the Classification using Logistic Regression

(Or)

14. What are the Application of Regularization in Linear and Logistic Regression

15. How Neural Networks Works.

(Or)

16. Define Back propagation Algorithm

17. Discuss Distributed Machine Learning

(Or)

18. How uses IoT for Agriculture

	Government College (Autonomous) Rajahmundry	Program & Semester III B.Sc. M.E.IoT (VSem)			
Course Code IoT117P	**TITLE OF THE COURSE** 6A: Machine Learning lab				
Teaching	Hours Allocated: 30 (Lab)	L	T	P	C
Pre-requisites:	Python	0	0	3	2

Objectives:

On successful completion of this practical course, student shall be able to:
1. Understand the implementation procedures for the machine learning algorithms
2. Design Python programs for various Learning algorithms.
3. Apply appropriate data sets to the Machine Learning algorithms
4. Identify and apply Machine Learning algorithms with IoT to solve real world problems

List of Experiments

1. **Programming for IOT : R- programming, Python Libraries, Azure Cloud platform Examining Machine Learning for IoT**

    Develop an Application on Arduino/Raspberry-Pi to capture the values of temperature sensor after every 15 sec of time interval, store these values in .csv format and predict the temperature at particular time t using linear regression analysis.

    Hint: Create the dataset of at least 20-25 instances, use any data analysis tool (WEKA/R)

2. **Getting Started with Azure Machine Learning**

    Deploy your first Azure/Think Speak IoT Edge module to a virtual Linux or Windows device

    Experiments:
    a. Deploy your first IoT Edge module to a Linux device
    b. Deploy your first IoT Edge module to a Windows device
    c. Things Speak for IoT
    d. Collect the sensor data on private cloud using Things Speak

3. **Exploring Code-First Machine Learning with Python**
    a. Download the Dataset of your choice
    b. Divide the dataset into Training data and Testing data.
    c. Perform the classification of the instances using any machine learning algorithm like KNN Algorithm, Naïve Bayes, Decision Tree or any.
    d. Evaluate the machine learning model by considering the parameter (TPR, TNR, FPR, FNR, accuracy, precision, recall, error rate etc.)

References

1. https://www.kaggle.com/datasets

2. https://archive.ics.uci.edu/ml/datasets.php

Virtual LabLinks:

1. https://ocw.cs.pub.ro/courses/iot/labs

	Government College (Autonomous) Rajahmundry		Program & Semester
			III B.Sc. M.E.IoT (V Sem)
Course Code IoT118	**TITLE OF THE COURSE** 7A: COMPUTER VISION		

Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Images, Image representations	3	1	-	3

Course Objectives:

1. To introduce students the fundamentals of image formation;
2. To introduce students the major ideas, methods, and techniques of computer vision and pattern recognition;
3. To develop an appreciation for various issues in the design of computer vision and object recognition systems; and
4. To provide the student with programming experience from implementing computer vision and object recognition applications

Course Outcomes:

Students after successful completion of the course will be able to:	
CO1	To implement fundamental image processing techniques required for computer vision
CO2	Understand Image formation process
CO3	To perform various analysis on image to extract features form Images
CO4	To develop applications using computer vision techniques

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

Unit-1: (10 hours)

Introduction to Computer Vision Image Processing, Computer Vision and Computer Graphics, Computer Vision Applications: Document Image Analysis, Biometrics, Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Video Data Processing, Multimedia, Virtual Reality and Augmented Reality

Unit-2:   (10 hours)

Image Representation And Analysis Image representation, Image processing techniques like color and geometric transforms, Edge-detection Techniques, Filtering, Mathematical operations on image and its applications like convolution, filtering

Unit-3:   (10 hours)

Motion Estimation Introduction to motion, Regularization theory, Optical computation, Stereo Vision, Motion estimation, Structure from motion and models

Unit-4:   (10 hours)

Object Recognition Hough transforms and other simple object recognition methods, Shape correspondence and shape matching, Principal component analysis, Shape priors for recognition

Unit-5:   (10 hours)

Applications Photo album, Face detection, Face recognition, Eigen faces, Active appearance and 3D shape models of faces Application: Surveillance, foreground background separation, particle filters, Chamfer matching, tracking, and occlusion, combining views from multiple cameras, human gait analysis Application: Invehicle vision system: locating roadway, road markings, identifying road signs, locating pedestrians

References

1. Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall Robot Vision, by B. K. P. Horn, McGraw-Hill.

2. Introductory Techniques for 3D Computer Vision, by E. Trucco and A. Verri, Publisher: Prentice Hall.

3. R. C. Gonzalez, R. E. Woods. Digital Image Processing. Addison Wesley Longman, Inc., 1992.

4. D. H. Ballard, C. M. Brown. Computer Vision. Prentice-Hall, Englewood Cliffs, 1982.

5. Richard Szeliski, Computer Vision: Algorithms and Applications (CVAA). Springer, 2010 6. Image Processing, Analysis, and Machine Vision. Sonka, Hlavac, and Boyle. Thomson.

6. E. R. Davies, Computer & Machine Vision, Fourth Edition, Academic Press, 2012

7. Simon J. D. Prince, Computer Vision: Models, Learning, and Inference, Cambridge University Press, 2012

8. Mark Nixon and Alberto S. Aquado, Feature Extraction & Image Processing for Computer Vision, Third Edition, Academic Press, 2012.

9. Web resources:

    a. https://opencv.org/opencv-free-course/

b. https://www.kaggle.com/learn/computer-vision

10. Other web sources suggested by the teacher concerned and the college librarian including reading material

II. Co-Curricular Activities:

a) **Mandatory:** *(Training of students by teacher in field related skills: (lab: 10 + field: 05) :*

1. **For Teacher**: Field related training of students by the teacher in laboratory/field for not less than 15 hours on demonstrating various Computer Vision Applications for Internet of things to develop a case study for implementing a solution for a real world problem with IOT Computer Vision etc.

2. **For Student**: Students shall (individually) search for possible areas of application of computer vision to develop solution using IoT and submit a hand-written Fieldwork/Project work Report not exceeding 10 pages. Example: Choosing an area such as Traffic prediction and alert system with OpenCV and Raspberry Pi.

3. Max marks for Fieldwork/Project work Report: 05.

4. Suggested Format for Fieldwork/Project work: *Title page, student details, index page, details of place or websites visited, structure of thewebsite and acknowledgements*.

5. Unit tests (IE).

b) Suggested Co-Curricular Activities

1. Arrange expert lectures by IT experts working professionally in the area of Computer vision and other related areas of IoT

2. Assignments (in writing or implementing contents related to syllabus or outside thesyllabus. Shall be individual and challenging)

3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).

4. Preparation by students on best websites.

5. Arrange a webpage development competition among small groups of students.

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1													
CO2													
CO3													
CO4													
CO5													

Model Blue print for the question paper setter

Blue Print				
S.No.	**UNIT**	**Short 2 M**	**Essay 8 M**	**Percentage %**
1	UNIT - I	2	2	20.8
2	UNIT - II	2	2	20.8
3	UNIT - III	2	2	20.8
4	UNIT - IV	1	2	18.8
5	UNIT – V	1	2	18.8
		16	80	100

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM
(Accredited by NAAC "A+" Grade)

III B.Sc. IOT (M.E.IOT)
MODEL QUESTION PAPER (W.E.F 2022-2023)
PAPER- IoT 118- 7A: COMPUTER VISION SEMESTER – V

Time: 2 ½Hrs   Max Marks: 50M

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SECTION - I

Answer Any <u>Five</u> Questions of the following   **5 X 2M=10 M**

1. What is Image Processing

2. Write Object Recognition

3. Explain geometric transforms

4. What is filtering

5. What is Motion

6. Define Optional computation

7. Explain shape matching

8. What is Eigen faces

SECTION –II

Answer <u>ALL</u> Questions   **5 X 8M=40 M**

9. Differentiate between Computer Vision and Computer Graphics.

(Or)

10. Briefly describe Document Image Analysis.

11. Discuss the Image processing Techniques.

(Or)

12. Write a note on Edge-detection Techniques.

13. Explain about Regularization Theory

(Or)

14. What are Mathematical operations on image?

15. Discuss simple object recognition methods

(Or)

16. Write a note on Principal component analysis.

17. Discuss Face detection and recognition

(Or)

18. How separates foreground and background in faces

	Government College (Autonomous) Rajahmundry	Program & Semester III B.Sc. M.E.IoT (V Sem)			
Course Code IoT118P	**TITLE OF THE COURSE** 7A: COMPUTER VISION				
Teaching	Hours Allocated: 30 (Lab)	L	T	P	C
Pre-requisites:	Image representation	0	0	3	2

Objectives:

On successful completion of this practical course, student shall be able to:

1. Implement fundamental image processing techniques with OpenCV

2. Perform various analysis on image to extract features form Images with OpenCV

3. Develop image recognition system for IOT

List of Experiments

1. Import libraries

2. Rgb image and resizing

3. Grayscale image

4. Image denoising, Image thresholding, Image gradients

5. Edge detection fourier transform on image

6. Line transform

7. Corner detection

8. Morphological transformation of image, Geometric transformation of image

9. Contours

10. Image pyramids

11. Colorspace conversion and object tracking

12. Interactive foreground extraction

13. Image segmentation, Image inpainting

14. Template matching

15. Face and eye detection

Virtual LabLinks:

1. https://ocw.cs.pub.ro/courses/iot/labs/01

	Government College (Autonomous) Rajahmundry	Program & Semester
Course Code IoT119	**TITLE OF THE COURSE** 6B: Java Programming for Internet of Things	III B.Sc. M.E.IoT (V Sem)

Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Java programming	3	1	-	3

Course Objectives:

1. Programming for IoT is usually a polyglot (multiple languages) effort since the Internet-of-Things.
2. (IoT) is a system of inter-related computing devices that are provided with unique identifiers and the ability to transfer data over a network.
3. The choice of programming-language depends on the capability and purpose of the device.
4. IoT encompasses a variety of devices including edge devices, gateways, and cloud servers.

Course Outcomes:

	Students after successful completion of the course will be able to:
CO1	Understand the basic concepts of Java Programming
CO2	Apply the programming knowledge to some of the biggest trending applications today
CO3	Understand how to program Java to interact with operating systems, networking, and mobile applications
CO4	Develop trending tech applications in the area of IoT (Internet of Things)
CO5	Find out firsthand how Java can be used for connected home devices, healthcare, the cloud, and all the hottest tech applications

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

UNIT-I **(10 HOURS)**

Introduction to Java : What Is Java, Versions of Java, Java Architecture, Editions of Java, The Java Spring Framework, Advantages and Disadvantages of Java, Java Certification, Downloading and Installing Java, Java IDEs, Java Hello World Program, Java Online Compilers, Java Online Code

Converters

Basic Java Programming: Introduction, Variables, Constants, Comments, Naming Conventions, The String and StringBuffer Types, The VAR Variable Type, Operators, Reserved Words, Input and Output, Loops and Selections

UNIT-II   (10 HOURS)

Arrays, Matrices, and ArrayLists: Reading and Writing Files, Methods, Object-Oriented Programming, Classes and Objects, Instantiation, Encapsulation, Inheritance, Overriding and Overloading, Polymorphism, Object Accessibility, Anonymous Inner Classes, Multithreading, The Life Cycle of a Thread, Thread Priorities, Thread Scheduling, Thread Synchronization, Date, Time, Timer, and Sleep Methods, Executing System Commands, Packages and Programming on a Large Scale, Deploying Java Applications: Using a Windows Batch File, Using an Executable JAR File, Using Microsoft Visual Studio, Java Application Installations

UNIT-III   (10 HOURS)

Java Programming for Windows Applications: Introduction, Java Swing Application, JavaFX Applications, JavaFX Window, Creating a Label and Button in JavaFX, JavaFX Charts, Handling Logins in JavaFX, Creating an Image Viewer in JavaFX, Creating a JavaFX Web Viewer, Creating a Menu in JavaFX, Creating a JavaFX File Chooser, JavaFX Tutorials, Deploying JavaFX Applications

UNIT-IV   (10 HOURS)

Java Programming for Mobile Applications: Introduction, Android Studio, The Hello WorldApp, The Button and TextView Apps, The Sensor App, Deploying Android Apps, The Activity Life Cycle of an Android App

MIT App Inventor: Speech Recognition App, Translation App, Millimeter Waves, Small Cells, Massive MIMO, Beamforming, Full Duplex, Future 6G and 7G

UNIT-V   (10 HOURS)

Java Programming for IoT Applications: IoT Communication Protocols-MQTT, CoAP, XMPP, SOAP, REST, Java IoT with Raspberry Pi: Java GPIO Examples, Running Python Programs from Java, Java PWM Example, Java PIR and LED Example, Java I2C Example, Java ADC Examples, Java Digital Sensor Examples, Java MQTT Example, Java REST Example

Other Java IoT Uses: Eclipse Open IoT Stack for Java, IBM Watson IoT for Java, Amazon IoT for Java, Microsoft Azure IoT for Java

References

1. Xiao, Perry. "Practical Java Programming for IoT, AI, and Blockchain" 2019.
2. Stephen Chin, James L Weaver, "Raspberry Pi with Java: Programming the Internet of Things (IoT)", McGraw-Hill, ISBN: 9780071842020
3. J. F. DiMarzio, "JavaFX A Beginners Guide", Oracle Press, ISBN: 9780071742405
4. Joshua Bloch, "Effective Java", Second Edition, 2016, ISBN: 9789332576537
5. Joshua Marinacci , "Building Mobile Applications with Java" 2012, O'Reilly Media, Inc. ISBN: 9781449308230
6. Web Links:
   a. https://www.classcentral.com/course/independent-develop-java-embedded-applications-using-a-raspberry-pi-2051
   b. https://www.udemy.com/course/iot-turn-a-light-on-with-java-raspberry-pi-and-apis/
7. Other web sources suggested by the teacher concerned and the college librarian including reading material.

I. Co-Curricular Activities

a) **Mandatory:** *(Training of students by teacher in field related skills: (lab: 10 + field: 05) :*

1. **For Teacher**: Field related training of students by the teacher in laboratory/field for not less than 15 hours to develop an Android App/Web App to Visualize the Temperature, Humidity values read by the sensors and to control the Air Conditioners from the APP.
2. **For Student**: Students shall (individually) study various sensors and actuators and IoT prototype boards to develop an APP to read and visualize the data read by the sensors and submit a hand-written Fieldwork/Project work Report not exceeding 10 pages.
3. Max marks for Fieldwork/Project work//Projectwork Report: 05.
4. Suggested Format for Fieldwork/Project work: *Title page, student details, index page, details of place visited, observations, findings andacknowledgements*.
5. Unit tests (IE).

b) Suggested Co-Curricular Activities

1. Arrange expert lectures by IT experts working professionally in the area of App development for IoT
2. Assignments (in writing or implementing contents related to syllabus or outside the syllabus. Shall be individual and challenging)
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).

4. Preparation by students on best App designs.

Arrange a IoT App development competition among small groups of students

CO-PO Mapping:

(1:Slight[Low];   2:Moderate[Medium];   3:Substantial[High],   '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1													
CO2													
CO3													
CO4													
CO5													

Model Blue print for the question paper setter

Blue Print				
S.No.	UNIT	Short 2 M	Essay 8 M	Percentage %
1	UNIT - I	2	2	20.8
2	UNIT - II	2	2	20.8
3	UNIT - III	2	2	20.8
4	UNIT - IV	1	2	18.8
5	UNIT – V	1	2	18.8
		16	80	100

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM
(Accredited by NAAC "A+" Grade)

III B.Sc. IOT (M.E.IOT)
MODEL QUESTION PAPER (W.E.F 2022-2023)
PAPER- IoT 119- 6B: Java Programming for Internet of Things SEMESTER – V

Time: 2 ½Hrs   Max Marks: 50M

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SECTION - I

Answer Any <u>Five</u> Questions of the following   5 X 2M=10 M

1. What is Java

2. Write Java Hello World Program

3. Write Reading and Writing files

4. What is Overloading

5. What is JavaFX

6. Define Android Studio

7. Explain Speech Recognition App

8. What is Raspberry Pi

SECTION –II

Answer <u>ALL</u> Questions   5 X 8M=40 M

9. Draw Java Architecture? Explain advantages and disadvantages of Java.
                                        (Or)
10. List various operators in Java with suitable examples.

11. Discuss the basic concepts of OOP.
                                        (Or)
12. Write a java program to multiply two matrices.

13. What is Thread? Explain Life Cycle of a Thread with neat diagram
                                        (Or)
14. How create a Label and Button in JavaFX?

15. Discuss Deploying Android APPs
                                        (Or)
16. Write a note on Life Cycle of an Android App.

17. How Running Python Programs from Java,
                                        (Or)
18. Explain about Amazon IoT for Java,

	Government College (Autonomous) Rajahmundry		Program & Semester III B.Sc. M.E.IoT (V Sem)
Course Code IoT119P	**TITLE OF THE COURSE** 6B: Java Programming for Internet of Things LAB		
Teaching	Hours Allocated: 30 (Lab)		L T P C
Pre-requisites:	DBMS and Java		0 0 3 2

Objectives

1. (IoT) is a system of inter-related computing devices that are provided with unique identifiers and the ability to transfer data over a network.
2. The choice of programming-language depends on the capability and purpose of the device.
3. IoT encompasses a variety of devices including edge devices, gateways, and cloud servers

List of Experiments

1. Write a Java Program to demonstrate String and StringBuffer types
2. Write a Java Program to perform various operations on Two dimensional Arrays
3. Write a Java Program to read and display the contents of a File
4. Write a Java Program to demonstrate Encapsulation
5. Write a Java Program to demonstrate Multiple Inheritance
6. Write a Java Program to demonstrate the Life cycle of a Thread
7. Write a Java Program to handle Logins using JavaFX
8. Write a Java Program to create Menus using JavaFX
9. Demonstrate the Installation of Android Studio
10. Write a Java Program to create a simple App in Andriod Studio
11. Create an App using MIT App inventor
12. Write a Java Program to read the data from various sensors in RPi
13. Write a Java Program to connect to Amazon Cloud.

Virtual LabLinks:

1. https://www.iiitmk.ac.in/DAVirtalLab/

	Government College (Autonomous) Rajahmundry		Program & Semester
			III B.Sc. M.E.IoT (V Sem)

Course Code IoT120	**TITLE OF THE COURSE** 7B: Big Data and Analytics				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	DBMS	3	1	-	3

Course Objectives:

1. Big data analytics helps organizations harness their data and use it to identify new opportunities.
2. That, in turn, leads to smarter business moves, more efficient operations, higher profits and happier customers.
3. Businesses that use big data with advanced analytics gain value in many ways, such as: Reducing cost.

Course Outcomes:

Students after successful completion of the course will be able to:

CO1	Learn tips and tricks for Big Data use cases and solutions.
CO2	Learn to build and maintain reliable, scalable, distributed systems with Apache Hadoop.
CO3	Apply Hadoop ecosystem components.
CO4	Apply Big Data in IoT
CO5	Analyze the huge volume of data collected from IoT devices

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

UNIT-I   (10 HOURS)

Introduction to big data: Classification of Digital Data-Structured, Semi-Structured Data, Unstructured, Characteristics of data, Evolution of Big Data, Definition of Big Data, Challenges with Big Data, What is Big Data-Volume, Velocity, Variety, Why Big Data, Business Intelligence verses Big Data.

UNIT-II   (10 HOURS)

Big data analytics: What is Big Data Analytics, Classification of big data analytics, Data science, Data Scientist, **Terminology Used in Big Data Environment**-InMemory Analytics, In-Database Processing,

Symmetric Multiprocessor System, Massively Parallel Processing, Distributed Systems, Cap theorem, Introduction to Open-Source analytical tools.

UNIT-III   (10 HOURS)

Big Data Technology: NoSQL Database-Definition,Types of NoSQL Database,Why NoSQL? Advantages of NoSQL, NewSQL, comparision of SQL, NoSQL, NewSQL.

Introduction to MongoDB-Definition, Using Java Script Object Notation(JSON),Creating Unique Key, Support for dynamic Queries, Storing Binary Data, Replication, Sharding, Terms used in RDBMS and MonogoDB- Create Database,Drop Database,Datatypes in Monogodb, MonogoDB Query Language (Create,Read,Update,and Delete).

UNIT-IV   (10 HOURS)

Introduction to Hadoop :Introducing Hadoop, need of Hadoop, RDBMS versus Hadoop. Hadoop Overview-Key Aspects of Hadoop, Hadoop Components,High level Architecture of Hadoop, Use Case of Hadoop, **HDFS** (Hadoop Distributed FileSystem),Processing Data with Hadoop.

Introduction to MAPREDUCE Programming: Introduction , Mapper, Reducer, Combiner, Partitioner , Searching, Sorting , Compression, Real time applications using MapReduce.

UNIT-V   (10 HOURS)

Case studies: Applications of Big Data using Hive Architecture, Hive Data types, Hive Query Language(HQL), Pig on Hadoop.

Machine Learning Algorithms-Implementation of Regression, Implementation of k- Means.

References

1. Chris Eaton, Dirk deroos et al. "Understanding Big data ", McGraw Hill, 2012.
2. SeemaAcharya, SubhashiniChellappan, Big Data Analytics, Wiley,2019
3. Runkler, Thomas. A, Data Analytics: Models and Algorithms for Intelligent Data Analysis, Springer, 2012.
4. Tom White " Hadoop: The Definitive Guide" Third Edit on, O'reily Media, 2012.
5. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data ,Big Analytics: Emerging Business Intelligence and Analytics Trends for Todays Businesses", Wiley
6. Web Links:
   a. https://www.mygreatlearning.com/academy/learn-for-free/courses/ai-and-big-data-in-iot
   b. https://www.tutorialspoint.com/hadoop/hadoop_big_data_overview.htm

c. https://www.w3schools.in/hadoop/tutorials/

d. https://www.simplilearn.com/tutorials/big-data-tutorial/big-data-applications

7. Other web sources suggested by the teacher concerned and the college librarian including reading material.

I. Co-Curricular Activities

c) **Mandatory:** *(Training of students by teacher in field related skills: (lab: 10 + field: 05) :*

6. **For Teacher**: Field related training of students by the teacher in laboratory/field for not less than 15 hours to connect and store the IoT device data in MongoDB and apply various commands to retrieve/manipulate and analyze the data for identifying the patterns.

7. **For Student**: Students shall (individually) study various Analytics performed on Data and AWS IOT web services to store huge volume of data generated by sensor networks and submit a hand-written Fieldwork/Project work Report not exceeding 10 pages.

8. Max marks for Fieldwork/Project work//Projectwork Report: 05.

9. Suggested Format for Fieldwork/Project work: *Title page, student details, index page, details of place visited, observations, findings andacknowledgements*.

10.   Unit tests (IE).

d) Suggested Co-Curricular Activities

1. Arrange expert lectures by IT experts working professionally in the area of Microsoft Azure/ Amazon AWS IoT Services

2. Assignments (in writing or implementing contents related to syllabus or outside the syllabus. Shall be individual and challenging)

3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).

4. Presentation by Students on various proprietary/open source Cloud technologies for IoT.

CO-PO Mapping:

(1:Slight[Low];   2:Moderate[Medium];   3:Substantial[High],   '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1													
CO2													
CO3													
CO4													
CO5													

Model Blue print for the question paper setter

Blue Print				
S.No.	**UNIT**	**Short 2 M**	**Essay 8 M**	**Percentage %**
1	UNIT - I	2	2	20.8
2	UNIT - II	2	2	20.8
3	UNIT - III	2	2	20.8
4	UNIT - IV	1	2	18.8
5	UNIT – V	1	2	18.8
		16	80	100

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM
(Accredited by NAAC "A+" Grade)

III B.Sc. IOT (M.E.IOT)
MODEL QUESTION PAPER (W.E.F 2022-2023)
PAPER- IoT 120- 7B: Big Data and Analytics SEMESTER – V

Time: 2 ½Hrs   **Max Marks**: 50M

…………………………………………………………………………...…………

SECTION - I

Answer Any <u>Five</u> Questions of the following   **5 X 2M=10 M**

1. List the types of accidents

2. Write the elements of data architecture

3. List the stages of OODA Loop

4. What are the standard reporting templates?

5. What is Map Reduce?

6. What is Key-value data store?

7. How do you prepare the input data for an algorithm?

8. What are the types of machine learning?

SECTION –II

Answer <u>ALL</u> Questions   **5 X 8M=40 M**

9. Explain in detail about Export Job Process

(Or)

10. List the guide lines for identifying and reporting an accident or emergency in detail.

11. What is knowledge management? Explain about model based techniques.

(Or)

12. Explain about the Kepner-Tregoe Matrix Decision Model.

13. List the Classification of No SQL Databases and explain about columns based database

(Or)

14. Explain about Graph Databases and Descriptive Statistics?

15. Describe Train Model using Machine Learning Algorithm, Test model

(Or)

16. Explain Knowledge Discovery in Databases task in detail..

17. Explain Data Visualization in Tableau

(Or)

18. Draw insights out of any one Visualization Tool,

	Government College (Autonomous) Rajahmundry	Program & Semester III B.Sc. M.E.IoT (V Sem)
Course Code IoT120P	**TITLE OF THE COURSE** 7B: Big Data and Analytics LAB	

Teaching	Hours Allocated: 30 (Lab)	L	T	P	C
Pre-requisites:	DBMS Lab	0	0	3	2

Objectives

1. That, in turn, leads to smarter business moves, more efficient operations, higher profits and happier customers.

2. Businesses that use big data with advanced analytics gain value in many ways, such as: Reducing cost.

List of Experiments

1. Installation of Hadoop
   a. Ubuntu Operating System in stand-alone mode
   b. Psuedo Distributed Mode(Locally)
   c. Psuedo Distributed Mode(YARN)

2. File Management tasks in Hadoop
   a. Create a directory in HDFS at given path(s).
   b. List the contents of a directory.
   c. Upload and download a file in HDFS.
   d. See contents of a file
   e. Copy a file from source to destination
   f. Copy a file from/To Local file system to HDFS
   g. Move file from source to destination.
   h. Remove a file or directory in HDFS.
   i. Display last few lines of a file.
   j. Display the aggregate length of a file.

3. Word Count Map Reduce program to understand Map Reduce Paradigm

4. Weather Report POC-Map Reduce Program to analyse time-temperature statistics and generate report with max/min temperature.

5. Implementing Matrix Multiplication with Hadoop Map Reduce

6. Pig Latin scripts to sort, group, join, project, and filter your data.

7. Hive Databases, Tables, Views, Functions and Indexes

<table>
<tr>
<td rowspan="3">

![emblem]

</td>
<td colspan="2" style="text-align:center">Government College (Autonomous) Rajahmundry</td>
<td colspan="4">Program & Semester</td>
</tr>
<tr>
<td>Course Code
IoT121</td>
<td>TITLE OF THE COURSE
6C: Web of Things</td>
<td colspan="4">III B.Sc. M.E.IoT
(V Sem)</td>
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<td>Teaching</td>
<td>Hours Allocated: 60 (Theory)</td>
<td>L</td><td>T</td><td>P</td><td>C</td>
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<tr>
<td></td>
<td>Pre-requisites:</td>
<td>Basic computer programming</td>
<td>3</td><td>1</td><td>-</td><td>3</td>
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Course Objectives:

1. The W3C Web of Things (WoT) is intended to **enable interoperability across IoT platforms and application domains**.

2. Overall, the goal of the WoT is to preserve and complement existing IoT standards and solutions.

Course Outcomes:

	Students after successful completion of the course will be able to:
CO1	Connect electronic actuators and sensors (GPIO) to a Raspberry Pi Implement standard REST and Pub/Sub APIs with Node.js on embedded systems.
CO2	Learn about IoT protocols like MQTT and CoAP and integrate them to the Web of Things Use the Semantic Web (JSON-LD, RDFa, etc.) to discover and find Web Things.
CO3	Share Things via Social Networks to create the Social Web of Things
CO4	Build a web-based smart home with HTTP and WebSocket
CO5	Compose physical mashups with EVRYTHNG, Node-RED, and IFTTT

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

Unit - I   (10 hours)

BASICS OF THE IOT AND THE WOT - From the Internet of Things to the Web of Things : Defining the Internet of Things , Enter the Web of Things, Web of Things scenario, Comparing IoT and WoT , The Internet of Things - a brief history and Use cases, The Web of Things - a supercharged Internet of Things

Hello, World Wide Web of Things , Meet a Web of Things device ,Browse a device on the Web of Things , The web as user interface, The web as an API, Polling data from a WoT sensor, Polling the current sensor value, Polling and graphing sensor values, Real-time data updates, Act on the real

world, Use a form to update text to display, Create your own form to control devices, Tell the world about your device, Create your first physical mashup

Unit – II (10 hours)

Node.js for the Web of Things: The rise of JavaScript: from clients to servers to things, Pushing JavaScript to things, Introduction to Node.js, Installing Node.js on your machine, Your first web server in Node.js, Returning sensor data as JSON, Modularity in Node.js, npm—the Node package manager, Clean dependencies with package.json and npm, Your first Node module, Understanding the Node.js event loop, Multithreaded web servers, Single-threaded, non-blocking web servers, Getting started with asynchronous programming, Anonymous callbacks, Named callbacks, Control flow libraries Getting started with embedded systems, The world of embedded devices, Devices for hobbyists vs. industrial devices, Real-time operating systems vs. Linux , Set up your first WoT device, Setting up your Raspberry Pi, Connecting to your device, Installing Node.js on the Raspberry Pi , Using Git and GitHub on the Pi , Connecting sensors and actuators to your Pi, Understanding GPIO ports , Accessing GPIOs from Node.js

Unit – III (10 hours)

Building networks of Things : Connecting Things, Network topologies, Network classification models , Networking protocols for Things , Spatial considerations , Internet protocols and the IoT, IoT personal area networks , IoT wide area networks , Application protocols for Things- ZigBee and Bluetooth application stacks, Apple HomeKit and Google Weave, Message Queuing Telemetry Transport, Constrained Application Protocol , The Web of Things architecture: Access, Find, Share, Compose

Access: Web APIs for Things: Devices, resources, and web Things, Representational State Transfer, Why do we need a uniform interface? , Four Principles, **Beyond REST:** the real-time Web of Things , The WoT needs events- Publish/subscribe, Webhooks - HTTP callbacks, WebSockets , The future: from HTTP/1.1 to HTTP/2

Unit – IV (10 hours)

Implementing web Things, Connecting devices to the web, **Direct integration pattern**- REST on devices , Creating a WoT server, Resource design , Representation design, Interface design, Pub/sub interface via WebSockets

Gateway integration pattern- CoAP example, Running a CoAP server , Proxying CoAP via a gateway

Cloud integration pattern-MQTT over EVRYTHNG - Set up your EVRYTHNG account, Create your MQTT client application, Use actions to control the power , Create a simple web control application

Find: Describe and discover web Things- The findability problem, Discovering Things- Network

discovery- Resource discovery on the web , Describing web Things- Introducing the Web Thing Model-Metadata, Properties-Actions - Things -Implementing the Web Thing Model on the Pi, The Semantic Web of Things - Linked data and RDFa , Agreed-upon semantics: Schema.org , JSON-LD

Unit – V   **(10 hours)**

Share: Securing and sharing web Things-Securing Things-Encryption, Web security with TLS: the S of HTTPS, Enabling HTTPS and WSS with TLS on your Pi , Authentication and access control-Access control with REST and API tokens, OAuth: a web authorization framework , The Social Web of Things - Social Web of Things authentication proxy- Implementing a Social WoT authentication proxy

Compose: Physical mashups - Building a simple app—automated UI generation -universal user interface for web Things , Physical mashups -Boxes and wires mashups for the Physical Web: Node-RED , Using wizards for physical mashups: IFTTT -Pushing intruder alert tweets to a Google spreadsheet , Sending requests to a Thing with the Maker Channel , Pushing intruder alert tweets to a Google spreadsheet From simple mashups to big data mashups

References

1. Building the Web of Things With examples in Node.js and Raspberry Pi,Dominique D. Guinard and Vlad M. Trifa, June 2016 , Manning, ISBN 9781617292682

2. Using the Web to Build the IoT, Dominique Guinard and Vlad Trifa in collaboration with Manning.

3. Samuel Greengard "The Internet of Things" MIT Press Essential Knowledge Series, 2015, ASIN: B00VB719VS

4. Jain, Aarti, Rubén González Crespo, and Manju Khari. 2020. Smart innovation of web of things. https://www.taylorfrancis.com/books/978042929846

5. Web resources:
   a. http://book .webofthings.io
   b. https://webofthings.org/

6. Other web sources suggested by the teacher concerned and the college librarian including reading material.

II. Co-Curricular Activities

a) **Mandatory:** *(Training of students by teacher in field related skills: (lab: 10 + field: 05) :*

1. **For Teacher**: Field related training of students by the teacher in laboratory/field for not less than 15 hours to integrate a Raspberry Pi/Arduino to Web of Things to erect smart home with various sensors.

2. **For Student**: Students shall (individually) search online and identify any one case study for WoT such as Smart Agriculture, Smart retails etc., and submit a hand-written Fieldwork/Project work Report not exceeding 10 pages.

3. Max marks for Fieldwork/Project work/Project work/Project work/Project work/Project work Report: 05.

4. Suggested Format for Fieldwork/Project work/Project work/Project work/Project work: *Title page, student details, index page, details of place visited, observations, findings and acknowledgements*.

5. Unit tests (IE).

b) Suggested Co-Curricular Activities

1. Develop a WoT with 10 pages for the case study identified.

2. Training of students by related industrial experts.

3. Assignments

4. Seminars, Group discussions, Quiz, Debates etc. (on related topics).

5. Presentation by students on different tools for WoT.

CO-PO Mapping:

(1:Slight[Low];   2:Moderate[Medium];   3:Substantial[High];   '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1													
CO2													
CO3													
CO4													
CO5													

Model Blue print for the question paper setter

	Blue Print			
S.No.	**UNIT**	**Short 2 M**	**Essay 8 M**	**Percentage %**
1	UNIT - I	2	2	20.8
2	UNIT - II	2	2	20.8
3	UNIT - III	2	2	20.8
4	UNIT - IV	1	2	18.8
5	UNIT – V	1	2	18.8
		16	80	100

III B.Sc. IOT (M.E.IOT)
MODEL QUESTION PAPER (W.E.F 2022-2023)
PAPER- IoT 121- 6C: Web of Things SEMESTER – V

Time: 2 ½Hrs   **Max Marks: 50M**

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SECTION - I

Answer Any <u>Five</u> Questions of the following   **5 X 2M=10 M**

1. Define Internet of Things

2. Write the Web of Things dvice

3. Explain rise of JavaScript

4. How Accessing GPIOs?

5. What is ZigBee?

6. What is WebSockets?

7. How do you Enabling HTTPS?

8. What is Physical mashups?

SECTION –II

Answer <u>ALL</u> Questions   **5 X 8M=40 M**

9. Compare and Contrast IoT and WoT

(Or)

10. Explain how Create your own form to control devices,

11. What is Node.js,? Explain how Installing Node.js on your machine,

(Or)

12. Explain Single and Multithreaded threaded web servers,

13. List the Classification of Network topologies,

(Or)

14. Explain about WoT needs events?

15. Explain how implementing Web Tings

(Or)

16. How Implementing the Web Thing Model on the Pi,

17. Explain how Implementing a Social WoT authentication proxy

(Or)

18. Discuss Physical mashups

	Government College (Autonomous) Rajahmundry	Program & Semester III B.Sc. M.E.IoT (V Sem)			
Course Code IoT121P	**TITLE OF THE COURSE** 6C: Web of Things Lab				
Teaching	Hours Allocated: 30 (Lab)	L	T	P	C
Pre-requisites:	HTML	0	0	3	2

Objectives

1. The W3C Web of Things (WoT) is intended to **enable interoperability across IoT platforms and application domains**.

2. Overall, the goal of the WoT is to preserve and complement existing IoT standards and solutions

List of Experiments

1. Polling Data from WoT Sensor
2. Create your Own form to Control your devices in WoT
3. Installing Node.js in RPi
4. Read the Sensor data as JSON
5. Accessing GPIOs with Nodejs
6. Implementing the Web Thing Model on the Pi
7. Web Control using MQTT
8. Implementing a Social WoT authentication proxy
9. Pushing intruder alert tweets to a Google spreadsheet

![logo]	**Government College (Autonomous) Rajahmundry**	Program & Semester
		III B.Sc. M.E.IoT (V Sem)

Course Code IoT122	**TITLE OF THE COURSE** 7C: Security in IoT				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:	Foundations of IoT	3	1	-	3

Course Objectives:

1. The overall goal is **to protect the entire system which represents an IoT installation**.
2. The more granular security requirements, often called security attributes, are confidentiality, availability, integrity, and privacy

Course Outcomes:

Students after successful completion of the course will be able to:

CO1	Understand the Security requirements in IOT.
CO2	Understand the cryptographic fundamentals for IOT.
CO3	Understand the authentication credentials and access control.
CO4	Understand the various types Trust models and Cloud Security

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

Unit-1:   (10 hours)

Data & Network Security: Need for Security, Security Attack, Security Services, Information Security, Methods of Protection, and Basics of Cryptography: Terminologies used in Cryptography, Substitution Techniques, Transposition Techniques, Network Security, Threats in Networks, Network Security Controls.

Unit-2:   (10 hours)

Securing the Internet of Things: 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 and challenges, Authentication and Authorization in IOT, Access Control in IOT, Threats to Access Control, Privacy, and Availability, Attacks Specification IOT, Vulnerability and Risk in IOT, Attack and Counter measures.

Unit-3:   (10 hours)

Cryptographic Fundamentals for IOT: Cryptographic primitives and its role in IOT, Encryption and Decryption, Hashes, Digital Signatures, Random number generation, Cipher suites, key management fundamentals, cryptographic controls built into IOT messaging and communication protocols, IOT Node Authentication

Unit-4:   (10 hours)

Identity & Access Management Solutions for IOT: Identity lifecycle, authentication credentials, IOT IAM infrastructure, Authorization with Publish / Subscribe schemes, access control

Privacy Preservation and Trust Models for IOT: Concerns in data dissemination, Lightweight and robust schemes for Privacy protection, Trust and Trust models for IOT, self-organizing Things, Preventing unauthorized access.

Unit-5:   (10 hours)

Cloud Security for IOT: Cloud services and IOT, offerings related to IoT from cloud senrice providers, Cloud IOT security controls, An enterprise IOT cloud security architecture, New directions in cloud enabled IoT computing.

Web Security: Web Security Requirements, Secure Socket Layer (SSL), Transport Layer Security (TLS), Secure Electronic Transaction (SET).

References

1. William Stallings, "Network Security Essentials: Applications and Standards", Prentice Hall, 4th edition,2010.

2. Madhusanka Liyanage, An Braeken, Pardeep Kumar, Mika Ylianttila, "IoT Security: Advances in Authentication", Wiley Publishers, 2019.

3. Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations.

4. Michael T. Goodrich and Roberto Tamassia, "Introduction to Computer Security", Addison Wesley,20ll.

5. Brian Russell, Drew Van Duren, "Practical Internet of Things Security", Packt Publication, 2016

6. Web resources:

https://online.stanford.edu/courses/xee100-introduction-internet-things

7. Other web sources suggested by the teacher concerned and the college librarian including reading material.

Co-Curricular Activities:

a) **Mandatory:** *(Training of students by teacher in field related skills: (lab: 10 + field: 05) :*

1. For Teacher: Field related training of students by the teacher in laboratory/field for not less than 15 hours to develop the programs to encrypt/decrypt the data collected by the IoT device with various algorithms.

2. **For Student**: Students shall (individually) search for potential threats/attacks to the IoT devices and its countermeasures online and and submit a hand-written Fieldwork/Project work Report not exceeding 10 pages.

3. Max marks for Fieldwork/Project work Report: 05.

4. Suggested Format for Fieldwork/Project work: *Title page, student details, index page, details of place or websites visited, structure of thewebsite and acknowledgements.*

5. Unit tests (IE).

b) Suggested Co-Curricular Activities

1. Arrange expert lectures by IT experts working professionally in the area of Cyber Security.

2. Assignments (in writing or implementing contents related to syllabus or outside thesyllabus. Shall be individual and challenging)

3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).

4. Awareness Programs by students to community about Cyber Security in daily life

CO-PO Mapping:

(1:Slight[Low];   2:Moderate[Medium];   3:Substantial[High],   '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1													
CO2													
CO3													
CO4													
CO5													

Model Blue print for the question paper setter

S.No.	UNIT	Short 2 M	Essay 8 M	Percentage %
	Blue Print			
1	UNIT - I	2	2	20.8
2	UNIT - II	2	2	20.8
3	UNIT - III	2	2	20.8
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		16	80	100

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM
(Accredited by NAAC "A+" Grade)

III B.Sc. IOT (M.E.IOT)
MODEL QUESTION PAPER (W.E.F 2022-2023)
PAPER- IoT 122- 7C: Security in IoT SEMESTER – V

Time: 2 ½Hrs   **Max Marks: 50M**

……………………………………………………………………………....…………

SECTION - I

Answer Any <u>Five</u> Questions of the following   **5 X 2M=10 M**

1. What is Security Attack
2. Write the need for Security
3. Explain Attacks Specification IoT
4. How Access Control in Threads?
5. What is Digital Signatures,?
6. What is Cipher suites?
7. What are Cloud services?
8. What is Secure Socket Layer (SSL)?

SECTION –II

Answer <u>ALL</u> Questions   **5 X 8M=40 M**

9. What is Cryptography? Explain basics of Cryptography
                                      (Or)
10. Explain about Network Security Controls,

11. Briefly explain Architecture of Security in IOT
                                      (Or)
12. Explain Authentication and Authorization in IOT

13. Discuss Cryptographic primitives and its role in IOT
                                      (Or)
14. Explain about built in controls cryptographic?

15. Define Identity? Explain lifecycle of Identity
                                      (Or)
16. Explain Trust and Trust models for IOT.

17. Explain Cloud IOT security controls,
                                      (Or)
18. Discuss Secure Socket Layer (SSL)

	Government College (Autonomous) Rajahmundry	Program & Semester III B.Sc. M.E.IoT (V Sem)			
Course Code IoT-122P	**TITLE OF THE COURSE** 7C: Security in IoT Lab				
Teaching	Hours Allocated: 30 (Lab)	L	T	P	C
Pre-requisites:		0	0	3	2

Objectives

1. The overall goal is **to protect the entire system which represents an IoT installation**.

2. The more granular security requirements, often called security attributes, are confidentiality, availability, integrity, and privacy

List of Experiments

8. Write Python/Java Program for Substitution Ciphers

9. Write Python/Java Program for Transposition Ciphers

10. List out various IoT attacks and Countermeasures

11. Implement Hash algorithms on the Sensor collected data before sending to the Cloud

12. Implement Digital Signature on the Sensor collected data before sending to the Cloud

13. Implement MQTT with Mosquitto in RPi and explore Various Security features of MQTT protocol

14. Demonstrate AWS IoT Security