College of Science and Technology

African Center of Excellence in Internet of Things (ACEIoT)

P.O.BOX BP 3900, Kigali

Master of Science in Internet of Things: Embedded Computing Systems (MSc in IoT:ECS)

PROGRAMME SPECIFICATION

(August, 2017)

Master of Science in Internet of Things:Embedded Computing Systems (MSc in IoT:ECS)

1. PROGRAMME DETAILS

The table in this section sets out the programme details. It shows the title, which is also the highest qualification obtainable from the programme. The title was selected with the aim to make the programme look both academically sound and useful for employment. In addition, in the table we specify the exit awards, the mode of attendance and the resource group. For the resource group in particular, we opt a part classroom/part laboratory. According to the National Qualification Framework, such a class corresponds to category 5 with a staff/students ratio of 1:14.

<table>
<tr><td>1.1 Programme Title</td><td colspan="4">Master of Science in Internet of Things:Embedded Computing Systems</td></tr>
<tr><td rowspan="4">1.2 Exit Awards</td><td colspan="4"><table><tr><td></td><td>Credits</td></tr><tr><td>Master of Science in Internet of Things: Embedded Computing Systems , MSc in IoT-ECS</td><td>240</td></tr></table></td></tr>
<tr><td>Part-time</td><td></td><td>Full-time</td><td>X</td></tr>
<tr><td>Distance Learning</td><td></td><td>Work-based Learning</td><td></td></tr>
<tr><td>Other (please specify)</td><td></td><td>Short course</td><td></td></tr>
<tr><td rowspan="4">1.3 Resource group</td><td>1</td><td></td><td>5</td><td>X</td></tr>
<tr><td>2</td><td></td><td>6</td><td></td></tr>
<tr><td>3</td><td></td><td>Other (write in)</td><td></td></tr>
<tr><td>4</td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">1.4 Year of presentation</td><td colspan="3">2017 (1st Presentation)</td><td>X</td></tr>
<tr><td colspan="3"></td><td></td></tr>
<tr><td>1.5 Programme Leader</td><td colspan="4">Prof. Santhi Kumaran, Director, ACEIoT</td></tr>
</table>

1.6 Programme Development Team

Name	School/Institution
Prof.Santhi Kumaran(Chair)	ACEIoT, UR-CST, Rwanda
Dr. Damien Hanyurwimfura	ACEIoT, UR-CST, Rwanda
Dr. Luc Ngend	School of ICT, UR-CST, Rwanda
Dr. Richard Musabe	School of ICT, UR-CST, Rwanda
Dr.Said RutabayiroNgoga	School of ICT, UR-CST, Rwanda
Dr. Gaurav Bajpai	School of Engineering, UR-CST, Rwanda
Dr. Marco Zennaro	International Center of Theoretical Physics (ICTP), Italy

Prof.Raja Datta	Indian Institute of Technology (IIT), Kharagpur, India
Prof. Martin Saint	Carnegie Mellon University (CMU)-Africa
Dr.ChomoraMikeka	University of Malawi (UNIMA), Malawi
Dr. Jimmy Nsenga	CETIC, Belgium
Mrs. Didacienne Mukanyiligira	ACEToT, UR-CST, Rwanda

1.7	**School/Centre Administratively responsible for the Program**
	African Center of Excellence in Internet of Things (ACEIoT)

2. PROGRAMME FUNDING AND NEED FOR RESOURCES

2.1 Programme Development Team

The team is composed of the Programme Leader and six academic staff from UR-CST and regional and international experts from Research labs and Universities (ICTP Italy, CETIC Belgium, IIT Kharagpur-India and UNIMA Malawi, CMU-Africa) who were involved in the writing and planning of the module descriptors. Also included were representatives from private and public sector such as RISA, MYICT, HeHe labs ltd.. The Programme leader who is also the Director of the ACEIoT will be present throughout the planning process, including the validation meetings.

2.2 Students numbers:

Intake per year into Level 6: 15 students/specialization
Eventual population, all years: 30 students

2.3 Adequacy of Infrastructure

The programme will be resourced from the existing resources of the College of Science and Technology Campuses. The classrooms and computer laboratories are adequate for the program. Two special state of art laboratories (Wireless Intelligent Sensor laboratory and Embedded Computing Systems laboratory) including a mini fab lab will be set up by the ACEIoT –World Bank funds.

2.4 Adequacy of Staff Resource

Here the numbers and level of staff working on the programme in each year are given with the objective to show how the staff resource is adequate in terms of numbers and seniority as well as to cost the programme in financial terms. The staff figures given in the table are full time equivalents.

Year	**2017/18**	**2018/19**	**2019/20**	**2020/21**	**SOURCE OF FUNDS**

Academic Staffing					
Full professors	0	1	1	2	UR/ACEIoT
Associate professors	1	2	3	4	UR/ACEIoT
Senior lecturers	2	4	5	6	UR/ACEIoT
Lecturers	3	4	5	6	UR/ACEIoT
Support Staff	4	4	6	8	UR/ACEIoT
Technical & Other Staff	2	2	2	2	UR/ACEIoT

2.5 General accommodation requirements

The figure in this section serves to give an idea on the number and size of rooms that will be needed by the programme.

- Two classrooms and Two computer laboratories for at least 30 students are available. Apart from the above specialized laboratories (Wireless Sensor Networking Laboratories, UMV labs, fab Labs and Embedded Systems Labs) will be available.
- Students will, however, be encouraged to bring their own devices (BYOD), thus enabling them to access online materials and lectures.

3. PROGRAMME AIMS AND RATIONALE

This program specification has been produced to conform to the Rwandan National Qualifications Framework for Higher Education Institutions. Use has also been made of the ITU Post Graduate Course in Internet of Things to ensure that the proposed curriculum meets International Standards.

3.1 Programme Rationale

To improve capabilities for innovation and higher productivity and to become globally competitive we should invest in higher education and training in Science Technology and Innovation (STI). The latest ICT technologies such as Internet of Things (IoT) have the potential to revolutionize science and transform lives through environmental management, monitoring and control by remote sensing, agriculture, health equipment, automation in e-governance, tourism, networking, security, software developmentand will greatly improve service delivery in all sectors. This will create more jobs and reflect into socio-economic development.

There is scarcity of trained personnel in the IoT domain in the East and South African (ESA) region who can work towards development of new innovative approaches and solutions, focusing on low-cost, open and sustainable solutions. Therefore, the main development challenge is to build a critical mass of African scientists and engineers in the field of IoT through higher education, research and training. Rather than addressing a specific development challenge, IoT

focusses on the underlying technological framework for all development challenges. For example to list few, IoT devices can greatly benefit farmers to monitor irrigation and to predict water necessities based on temperature, humidity, soil moisture and light readings; would be the best monitoring tool for disaster management; could be used as patient vital sign monitoring and scheduling device in rural and remote health centers; and to monitor real-time data such as the state of batteries, the usage of energy , the status of the panels allowing for the dynamic exchange of energy among users.

Hence, we propose Masters programs in Internet of Things with various focus domains under the African Center of Excellence in Internet of Things (ACEIoT) to educate and train African researchers in the field of IoT. IoT is a multidisciplinary field and the two main focus directions are (i)Wireless Sensor Networking and (ii) Embedded Computing Systems. We have developed two Master's programmes focusing on the two major fields. Both programmes have five modules of 50 credits out of the 240 credits in common and are core compulsory modules of the Masters in IoT program. Both the programmes, therefore has 28.83% of the content in common. These modules introduce the whole area of the Internet of Things and explain its relevance and importance. This background will be instrumental for the student to undertake the other specialized modules of the Embedded Computing Systems field successfully. They ought to understand the flow of the modules, and the expected learning outcomes.

With billons of connected products, IoT end nodes will have to be smart. They must be able to act independently, as well as act in concert with each other. IoT-connected products will require complex M2M middleware for communication, zero configuration networking, and advanced protocols for cloud connectivity. Because many of these end products will be resource-limited to minimize cost, size, space, power consumption, heat dissipation, etc., the task of creating advanced embedded systems to meet IoT requirements becomes extremely challenging.The *Master of Science in IoT-Embedded Computing Systems (MSc in IoT- ECS)* program apart from teaching the ever-increasing importance of sensor technology in today's information society, provides knowledge on operating system (OS) to manage the advanced middleware and IoT protocols, frameworks for memory and power management, as well as scalability features available on a full-featured, real-time operating system (RTOS), it is possible to have a system behave as if it has more resources available than what's actually present.

The importance of power management and power optimization will steadily grow as an increasing number of battery-powered products connect to the cloud. More often than not, engineers address power concerns by looking to the core of the system, whether it is a microcontroller (MCU), a low-end digital signal processor (DSP), or a field-programmable gate array (FPGA), therefore emphasize is given on these topics in this program.Moreover, much of the IoT's growth will be driven by low-cost microcontrollers (MCUs) and the program covers these aspects. MCU-based development has historically been driven largely by reducing

footprint to maximize the use of limited, system-on-chip (SoC) resources. For embedded developers, footprint reduction starts with the underlying framework: the operating system. Although a vast array of embedded operating systems is available, selecting a scalable OS can be critical to success and the students will gain the right knowledge to do the right choice.

Research Seminar: Every module will have a component called Research Seminar. The seminar topic relates to the content of the study course. The students work on the topic on their own, present it for discussion.

The projects are a major part of the programme. They are designed to enable students to demonstrate their skills and ability to solve real-life problems while gaining more detailed knowledge of a particular topic. Projects should be simulation-based or experimental. In all cases, students are expected to show innovation and an ability to come up with own solutions.

As ACEIoT is a collaborative Project with Regional and International partners from Academia, Industries and Research Institutions funded by World Bank to build STI capacity in the ESA region, this Master's programs will be targeting students from within the country Rwanda and to the students from the ESA region.

Educational Aims

The main thematic basis of the programme is to provide the knowledge to choose operating systems to minimize footprint that's both scalable and includes a power-management framework to leverage the features in the silicon, MCU- development to maximize the use of limited, system-on-chip (SoC) resources.The program provides students with the basic skills needed by the software developers to add advanced operational features in embedded systems with limited system resources.

The programme has the following educational aims:

- To provide practical introduction to Sensors, Actuators, and Programming of Sensor network nodes;
- To train embedded-system developers to generate power-efficient code for memory and power management and power optimization;
- To provide knowledge about various Real Time Operating System (RTOS) kernel and its scalability;
- To expose students to the core of the system such as microcontroller (MCU), a low-end digital signal processor (DSP), or a field-programmable gate array (FPGA), SoC designs etc.;
- To develop a broad technical understanding of the IoT related ECS technologies applied to business in a real world perspective;
- To develop communication, interpersonal, and team building skills;

4. PROGRAMME LEARNING OUTCOMES

A. Knowledge and Understanding

At the end of the programme students should be able to demonstrate knowledge and understanding of the:

A1. Concepts of sensors and actuators, protocols, networking aspects and delivery platforms of IoT systems and regulatory aspects of IoT systems.

A2. Programming aspects of the WSN and Intelligent Smart devices, selection of appropriate platforms for the building a WSN.

A3. Principles of IoT business and requirements to start an IoT business and its legal implications;

A4. Ultra-low power devices/sensors with their circuit of operation, the various operating systems and the communication subsystem.

A5. Principles of embedded systems, their components and methodologies for the system on chip design and development and use of simulators for ultra-low-power system design.

A6. Principles and use of existing AI and ML techniques to prototype context-aware analytical applications

A7. The various power harvesting systems and Simulations using Agilent Advanced Circuit Simulator, HFSS, or Microwave Studio.

A8. Theory and techniques for implementing edge & distributed Computing

A9. Principles of 3D printing and its software with special focus on Open SCAD and PCB designs

A10. Research methodology involving embedded analytics and identification of business applications.

B. Cognitive/ Intellectual Skills/ Application of Knowledge

At the end of the programme students should be able to:

B1. Critically analyse IoT use cases and to apply appropriate technologies for innovative designs of IoT system solutions

B2. Program wireless sensor nodes/networks (WSN) and to develop intelligent algorithms.

B3. Build interrupt-based programs and to use peripheral components to realize complex tasks for embedded systems and to develop scheduling algorithms for real time operating systems

B4. Use IoT in the development of solutions to problems in business; start and grow small business.

B5. Critically analyse the power consumption of devices and apply ultra-low power design techniques to design low power sensors

B6. Design objects, casings and fabricate simple layouts, print a PCB and lease cut simple objects

B7. Identify the right operating systems for simple embedded devices, Sensors/Actuators, WSN and to apply special purpose real time operating systems and fault tolerant systems

B8. Apply the knowledge, the know-how and the interpersonal skills they have acquired during their internship.
B9. Deploy research methodology in embedded computing Systems field to achieve a novel and leading edge outcome.

C. Communication/ICT/Numeracy/Analytic Techniques/Practical Skills

At the end of the programme students should be able to:

C1. Undertake testing of design ideas of IoT systems in the laboratory or by simulation, and analyse and critically evaluate the results;
C2. Use software development environment and real-time operating system to develop, debug embedded devices/systems;
C3. Use software in the design of energy harvesting circuits that can help IoT sensors utilize energy harvested directly from the environment;
C4. Design and simulate models using Open SCAD and 3D software.
C5. Critically evaluate the installed RTOS in various equipment used for embedded systems.
C6. Communicate scientific research outputs among the relevant stakeholders and IoT research community.

D. General transferable skills

At the end of the programme students should be able to:

D1. Apply smart sensors and actuators to solve community based problems in the field Agriculture, Energy, Health etc.
D2. Manage an embedded software development project using SDLC and Communicate effectively using sketches block diagrams and wiring diagrams;
D3. Start your own businesses and communicate effectively (written, verbal drafting, sketching etc.) in presenting an IoT business plan, business reports and market analysis reports;
D4. Create awareness about the usefulness of IoT technologies and demonstrate problem solving skills using IoT techniques;
D5. Efficiently disseminate scientific research findings within the community and outside, to the research sphere for inter-disciplinary cooperation for increased visibility.

5. PROGRAMME STRUCTURE

Students are required to obtain 240 credits as stated in "Rwandan National Qualification Framework for Higher Education Institutions". Duration of the programme is two academic year. As specified in "Rwandan National Qualification Framework for Higher Education Institutions", the academic year will be divided into four semesters of 15 weeks each. A semester will consist of twelve weeks of learning and teaching, one week for revision and consolidation and two weeks during which examinations etc. take place. Academic work and assessments will be carried out within the month in which the module is taught and completed.

Semester I (January-June)					
Module Code	**Module**	**Contact Hours**	**Credits**	**Level**	**Achievement of Programme Outcomes**
IOT6161	FUNDAMENTALS OF INTERNET OF THINGS	36	10	6	A1, A3-A5, B1, B3, B4, B7, C1, C2, C5, C6, D1, D4, D5
IOT6162	SMART SENSORS & ACTUATORS	36	10	6	A1-A5,B1-B4,B7,C1-C3,C5,C6,D1,D4, D5
IOT6163	WIRELESS SENSOR NETWORKS	36	10	6	A1-A5,B1-B4,B7,C1-C3,C5,C6,D1,D4, D5
IOT6164	DESIGNING AND PROGRAMMING EMBEDDED DEVICES	36	10	6	A1,A2,A4,A5,A7,B1-B3,B5,C1-C3,C5,C6, D1,D2,D4,D5
IOT6165	IoT ENTERPRENEURSHIP	36	10	6	A1-A3,A7,A8,A10, B1, B4, C1, C3, C5, C6, D1, D3, D4, D5
IOT6166	RESEARCH METHODOLOGY	36	0	6	A1,A2,A10,B1,B2,B9,C1,C2, C6,D1,D4,D5
Semester II (July-December)					
Module Code	**Module**	**Contact Hours**	**Credits**	**Level**	**Achievement of Programme Outcomes**
ECS6261	ULTRA-LOW POWER DESIGN TECHNIQUES FOR IoT DEVICES	48	15	6	A4, A5, A7, B5, B7,B9, C1, C3, C6, D1, D4, D5
ECS6262	SYSTEM ON CHIP DESIGN	48	15	6	A1,A2,A5,B2,B3,B8,C2,C3,C5,D2,D4
ECS6263	EDGE AND DISTRIBUTED COMPUTING	48	15	6	A6,A8,A10,B1,B4,B9,C1,C6, D4,D5
ECS6264	IoT OPERATING SYSTEMS	48	15	6	A2, A4, A7, A10, B3,B8, C2, C5, C6, D2,D4,D5
ECS6265	MODELLING AND FABRICATION TECHNIQUES	36	10	6	A9,A10,B6,B9,C3,C4,C6, D3, D4,D5
Internship will start immediately after the End of the Last Module in Semester II (January to March) Project work will start from April to November (Semester III and IV)					
ECS6361	FIELD ATTACHMENT	72	20	6	B1,B2,B4,B8,C1,C2,C3,C5,D1,D2, D3,D4
ECS6461	MASTER'S DISSERTATION	360	100	6	A1, A2, A4, A6,A7, A10, B1, B2, B3, B4, B9, C1, C2, C3, C5, C6,D1, D2, D4, D5
	Total	**858**	**240**	**6**	

Programme Mapping

	Semester I (January 2018-June 2018)																														
	Module	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	B6	B7	B8	B9	C1	C2	C3	C4	C5	C6	D1	D2	D3	D4	D5
IOT 6166	Research methodology	√	√								√	√	√							√	√	√				√	√		√	√	√
IOT 6161	Fundamentals of Internet of Things	√		√	√	√						√		√	√			√			√	√			√	√	√		√	√	√
IOT 6162	Smart Sensors & Actuators	√	√	√	√	√						√	√	√	√			√			√	√	√		√	√	√			√	√
IOT 6163	Wireless Sensor Networks	√	√	√	√	√						√	√	√	√			√			√	√	√		√	√	√			√	√
IOT 6164	Designing and Programming Embedded Devices	√	√		√	√		√				√	√	√		√					√	√	√		√	√	√	√		√	√
IOT 6165	IoT Enterpreneurship	√	√	√				√	√		√	√			√						√		√		√	√	√		√	√	√
	Semester II (July 2018-December 2018)																														
	Module	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	B6	B7	B8	B9	C1	C2	C3	C4	C5	C6	D1	D2	D3	D4	D5
ECS6261	Ultra-Low Power Design Techniques for IoT devices				√	√		√								√		√		√	√		√			√	√			√	√
ECS6262	System on Chip design	√	√			√							√	√					√			√	√		√			√		√	
ECS6263	Edge and Distributed Computing						√		√		√	√			√					√	√					√				√	√
ECS6264	IoT Operating systems		√		√			√			√			√					√			√			√	√		√		√	√
ECS6265	Modelling and Fabrication Techniques									√	√						√			√			√	√		√			√	√	√
	Semester III & IV (January 2019-December 2019)																														
	Module Name	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	B6	B7	B8	B9	C1	C2	C3	C4	C5	C6	D1	D2	D3	D4	D5
ECS6361	Field Attachment											√	√		√				√		√	√	√		√		√	√	√	√	
ECS6461	**Dissertations/ Project**	√	√		√		√	√			√	√	√	√	√					√	√	√	√		√	√	√	√		√	√

6. LEARNING AND TEACHING STRATEGY

We follow a module based teaching approach and modules will be offered in a carefully orchestrated instructor-led teaching, e.g. as a full-time, five-days a week, lecture-based classroom presentation. This could be followed by three weeks of instructor-led e-learning with self-study of reference materials (primary documents whenever possible). At the end of the final week, an interactive seminar should be held to enable students to strengthen their knowledge and understanding by discussing and resolving problems based on real-life situations. All modules might benefit from exploiting different delivery modes adapted by the Lecturer.

For example, the time allocated to a module might be divided between:
- Classroom teaching and physically attended seminars and workshops.
- Research seminars, Case studies and practical exercises which should be included in all modules.
- Instructor-led remote lectures (live or pre-recorded in some cases).
- Self-study of textbooks and reference material.

The 10/15 credits modules will be taught within four and five weeks respectively. Research methodology which is a zero credit that shall be taught in two weeks, the internship will span over a period of 2 to 3 months and the project shall span for over a period of six to eight month with supervision and no classroom teaching until otherwise advised by supervisor in advance.

Category 1: Theory with No credits module

1) Only 36 hours of lectures shall be provided with a significant assignment in built to pass.

The basic strategy is to encourage students to work independently.

Category 2: Theory course with Practical's or 10/15 credit modules

1) 36/48 contact hours (lectures, tutorials, discussions, seminars, case studies etc.)
2) 26/42 hours of self study
3) 38/60 hours' work on written assignments, practical's and mini project (mandatory)

Category 3: Field Attachment with 20 credits

Field & Supervised Learning: 200 hours total consisting of 176 hours (22 working days) of field placement and 24 hours Report Writing.

Category 4: Master's Thesis /Dissertation with 100 credits

1000 hours of practical work includes field survey and all previous modules to be passed as the project carried out shall involve the requirement / design / analysis / testing / maintenance /etc. provided in all modules taught in semester I & II to link up to a particular working project at the end of this module with Practise oriented to Students thesis.

Note*

(The meaning is the student shall be provided tentatively a research project after IOT6166 Research Methodology module, which has to be, carried forward with all other modules as assignment or mini project whatever is applicable depending on theoretical or practical nature of the modules)

7. ASSESSMENT STRATEGY

The module evaluation will be based upon individual assessment submitted by Lecturer at the end of the module. The special tools/software's and strategies will be used to avoid plagiarism, cheating and other malpractices. The specific marking criteria for each module will be provided in individual module descriptions. The Final Exam shall be of 2 hours following general masters programme format as already followed. A tentative guide is provided for lecturer to use for continuous assessment but may vary with different module but at least 4 different elements shall be covered.

Category 1: Theory with no credits module

Only class assignments to be marked during lecture to pass

Category 2: Theory course with Practical's or 10/15 credit module

The Final assessment shall include 60% of continuous and 40% of End of Module assessment.

The assessments shall be made 50% each for practical and theoretical aspects. A completed module will be considered passed only if a minimum score of 60 % or above is achieved during evaluation.

For Example:

One quiz (5%), one/two practical assignment (10%), one Research Seminar or mini project for presentation (20%), one tutorial session (5%), short practical test (10%) and a short written test (10%) followed by final assessment (40%) of End of Module Examination divided equally into practical viva-voce and theoretical examination.

Category 3: Field Attachment with 20 credits

1 report by the student;

Evaluations of the professional and social skills of the student by the company field attachment supervisor (intermediary and final evaluation);

Copy of the work certificate from the company

Category 4: Master's Thesis/Dissertations with 100 credits

The Thesis/dissertations will be evaluated by a written report, presentation and oral examination by the external examiner(s) during the Project Defence. The guidelines shall be provided during IOT6166 module.

• Examination.

An examination could be used to assess a complete module, especially the Foundation modules where students are either physically present face-to-face or electronic (on-line) tools can be used. However, this method may not be flexible enough to cover Advanced modules, where understanding demonstrated through projects and exercises will be much more important.

• Essays.

An essay can be used to demonstrate a student's understanding of the content of a particular module. This would demonstrate a student's ability to assimilate a subject in depth and objectively analyse the material that has been provided. However, marking of essays can be time consuming for the course tutor and lead to a degree of subjective assessment which depends, for example, on the student's knowledge of English rather than on their level of knowledge of the subject.

• Projects.
A project can be set which requires the student (or a group of students) to research a subject in more depth than has been provided on the course. The thoroughness with which a project has been completed and the adequacy of the results obtained could be an excellent way to assess whether a student has fully understood the concepts and methods used in the module. Ideally, around 50% of the marks for a particular module should be based on the results of projects or interactive exercises if these can be set in the required context and timescale.
• Research Seminars.
Every module will have a component called Research Seminar. The seminar topic relates to the content of the study course. The students work on the topic on their own, present it for discussion.
• Interactive exercises.
These can be a fun way of quickly allocating marks to a student or a group of students. A problem can be outlined and the student or group of students asked to work out the best way of solving it (e.g. how to design an IoT regulation in a national context). Enough scope should be given to allow the student to come up with innovative ways of solving the problem.

8. STUDENT PROFILE

This Masters (MSc in IoT-ECS) could be taken by any professional who has previously graduated with a first-level University degree (e.g. BSc) in the field of ICT or Electrical & Electronics.
Prospective candidates for the programme will include

i) Fresh graduates with relevant ICT or Electrical & Electronics Engineering degrees with Second Class Honors Upper Division and above
ii) Non professionals should have at least 2 years of working experience in the related field. They shall be required to complete at least four pre-requisite modules of bachelors programmes as given in Section 2.10

9. SPECIFIC ADMISSION CRITERIA

The minimum entrance requirement to MSc in IoT-ECS Programme at UR-CST is a Bachelor Degree with Second Class Honors Upper Division. The program designed for anyone wishing to enhance their professional knowledge in the field of IoT with ECS specialization, for example:
- Electronics Engineers
- Electrical Engineers
- Telecommunications Engineers
- Computer Engineers

Students with non-technical Bachelor degrees should have atleast two years minimum experience in the related field (in relevant Departments or Directorates) and have to take at least four pre-requisite courses: 1) Operating Systems 2)Microcontrollers 3) Power Systems 4)Digital Signal Processing (DSP). Each case however will be considered individually and other pre-requisite courses might be proposed to the potential candidates.

10. STRATEGY FOR STUDENT SUPPORT

Each student will be allocated to a supervisor. The students will meet their supervisors on the regular basis in the face-to-face mode (in the case of local lecturers) or in the blended mode - face-to-face and communication through Internet (in case of visiting lecturers). The meetings will take place at least once a week with record keeping as per UR/CST guidelines.

In case of a suspected conflict, bias, discrimination, harassment or any other issues, students are advised to address the Head of Department or the Programme Coordinator. Alternatively, the Director of Research and Postgraduate Studies (DRPGS) shall serve the final verdict in case of any disputes after seeking prior order from the higher authorities being well informed on any such instance if it occurs on individual basis.

All students will be provided with study materials, assignments, exercises, necessary guidelines, templates and supplementary materials. Those materials will also be posted on e-learning systems of UR/CST. Students will be given an opportunity to interact with lecturers through communication tools embedded into the e-learning system currently under progress.

11. PROGRAMME-SPECIFIC NEED FOR RESOURCES AND UNUSUAL DEMANDS ON UNIVERSITY RESOURCES

In UR-CST currently there are a number of scholars possessing academic qualifications (PhD) and expertise in the relevant areas (namely Electronics and Electrical Engineering). There are five (5) PhD holders with relevant areas of expertise lecturing/co-lecturing on this programme. There will be experts from our partner Institution of ACEIoT such as ICTP Italy, CETIC Belgium, IIT Kharagpur-India and UNIMA Malawi, SUZA –Zanzibar, CMU-Africa and much more.

For each module the space required includes one lecture room accommodating 15 students or one computer lab with 15 computers. Dedicated Masters' classroom and 2 dedicated labs with 30 computers each are available at UR-CST with the needed LCD projector, smart board, printer and scanner.

12. STRATEGIES FOR CONTINUOUS ENCHANCEMENT AND FUTURE DEVELOPMENT

At the end of each module students will be given evaluation forms and requested to give their feedback on teaching and course content. The student evaluation of modules as well as their performance will be a subject of the discussion on the programme review meeting at the end of the academic year. This may involve changes to the content and timing of the module, the sequence of module delivery, prerequisite courses, the methods of teaching, learning and assessment, and, in some cases, replacement of lecturers/ teaching assistants.

13. STAFF DEVELOPMENT PRIORITIES

Visiting lectures will be invited to boost up manpower in case local staffs are insufficient to handle any of the modules in the programme. The members of the academic staff in the department with relevant Masters degrees acting as Teaching Assistants will under study the local and visiting lecturers, thus building their academic capacity. All academic staffs on the programme to pursue higher academic qualifications.

14. PROVISIONAL APPROVAL

Members of Approval Panel

Role/ Location	**Dean /Director**	**Date**
1 Principal	Signature	
	Print Name	

2 Director	Signature	
	Print Name	
3	Signature	
	Print Name	
4	Signature	
	Print Name	
	Print Name	

Seen and noted

Library	Signature	
	Print Name	
ICT	Signature	
	Print Name	
Quality Office	Signature	
	Print Name	
Finance	Signature	
	Print Name	