PART A: Introduction			
Program: **Diploma**	Class: **BCA**	Year: **II Year**	Session: **2022-23**
Subject: **Computer Application (BCA)**			
1.	Course Code	**S2-BCAC1G**	
2.	Course Title	**Internet of Things (IOTs)**	
3.	Course Type (Core Course/ Elective/ Generic Elective/ Vocational	Generic Elective	
4.	Pre-Requisite (if any)	Student must have basic Computer Knowledge	
5.	Course Learning Outcomes (CLO)	**After completing this course student will be able to:** 1.To understand the basics of Internet of Things 2. To get an idea of some of the application areas where Internet of Things can be applied 3. To understand the middleware for Internet of Things and the concepts of Web of Things 4. To understand the concepts of Cloud of Things with emphasis on Mobile cloud computing 5. To understand the IOT protocols	
6.	Credit Value	**Theory – 4 Credits Practical – 2 Credits**	
7.	Total Marks	Max. Marks: **30+70**	Min. Passing Marks: **33**

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PART B: Content of the Course		
No. of Lectures (in hours per week): **2 Hrs. per week**		
Total No. of Lectures (in hours): **60 Hrs.**		
Module	**Topics**	**No. of Lectures**
I	**Introduction** Introduction: Definition, Characteristics of IOT, IOT Conceptual framework, IOT Architectural view, Physical design of IOT, Logical design of IOT, Application of IOT.	8
II	Machine-to-machine (M2M), SDN (software defined networking) and NFV (network function virtualization) for IOT, data storage in IOT, IOT Cloud Based Services.	14
III	Design Principles for Web Connectivity: Web Communication Protocols for connected devices, Message Communication Protocols for connected devices, SOAP, REST, HTTP Restful and Web Sockets. Internet Connectivity Principles: Internet Connectivity, Internet based communication, IP addressing in IOT, Media Access control.	14
IV	Sensor Technology , Participatory Sensing, Industrial IOT and Automotive IOT , Actuator, Sensor data Communication Protocols ,Radio Frequency Identification Technology, Wireless Sensor Network Technology.	12
V	IOT Design methodology: Specification -Requirement, process, model, service, functional & operational view.IOT Privacy and security solutions, Raspberry Pi &arduino devices. IOT Case studies: smart city streetlights control & monitoring.	12

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PART C: Learning Resources

Textbooks, Reference Books, Other Resources

Suggested Readings

Textbooks:

- Rajkamal,"Internet of Things", Tata McGraw Hill publication.
- HakimaChaouchi "The Internet of Things: Connecting Objects", Wiley publication.
- Francis dacosta "Rethinking the Internet of things: A scalable Approach to connecting everything", 1st edition, Apress publications2013.
- Donald Norris"The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and BeagleBone Black", McGraw Hillpublication.

Reference books:

1. Philip Levis, " TinyOS Programming"
2. D. Norris, "The Internet of Things: Do-It-Yourself Projects with Arduino, Raspberry Pi, and Beagle Bone Black", McGraw-Hill Education, New Delhi.
3. Raj Kamal, "Internet of Things: Architecture and Design", Tata McGraw Hill publication.
4. A. Pajankar and A. Kakkar, "Raspberry Pi by Example", Packt Publishing Ltd, Birmingham,UK.
5. Books published by M.P. Hindi Granth Academy, Bhopal

Suggestive digital platform web links

- https://www.iotforall.com/introduction-iot-applications-in-education
- https://onlinecourses.swayam2.ac.in/arp19_ap52/preview
- http://www.mphindigranthacademy.org/

Part D-Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks : 100

Continuous Comprehensive Evaluation (CCE) : 30marks University Exam (UE) 70marks

Internal Assessment : Continuous Comprehensive Evaluation (CCE):30	Class Test Assignment/Presentation	Total 30
External Assessment : University Exam Section: 70 Time : 03.00 Hours	**Section(A)** : Objective Questions **Section (B)** : Short Questions **Section (C)** : Long Questions	Total 70

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PART A: Introduction			
Program: **Diploma**	Class: **BCA**	Year: **II Year**	Session: **2022-23**
Subject: **Internet of Things(IOTs)Practicals/Lab**			
1.	Course Code	**S2-BCACIR**	
2.	Course Title	**Internet of Things (IOTs) Lab**	
3.	Course Type (Core Course/ Elective/ Generic Elective/ Vocational	**Elective**	
4.	Pre-Requisite (if any)	Open for all	
5.	Course Learning Outcomes (CLO)	**After completing this lab course, students will be able to:** 1. Arduino/Raspberry Concpet. 2. Knowledge of Digital Sensor. 3. Uses of DHT11 Sensors. 4. Knowledge of Bluetooth interface.	
6.	Credit Value	**Practical – 2 Credits**	
7.	Total Marks	Max. Marks: **30+70**	**Min. Passing Marks: 33**

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PART B: Content of the Course	
No. of Lab. Practicals (in hours per week): 1 Hr. per week	
Total No. of Labs: 30 Hrs.	
Suggestive List of Practicals	**No. of Labs.**
1. To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds. 2. To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection. 3. To interface DHT11 sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings. 4. To interface motor using relay with Arduino/Raspberry Pi and write a program to turn ON motor when push button is pressed. 5. To interface OLED with Arduino/Raspberry Pi and write a program to print temperature and humidity readings on it. 6. To interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to smartphone using Bluetooth. 7. To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when '1'/'0' is received from smartphone using Bluetooth. 8. Write a program on Arduino/Raspberry Pi to upload temperature and humidity data to thingspeak cloud. 9. Write a program on Arduino/Raspberry Pi to retrieve temperature and humidity data from thingspeak cloud. 10. To install MySQL database on Raspberry Pi and perform basic SQL queries.	30 Hrs.

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PART C: Learning Resources

Textbooks, Reference Books, Other Resources

Suggested Readings

- Vijay Madisetti and ArshdeepBahga, "Internet of things(AHand-on-Approach)" 1st Edition ,UniversalPress .
- HakimaChaouchi "The Internet of Things: Connecting Objects", Wiley publication.
- Charless Bell "MySQL for the Internet of things", Apresspublications.
- Francis dacosta "Rethinking the Internet of things: A scalable Approach to connecting everything", 1st edition, Apress publications2013.
- Book published by M.P. Granth Academy , Bhopal

Reference books:

- https://www.lnmiit.ac.in/Department/ECE/uploaded_files/Internet_of_Things_Lab_manual.pdf

Suggestive digital platform web links
https://www.corning.com/in-building-networks/worldwide/en/home/knowledge-center/practical-iot.html
Suggested equivalent online courses
https://onlinecourses.nptel.ac.in/noc21_cs17/preview
http://www.mphindigranthacademy.org/

Part D-Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Internal Assessment	Marks	External Assessment	Marks
Class Interaction /Quiz		Viva Voce on Practical	
Attendance		Practical Record File	
Assignments (Charts/ Model Seminar / Rural Service/ Technology Dissemination/ Report of Excursion/ Lab Visits/ Survey / Industrial visit)		Table work / Experiments	
TOTAL	30		70

Generic elective II

Part A Introduction				
Program:**Diploma**		Class:BCA	Year:II Year	Session: 2022-2023
Subject:**Computer Applications**				
1	Course Code	S2-BCAC2G		
2	Course Title	**Optimization Techniques**		
3	Course Type	**Generic Elective**		
4	Pre-requisite (if any)	To study this course, a student must have had Certificate Course.		
5	Course Learning Outcomes (CLO)	The course will enable the students to: 1. Formulate real life problems into linear programming problem. 2. Apply the simplex method to find an optimal vector for the standard linear programming problem and the corresponding dual problem. 3. Find optimal solution of transportation. 4. Formulate and solve linear programming model of two person zero sum game. 5. Solve nonlinear programming problems using Kuhn-Tuckerconditions.		
6	Credit Value	06Credits		
7	Total Marks	Max. Marks: 30 + 70 = 100	Min. Passing Marks: 33	

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Part B - Content of the Course		
Total No. of Lectures (in hours per week):3 hours per week Total Lectures:90 hours		
Unit	Topics	No. of Lectures
I	**Linear Programming Problem:** 1.1Basic concepts oflinear programming problem 1.2Simplex method and algorithm 1.3 Artificial variables technique 1.4 Two-phase method 1.5 Big-M method	15
II	**Duality:** 2.1Definition and formulation of the dual problem 2.2 Primal-dual relationships 2.3 Economic interpretation of the dual 2.4 Dual simplex Method 2.5 Sensitivity analysis	15
III	**Transportation Problems:** 3.1 Mathematical model 3.2 Balanced and unbalanced problems 3.3 Degeneracy 3.4 Optimality conditions 3.5 Methods to find starting solution and optimal solution 3.6 Algorithm for solving transportation problem 3.7 Northwest-Corner method 3.8 Least cost method 3.9 Vogel approximation method for determination of starting basic solution	20
IV	**Network Analysis:** 4.1 Constraints in network 4.2 Construction of network 4.3 Critical Path Method (CPM) 4.4 PERT calculation 4.5 Resource leveling by network techniques 4.6 Advances of network (PERT/CPM)	20
V	**Game Theory:** 5.1 Formulation of two person zero sum games 5.2 Solving two person zero sum games 5.3 Games with mixed strategies 5.4 Graphical solution procedure 5.5 Linear programming solution of games 5.6Non-Linear programming techniques 5.6.1 Kuhn-Tucker conditions 5.6.2 Non-negative constraints	20
Keywords/Tags: Linear Programming Problem, Duality, Transportation Problems, Network Analysis, Game Theory.		

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Part C - Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings:

Text Books:

1. KantiSwarup, P.K. Gupta and Manmohan: Opertions Research, Sultan Chand and Sons, New Delhi, 2014.
2. Guillermo Owen: Game Theory, Emerald Publishing Limited, 4th edition, 2013.
3. S. D. Sharma: Operations Research, KedarNath Publication, 2012.
4. Nita H. Shah, Ravi M. Gor and HardikSoni: Operations Research, PHI Learning Pvt. Ltd., 2007.
5. Book published by M.P. Granth Academy , Bhopal

Reference Books:

1. Mokhtar S. Bazaraa, John J. Jarvis and Hanif D. Sherali:Linear Programming and Network Flows, 2nd Ed., John Wiley and Sons, India, 2004.
2. F.S. Hillier and G.J. Lieberman:Introduction to Operations Research, 9th Ed., Tata McGraw Hill, Singapore, 2009.
3. Hamdy A. Taha:Operations Research, An Introduction, 8th Ed., Prentice-Hall India, 2006.
4.Prem Kumar Gupta and D.S.Hira: Operations Research-An Introduction, S.Chand & SonsCompany Ltd.,New Delhi, 1995.

Suggested Digital Platforms Web links:

https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=25
https://www.highereducation.mp.gov.in/?page=xhzlQmpZwkylQo2b%2Fy5G7w%3D%3D

Suggested Equivalent online courses:

https://nptel.ac.in/courses/110106062/
https://nptel.ac.in/courses/111107128/
https://ugcmoocs.inflibnet.ac.in/index.php/courses/view_ug/275
http://www.mphindigranthacademy.org/

Part D-Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks : 100

Continuous Comprehensive Evaluation (CCE) : 30marks University Exam (UE) 70marks

Internal Assessment : Continuous Comprehensive Evaluation (CCE):30	Class Test Assignment/Presentation	Total 30
External Assessment : University Exam Section: 70 Time : 03.00 Hours	**Section(A)** : Objective Questions **Section (B) :** Short Questions **Section (C) :** Long Questions	Total 70

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