



SYMBIOSIS INTERNATIONAL (DEEMED UNIVERSITY)

(Established under section 3 of the UGC Act 1956)

Re - accredited by NAAC with 'A' Grade

Founder: Prof. Dr. S. B. Mujumdar, M.Sc., Ph.D. (Awarded Padma Bhushan and Padma Shri by President of India)

(Established under section 3 of the UGC Act 1956, by notification No.F.9-12/2001-U3 Government of India)

Sub Committee - Specialization for Curriculum Development

(IT Infrastructure for Management)

Post Graduate/ Under Graduate

Course Title: Internet of Things

Course Code: TM2031

Number of Credits: 2

Level: 5

Learning Objectives:

1. Compare how the telephone system works (that is, peer-to-peer networks) with how media delivery works (that is, broadcast/multicast networks).
2. Explain the tradeoffs between circuit switched networks (that is, dedicated resources) and packet switched networks (that is, shared resources).
3. Tell interesting stories about key innovations that transformed the communications, entertainment and consumer electronics industries.
4. Explain how email, YouTube, SMS, etc. work.
5. Find resources for those wishing to do more of a “deep-dive” into the above topics.
6. Understand what the cloud is and how it works.
7. Install and configure the AWS CLI and SDK on a Linux system.
8. Use various AWS services such as EC2, IoT, and many more.
9. Build projects that heavily leverage the cloud.
10. Integrate the cloud into embedded systems.
11. Implement session initiation, management and termination on your DragonBoard™ 410c using SIP.
12. Discover other users and exchange device capabilities.
13. Compare and contrast narrowband and wideband codecs and experience the voice quality differences between them.
14. Implement and demonstrate VoIP calls using the DragonBoard 410c.

Pedagogy

Blended Learning and Projects

Pre-learning: Computer Networks, protocols

Course Outline:

Sr. No.	Topics	No. of hours
Internet of Things: How did we get here?		
1	Introduction: <ul style="list-style-type: none"> • Welcome to the Internet of Things Specialization! • Capstone 1: Sonification of Movement • Capstone 2: Healthcare Remote Monitoring • Qualcomm talks about the course 	2
2	Circuit Switched Networks: <ul style="list-style-type: none"> • Introduction • We love to talk • Birth of the Telephone • Control Plane • Data Plane • Broadcast Innovations • Broadcast Industry • Content is King • Sampling: Analog <---- > Digital • Audio and Speech Coding • Shannon: Information Theory • Transistor • C and UNIX • Regulated Monopoly • Breakup of AT&T • Impact on Research 	2
3	Packet Switched Networks: <ul style="list-style-type: none"> • Introduction • CS and PS (Control Switched and Packet Switched) • Brief History • TCP / IP Protocol • Open Standards • Email • Browser • Voice over RTP/UDP/IP or VoIP • Broadcast / Multicast 	2
4	Computer Telephony: <ul style="list-style-type: none"> • Introduction • Data Plane • Control Plane 	2

	<ul style="list-style-type: none"> • The Big 5 • Power Shift • Message Machine • Interactive Voice Response • Call Centers • What happened to the dial tone? • The 911 Fiasco • Hackers get into your phone 	
5	<p>Wireless Technologies:</p> <ul style="list-style-type: none"> • Introduction • Why would someone want to walk around with a phone? • AT&T almost missed the boat! • Leveraging Telephony Infrastructure for Mobility • Billing and Prepaid • Get more spectrum • Improving Spectral Efficiency • Reduce data rate for each voice call • 3G and 4G evolution • WiFi • Bluetooth • Other low power radios • Introduction to Lesson 5 • Telephony 1-to-1 • Broadcast 1-to-N • Sensor Networks N-to-1 • A platform for IoT 	2
6	<p>Features and Apps:</p> <ul style="list-style-type: none"> • Introduction • Solutions Looking for Problems • Unintended Consequences • Phones get GPS • Phones get Cameras, accelerometers, etc • Voice is not the killer app? 	2
7	<p>Future Outlook:</p> <ul style="list-style-type: none"> • Introduction • IoT: What the heck is it? • Build your own IoT • Specialization in a Nutshell • IoT: mHealth • IoT: Smart Homes • IoT: Automotive 	2

Setting up and Using Cloud Services		
8	Cloud 101 for Dragonboard 410c: <ul style="list-style-type: none"> • The Cloud • AWS Services • Systems Architecture • Assigned Homework • Amazon AWS - Bring Up • Assigned Homework • REST API & JSON • MQTT Protocol • AWS IoT SDK • Assigned Homework • Elastic Cloud Compute (with LAMP) • REST API & PHP Walkthrough • RDS, S3, and Code Commit • Assigned Homework • Rekognition • Polly • Lex • GPU's for Machine Learning 	2
9	Real projects using AWS Cloud services: <ul style="list-style-type: none"> • Description and Execution • Code Walkthrough • Description and Execution • Code Walkthrough • Description and Execution • Code Walkthrough 	2
10	Advanced Projects and Code - Deep dive: <ul style="list-style-type: none"> • Description and Execution • Code Walkthrough • Assigned Homework • Description and Execution • Code Walkthrough • Description and Execution • Code Walkthrough 	2
Communication Technologies:		
11	Introduction	2

12	Terminology/Cheat Sheet (Beginner): <ul style="list-style-type: none"> • Introduction • Acronyms • Frequent Terminology • Software Stack • Internet Protocol • Packet-switched Network • PSTN: The Traditional Phone • Linphone Source Code • Codec Selection 	2
13	VOIP in a Nutshell: <ul style="list-style-type: none"> • Introduction • What is VoIP? • Flavors of VoIP • VoIP: Common Applications and Fun Facts • What is Linphone? • Linphone Features • Setup • Linphone Essentials • SIP • Protocol Operations • Network Elements • SIP Messages 	2
14	Codecs: <ul style="list-style-type: none"> • Introduction • Why compress data? • Why does it work? • What to look for? • Amplitude - Log Companding (PCM) • Time - Adaptive, Delta Quantization (ADPCM) • Frequency - ADPCM in multiple subbands (Subband ADPCM) • Speech production model • Linear Predictive Coding of Speech • 2G / 3G Codecs • Voice Quality • VoIP over Wireless 	2
15	Make your own VoIP application: <ul style="list-style-type: none"> • Introduction • SipProfile • SipManager • Code Walkthrough 	2

	<ul style="list-style-type: none"> • Deploy and Demo • VoIP and the Smart Home • VoIP and the Smart Office • Mobile VoIP and EoIP 	
	Total	30

Recommended Readings from Coursera

- History of Bell Systems
- AT&T System in 1953
- reading on the Carterphone
- Further reading on 1G and 2G cellular
- Links for mHealth video
- The analog expansion header

Suggested Assessment/ Evaluation Methods

As per Coursera

Benchmarked against similar courses in other national/ international universities /organizations

Sr. No.	Name of the Course	Name of University where it is offered
1	Masters in IoT	Queen Mary University of London
2	IoT - Roadmap to a connected world	MIT Professional Education
3	Data Science for IoT	University of Oxford

Name of Members	Dr. R. Raman	Dr Rohit Prabhudesai			
Designation	Professor	Asst. Professor			
Org. / Inst.	SIBM-P	SIBM-P			
Signature					

Signature of Dean:

Date: