Information Booklet

for

Postgraduate Studies

Institute of Information & Communication Technology

Dhaka University of Engineering & Technology (DUET), Gazipur

Rules and Regulations for Postgraduate Programs

Dhaka University of Engineering & Technology (DUET), Gazipur

Academic Rules and Regulations for Postgraduate Programs

1. Definitions:

(i) 'University' means the Dhaka University of Engineering & Technology, Gazipur abbreviated as DUET, Gazipur.

(ii) 'Syndicate' means the Syndicate of the University.

(iii) 'Academic Council' means the Academic Council of the University.

(iv) 'Vice-Chancellor' means the Vice-Chancellor of the University.

(v) 'Pro-Vice Chancellor' means the Pro-Vice Chancellor of the University.

(vi) 'Institute' means the Institute of Information & Communication Technology (IICT) of the University.

(vii) 'Faculty' means the Faculty of the University.

(viii) 'Dean' means the Dean of the Faculty of the University.

(ix) 'Director' means the Director of the Institute of the University.

(x) 'Registrar' means the Registrar of the University.

(xi) 'Controller' means the Controller of Examinations of the University.

(xii) 'CASR' means the Committee for Advanced Studies and Research of the University.

(xiii) 'ECF' means the Executive Committee of the Faculty of the University.

(xiv) 'RAC' means the Research and Academic Committee for the Postgraduate Program of IICT of the University.

(xv) 'Equivalence Committee' means the Committee for determining the equivalency of Undergraduate and Postgraduate Degrees obtained from other Universities.

(xvi) 'Semester' means program of study to be completed within a specific period of time, an Academic Year will consist of two semesters.

2. Committee:

2.1 Committee for Advanced Studies and Research (CASR):

2.1.1 The CASR shall consist of the following members:

(i)	Vice-Chancellor or his/her nominated person;	Chairman
(ii)	Pro-Vice Chancellor	Member
(iii)	Three Professors of the University to be nominated by the Syndicate;	Member
(iv)	Three Teachers of the University having research capabilities and experience to be nominated by the Academic Council not below the rank of Associate Professor;	Member
(v)	Two Experts from outside the University to be nominated by the Vice-Chancellor;	Member
(vi)	Director (Research & Extension).	Member Secretary

2.1.2 At least 50% of members will fulfill the quorum.

2.1.3 The term of the nominated members shall be of three years. A nominated member shall continue to act as member till a nominated substitute takes over.

2.1.4 The functions of the Committee shall be as follows:

(i) to recommend the concerned authorities for promotion of research and development of advisory and extension services of the University;

(ii) to approve the proposals for research, advisory and extension services submitted by the different Departments/Institutes of the University;

(iii) to approve the Doctoral Committee;

(iv) to approve the Teacher/Expert's name for supervision of research;

(v) to recommend the Academic Council about the Board of Examiners for research evaluations;

(vi) to do such other acts as may be assigned or referred to it by the Vice-Chancellor, the Academic Council or the Syndicate.

2.2 Executive Committee of Faculty (ECF):

2.2.1 The ECF shall consist of the following members:

(i)	Dean of the Faculty;	Chairman
(ii)	All Heads and Directors under the Faculty;	Member
(iii)	All Professors and Associate Professors under the Faculty;	Member
(iv)	Three Teachers of the University from outside the Faculty (closely related to the subjects) nominated by the Academic Council;	Member
(v)	Two Experts, having experience in one or more relevant field but not working at the University to be nominated by the Academic Council.	Member

2.2.2 The Chairman will nominate one of the members as mentioned in Article no. 2.2.1(iii) to act as the Member Secretary.

2.2.3 At least 50% of members will fulfill the quorum.

2.2.4 The term of the nominated members shall be of three years. A nominated member shall continue to act as member till a nominated substitute takes over.

2.2.5 The functions of the Committee shall be as follows:

(i) to select the courses, syllabuses and marks to award Postgraduate Degrees;

(ii) to recommend the Academic Council about the requirements for degree, diploma, certificate and other honors;

(iii) to recommend the Academic Council to create/restructuring posts for the Teacher and Researcher of the concerned Departments under the Faculty;

(iv) to take necessary actions as may be conferred on it by Academic Council.

2.3 Research and Academic Committee (RAC) for the Postgraduate Program:

2.3.1 The RAC shall consist of the following members:

(i)	The Director of the institute;	Chairman
(ii)	All Professors and Associate Professors of IICT;	Member
(iii)	Any other teacher from the institute or outside who offers a course in a semester will be the member for that semester;	Member
(iv)	One Professor to be nominated by the Vice-Chancellor from outside the University in the field of ICT Sector;	Member

(v)	One expert to be nominated by the BOG from outside the University from any National research organization, Industry or Business organization in the field of ICT Sector;	Member
(vi)	If the existing member of Professors & Associate professors of the institute is less than 3 (three), professors (maximum 03) from other relevant departments/institutes of DUET can be nominated as member by the Vice-Chancellor;	Member
(vii)	Postgraduate Course Coordinator of the Institute.	Member-Secretary

2.3.2 At least one-third of members will fulfill the quorum, fractions being counted as one.

2.3.3 The term of office of the nominated members shall be of two years but they shall continue in office till their successors are nominated.

2.3.4 The Chairman will nominate one of the members as mentioned in Article no. 2.3.1(iii) as Postgraduate Course Coordinator as well as the Member Secretary.

2.3.5 The functions of the Committee shall be as follows:

(i) To develop the syllabuses and courses for the postgraduate studies;

(ii) To deal with matters related to admission of students;

(iii) To suggest a panel of names of paper setters and examiners in the subject or subjects concerned;

(iv) To identify target groups for training, assess training needs and develop training strategies;

(v) To prepare annual program on short courses, training and workshop;

(vi) To identify the areas of research on the basis of national need and formulate research plan;

(vii) To review the research proposals submitted by teachers and technical personnel, or select experts for reviewing the proposal, if necessary;

(viii) To recommend the BoG for the appointment of exceptionally reputed technical personnel with vast experience as visiting fellow in the institute, if it feels that the appointment would help the research and human development activities of the institute, on such terms and conditions as the Board of Governors (BoG) may decide;

(ix) To do such other things as are assigned or referred to it by the Vice-Chancellor, the BoG, or the Syndicate.

2.4 Equivalence Committee:

2.4.1 The Equivalence Committee shall consist of the following members:

(i)	Vice-Chancellor or his/her nominated person;	Chairman
(ii)	Pro-Vice Chancellor;	Member
(ii)	Deans of the Faculties;	Member
(iii)	Director of the Institute concerned;	Member
(iv)	Two Professors of the University to be nominated by the Academic Council;	Member
(v)	One Professor of the University to be nominated by the Vice-Chancellor.	Member

2.4.2 The Chairman will nominate one of the members as mentioned in Article no. 2.4.1(iv) or (v) to act as the Member Secretary.

2.4.3 At least 50% of members will fulfill the quorum.

2.4.4 The term of the nominated members shall be of three years. A nominated member shall continue to act as member till a nominated substitute takes over.

2.4.5 The functions of the Committee shall be as follows:

(i) to assess the Degrees obtained from other Universities/Institutes;

3. Postgraduate Course Co-ordinator:

The Member Secretary of the RAC of the Institute will act as the Postgraduate Course Co-ordinator of that Institute. The Course Co-ordinator should coordinate all the related activities regarding the Postgraduate program and will preserve all the related documents and records.

Rules and Regulations for Postgraduate Programs

PG Dip. in ICT

Dhaka University of Engineering & Technology (DUET), Gazipur

Academic Rules and Regulations for PG Dip. in ICT Degree

1. Degrees Offered

The Post Graduate Diploma (PG Dip.) Degree to be offered by the Institute of Information & Communication Technology (IICT) under this Rules and Regulations is as follows:

1.1 Post Graduate Diploma in Information & Communication Technology abbreviated as PG Dip. in ICT.

1.2 Any other Post Graduate Diploma Degree in other branches of the Institute approved by the Syndicate on the recommendation of Academic Council may also be offered under the Rules and Regulations.

2. Eligibility for the Applicant

2.1 In order to get admission to the PG Dip. in ICT Program an applicant

(a) must have a minimum GPA of 3.00 out of 5.00; or, 2.75 out of 4.00; or, a first division at least in one of SSC, HSC, Diploma in Engg. or in equivalent examinations; and must not have a GPA less than 2.00 or a third division or equivalent in any of the aforementioned examinations; and,

(b) must have a 4-year B Sc. Engg. / Bachelor of Science / BBA; or, Masters of Science/MBA with 3-year Bachelor of Science; and must have at least 50% marks or a minimum GPA of 2.50 out of 4.00 or its equivalent in three or four-year Bachelor degree.

(c) The above requirements may be relaxed for applicants on deputation or sponsored by Academic Institutions / Research Organizations / IT Industries / DUET Graduates. Such relaxation shall be recommended by

the Admission Committee of the Institute for approval of Academic Council.

3. Admission and Registration Procedures

3.1 Applications for admission to PG Dip. in ICT shall be invited through regular means of advertisement and shall be received by the Registrar office.

3.2 On the recommendation of the RAC through ECF, the rules for admission into the University for PG Dip. in ICT Program shall be framed by the Academic Council from time to time. CASR on its own may, if it deems fit, recommend such rules for admission for approval of the Academic Council.

3.3 There shall be an Admission Committee in each Institute as constituted by the RAC on the recommendation of the Director of the Institute.

3.4 Before being finally selected for admission an applicant may require to sit for an oral and/or written test before the Admission Committee. S/he may require to take pre-requisite course(s) as may be prescribed by the Admission Committee.

3.5 The selected applicants should complete their course registration and related tasks as per the announcement of the Registrar office of the University.

4. Academic Requirements and Regulations

4.1 The minimum duration of PG Dip. in ICT Program shall be three semesters and generally not more than 5 (five) Academic Years starting from the date of first registration. Each Academic Year shall consist of two semesters. The duration of a semester will be of minimum 13 (thirteen) weeks.

4.2 The courses of a Program in an Institute shall be proposed by the RAC and approved by the Academic Council on the recommendation of ECF.

4.3 The courses to be offered by an Institute in any semester shall be determined by the Institute.

4.4 Academic progress of students shall be assessed in terms of credit hours earned by them. In a semester 1 (one) contact hour per week for theory courses or 3 (three) contact hours per week for Project represent(s) 1 (one) credit hour. The number of credit hours for each course shall be specified in the syllabus of the Institute.

4.4.1 For the Degree of PG Dip. in ICT, a student must earn a minimum of 36 credit hours of which 30 credit hours shall be assigned as for course work and6 credit hours shall be assigned for a Project.

4.4.2 From the 30 credit hours theory courses, 18 credit hours will cover for Core Courses* and rest 12 credit hours will cover the Optional Courses**.

4.5 There shall be two categories of student, namely, full-time student and part-time student.

4.6 A full-time student must register a minimum of 12 (twelve) credit hours and a maximum of 15 (fifteen) credit hours per term. If a full-time student gets an employment while continuing the program, s/he can continue the program as a part-time/full-time student with the written permission or leave from the employer.

4.7 A student, serving in different organizations, may be admitted as part-time student with a written consent of the employer. A part-time student may be allowed to register a maximum of 9 (nine) credit hours in a term.

4.8 A student may be allowed to switch from part-time to full-time or vice versa on the recommendation of the RAC through the Director of the Institute before the commencement of a term.

4.9 A student may be permitted to withdraw and/or change their registered courses within 3 (three) working weeks from the commencement of that term on the recommendation of the Course Co-ordinator and the

* Core Course details are in page no. 20
**Optional Course details are in page no. 20

Director of the Institute. The concerned course Teacher and authorities will be informed of the decision.

4.10 If a student is unable to complete the final examination of a term due to serious illness or serious accident or official commitment, s/he may apply to the Registrar in a prescribed form through Director of the Institute for total withdrawal from the semester within a week after the end of the semester final examination. The application must be supported by a medical certificate from the Chief Medical Officer (CMO), DUET or relevant Official documents. The Academic Council will take the final decision about such application on the recommendation of the RAC.

4.11 The qualifying requirement for graduation is that a student must earn a minimum CGPA of 2.65 based on the weighted average of their course work.

4.12 2 (two) courses may be repeated for improvement with the prior approval of the Director of the Institute on the recommendation of the Course Co-ordinator, provided that the student has a CGPA less than or equal to 2.65. In such cases, the better grade(s) amongst the previous examination and improvement examination would be retained.

4.13 A student shall not be allowed to continue the Program if s/he obtains a total of 4 (four) or more 'F' grades during the period of their studies.

4.14 If at the end of the second or any subsequent term, the cumulative GPA falls below 2.50, s/he shall not be allowed to continue the Program.

4.15 In addition to the successful completion of theory course work, each student shall have to submit a Report on their Project work, as applicable, fulfilling the requirements as detailed in the subsequent Article no. 7.

5. Grading System

5.1 The grading system for assessing the performance of a student in credit courses shall be as follows:

Numerical grade	Letter grade	Grade point	Merit description
90% and above	A plus	4.00	Excellent
≥80% but <90%	A regular	3.50	Very good
≥70% but <80%	B plus	3.00	Good
≥60% but <70%	B regular	2.50	Average
≥50% but <60%	C	2.00	Pass
below 50%	F	0.00	Failure
	I		Incomplete
	S		Satisfactory
	U		Unsatisfactory
	X		Continuation

All the final grades for the course of PG Dip. in ICT will be recorded in letter grade system. The Grade Point Average (GPA) shall be computed for each semester. The GPA will be calculated as follows:

$$GPA = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{n} C_i}$$

where, n is the number of courses passed by the student during the semester, C_i is the number of credits allotted to a particular course and G_i is the grade point corresponding to the grade awarded for that course(s). The overall or Cumulative GPA gives the cumulative performance of the student from first semester up to any other semester to which it refers and is computed by dividing total grade points ($\sum C_i G_i$) accumulated up to the date by the total credit hours ($\sum C_i$). Both GPA and Cumulative GPA will

be rounded off to the second place of decimal for representing/reporting.

5.2 Course(s) in which a student gets 'F' grade shall not be counted towards credit hour requirements and for the calculation of GPA. Students may repeat the 'F' graded course(s) if it is offered again.

5.3 The 'B' and 'C' grades, up to a maximum of two courses, may be ignored for calculation of GPA on the written request of the student to the Director of the Institute and on the recommendation of the Course Co-ordinator, provided that the student has to fulfill the total course credit hour requirements in the remaining courses with a minimum GPA of 2.65.

5.4 The performance in all the courses including all the 'F' grades shall be reflected in the transcript.

5.5 Grade 'I' will be given only when a student is unable to sit for the examination of a course at the end of the semester because of circumstances beyond of their control. To get 'I' grade, s/he must apply to the Director of the Institute through the respective course Teacher within 1 (one) week after the examination of the respective course. S/he has to complete the course within the next 2 (two) consecutive semesters; otherwise s/he will get 'F' grade in that course. If that course is not offered within the next 2 (two) consecutive semesters, the student can take any other offered course as a replacement on the recommendation of RAC. An PG Dip. in ICT student can apply for an 'I' grade for a maximum of 6 (six) different courses.

5.6 Satisfactory ('S') and Unsatisfactory ('U') shall be used for final grading of the performance of Project and non-credit courses. An 'X' grade shall be recorded for Project continuation.

5.7 A student may enroll for non-credit course(s) termed as audit course(s) on the recommendation of their Project Supervisor and Director of the Institute.

6. Conduct of Examination

6.1 In addition to class tests, assignments, term papers, etc. there shall be a written examination on all theoretical courses at the end of each term. The respective course Teacher will be solely responsible for the performance evaluation of a student. The dates of the examinations shall be announced by the Controller of Examinations as advised by the Director of the Instituteat least 2 (two) weeks before its commencement. The final grade in a theoretical course shall be based on the performance of all class tests, assignments, term papers, etc. and written examination.

6.2 The Controller of Examinations shall keep the up-to-date record of all the grades obtained by students and shall publish the results at the end of each term. A student may collect a copy of the grade sheet from the office of the Controller of Examinations at the end of each term. In addition, each student is entitled to 1 (one) official academic transcript after the completion of their academic program from the office of the Controller of Examinationson production of document of clearance from the Institute and payment of the prescribed fees.

6.3 The Director of the Institute shall recommend the names of the paper setters and examiners for the semester final examinations at least 2 (two) weeks before the date of the commencement of the examination to the Vice-Chancellor for approval.

7. Project

7.1 The Project work shall be carried out under the supervision of a full-time Teacher, who should be the member of RAC of the Institute. The Supervisor and the topic of the Project work shall be approved by the CASR on the recommendation of RAC after completion of at least 9 (nine)

credit hours of course work and having a minimum CGPA of 2.65.

7.2 A student shall submit a Project proposal to the RAC through Supervisor. The RAC shall examine the proposal and recommend it for the approval of the CASR through the Director of the Institute. In special circumstances, the RAC recommend any subsequent changes in the Project topic and forward it through the Director of the Instituteto CASR for approval.

7.3 If any change is necessary on the approved Project (Cost, Supervisor, Joint-supervisor/Co-supervisor, etc.), it shall be approved by the CASR on the recommendation of the RAC. However, the Examination Board can suggest and allow only minor changes (if necessary for Title or Content) and it should be further reported to the CASR.

7.4 The Project work should normally be carried out at the University. However, if necessary, with the approval of the RAC, the Supervisor can allow their student to carry out the Project work outside the University.

7.5 At the end of a student's Project work and with the consultation of the Supervisor the student has to submit a Project report. Each student must submit at least 5 (five) number of printed copies of their Project in the prescribed format to the Director of the Instituteon or before a date to be fixed by the Supervisor concerned in consultation with the Director of the Institute.

7.6 The student shall have to declare that the Project work was carried out by them and has not been submitted elsewhere for the award of any other Diploma or Degree.

7.7 Each student submitting a Project report in partial fulfillment of the requirements of a Degree, shall be required to take at an oral examination, on a date or dates fixed by the Supervisor concerned in consultation with the

Director of the Instituteand must satisfy the examiners that s/he has gained satisfactory knowledge related to the Project work.

7.8 An Examination Board for each student for Project and oral examination shall be approved by the Academic Council through the RAC and CASR on the recommendation of the Project Supervisor. The Supervisor shall act as the Chairman and the Director of the Institutewill be an Ex-officio member of the Examination Board. The Board shall consist of at least 5 (Five) members including the Director of the Instituteand the Supervisor. The Examination Board shall be constituted as follows:

(i)	Supervisor	Chairman
(ii)	Director of the Institute	Member (Ex-officio)
(iii)	At least one Teacher from the RAC of the Institute	Member
(iv)	One external member from outside the University/Institute	Member (External)

7.9 If any examiner is unable to accept the appointment or has to relinquish their appointment before the examination, the Vice-Chancellor shall appoint another examiner in their place, on the suggestion from the Supervisor in consultation with the Director of the Institute. This appointment will be reported to the CASR.

7.10 In case a student fails to satisfy the Examination Board in Project report and/or oral examination, the student shall be given one more chance to resubmit the Project report and/or take an oral examination as recommended by the Board.

8. Cancellation of Admission

The admission of a student shall be cancelled from the University on the following grounds:

(i) Non-payment of fees of the University and the Halls of residence within a prescribed period.

(ii) If the requirements in Article no. 4.16 and 4.17 are not fulfilled by the student.

(iii) Forced to discontinue their studies by the Board of Discipline.

(iv) Withdrawn officially from all the courses includingProject.

9. Academic Fees

Academic tuition and fees will be declared and reviewed by the appropriate authority of the University from time to time.

10. Extension of Time for Completion of Degree

The application for extension of time span of a student should be approved by the Academic Council through CASR on the recommendation of the RAC. A prescribed form may be used for this purpose. The application must be submitted before the normal time span has elapsed.

11. Admission Test

A written test will be conducted for the admission. The topics that will be covered are as follows but not limited to:

- Aptitude topics
- English
- Mathematics
- Computer Fundamentals
- Programming Skill

The admission test generally takes place on a pre-announced date as per the University Postgraduate academic.

Syllabus for PG Dip. in ICT

Course No.	Course Title	Credit
ICT 5001	Project	6
	Core Courses	
ICT 5101	ICT Fundamentals and Programming	3
ICT 5102	Data Structures and Algorithms	3
ICT 5103	Database Design and Management	3
ICT 5104	Operating Systems and Computer Architecture	3
ICT 5105	Basic Telecommunication	3
ICT 5106	Data Communications and Computer Networks	3
	Optional Courses	
ICT 5201	Visual Programming	3
ICT 5202	Web Engineering	3
ICT 5203	Multimedia Design and Development	3
ICT 5204	Mobile Application Development	3
ICT 5205	Electronic Commerce	3
ICT 5301	Internet of Things	3
ICT 5302	Cyber Physical System	3
ICT 5303	Cloud Computing	3
ICT 5304	ICT Industrial Revolutions	3
ICT 5304	Artificial Intelligence	3
ICT 5401	Information System Analysis and Design	3
ICT 5402	Software Engineering	3
ICT 5403	Software Quality Assurance	3
ICT 5501	Remote Sensing and Geographical Information System	3
ICT 5502	Internet Technologies	3
ICT 5503	Mobile Communications	3
ICT 5504	Software and Database in Telecommunication	3
ICT 5505	Network Systems Design and Estimation	3
ICT 5601	Information System and Network Security	3
ICT 5602	Cyber Security	3
ICT 5701	Microprocessor and Microcontroller Architecture	3

ICT 5702	Embedded Systems Design	3
ICT 5703	Digital Signal Processing	3
ICT 5704	Satellite and Radar Communication	3
ICT 5801	ICT Ethics	3

ICT 5101 ICT Fundamentals and Programming 3 Credits

Types and generation of computer, basic organization and functional units, input, output and memory devices. Boolean algebra, De-Morgain's Theorems, logic gates, canonical forms, combinational logic circuits and sequential logic circuits. Decoders, encoders, multiplexers, demultiplexers, flip-flops, counters and registers. Discrete Mathematics logic, set theory, relations, partial ordered sets, functions, mathematical reasoning and proof techniques, propositional calculus, predicate calculus. Graph theory, graphs, paths, trees, algebraic structures, binary operations, semi-groups, rings and fields, lattices. Algorithms and flow chart. Structured programming concepts. Writing, debugging and running programs: Variables, Data Types, Operators and Expressions, Control flow, Procedures and Functions, Arrays. Introduction to java Programming, Primitive Data Types and Operations. Selection Statements. Loops, Methods. Arrays, Strings and Text I/O, Exceptions and Assertions. Objects and Classes, Inheritance and Polymorphism. Abstract Classes and Interfaces, Object-Oriented Design. Getting Started with GUI Programming, Creating User Interfaces. Event Driven Programming, Java Database Programming. Remote Method Invocation. Java Server Pages. Multithreading. Advanced Swing Models, Menus, Toolbars, Dialogs. Containers, Layout Managers, and Borders.

ICT 5102 Data Structures and Algorithms 3 Credits

Data Structures Basics, Data structure Operations, Algorithms Complexity, Time- space tradeoff. Linked List: Representation of linked lists in Memory, Traversing a linked list, Searching a linked list, Memory allocation and Garbage collection, insertion into linked list, Deletion from a linked list, Types of linked list. Stack and Queue: Array Representation of Stack, Linked List Representation of stack, Application of stack, Queue, Array Representation of Queue, Linked List Representation of Queue. Trees: Operations on Binary Trees, Representation of binary tree, Conversion of General Trees to Binary Trees, Sequential and Other Representations of Trees, Tree Traversal. Graphs: Matrix Representation of Graphs, List Structures, Other Representations of Graphs, Breadth First Search, Depth First Search, Spanning Trees. Topological Sorting, Shortest-Path Algorithms, Weighted Shortest Paths, Dijkstra's Algorithm, Minimum spanning tree- Prim's Algorithm. Bubble sort, Merge sort,

Selection sort, Heap sort, Insertion Sort. Sequential Searching, Binary Searching, Search Trees. Procedure and Recursion.

ICT 5103 Database Design and Management 3 Credits

Database Environment, Database Development Proc, Database Modeling, Enhanced ER Model, Relational Model and Logical Database Design, Physical Database Design, relational algebra, SQL and advanced SQL, database design and the entity-relationship model, Relational database design and normalization, application design and development, indexing, Database storage and file structure, transaction management, concurrency control recovery management, object database and database administration.

ICT 5104 Operating Systems and Computer Architecture 3 Credits

Operating system preliminaries, goals and components of operating system. Process management, process states and states transition, process control blocks, job and process scheduling, scheduling levels, objectives and criteria. CPU scheduling algorithm, process co-ordinations critical section problems, semaphores. Deadlock: prevention, avoidance, detection and recovery. Memory management, virtual memory, file system, file organization, space allocation, file access control mechanisms, Disk scheduling algorithm, parallel processing. Operating systems security. MIPS Introduction, Operations, Operands, Signed and Unsigned Assignment, Logical Operation, Instructions for Making Decisions, Supporting Procedures, Communicating with users, MIPS Addressing, Addition and Subtraction, Multiplication Assignment, Division, Floating Point, Logic Design Conventions, Building Datapath Assignment and Building, Pipelining, Exceptions, Parallelism and Advanced ILP Assignment, Memory Systems, Basics of Caches, Measuring and improving Cache Performance, Virtual Memory Assignment, Common Framework for Memory Hierarchies, Computer Systems Overview, Connecting Processors, Memory, and I/O Devices, Interfacing IOs to the Processor, Memory, and OS.

ICT 5105 Basic Telecommunication 3 Credits

Models of telecommunication system. Analog amplitude and angle modulation, Frequency Division Multiplexing. Digitization of analog

signals. Binary system. Arithmetic operations on binary numbers. Modulo 2 arithmetic. Pulse code modulation (PCM), sampling, quantization, coding. Delta and differential pulse code modulation. Synchronous and asynchronous, static and dynamic time division multiplexing. Transmission media. Optical fibres: single mode, multimode. Optical cables. Wavelength division multiplexing (WDM): Dense wavelength division multiplexing (DWDM) and Coarse wavelength division multiplexing (CWDM). Frequency bandwidth of signal in radio transmission. Nyquist theorem. Scrambling. Clock recovery. Frame and bit synchronization. Line coding and encryption in digital transmission. CDMA, OFDM. Using sine and cosine functions as orthogonal functions. Amplitude Modulation (AM), Frequency Modulation (FM), BPSK, QPSK, GMSK, OFDM. Asynchronous Transfer Mode (ATM), adaptable and flexible multiplexing. OSI model. IT networks, Ethernet (IEEE 802.3, 801.11, 802.16), LAN, MAN, WAN. Terms: HUB, Bridge, Router, MAC address, IP address.

ICT 5106 Data Communications and Computer Networks 3 Credits

Network fundamentals: Classification, Network taxonomy, Packet switching, circuit switching. Network performance: Bandwidth and propagation delay, Latency and throughput. Network models: Internet model, OSI model. Physical layer and media: Data and Signals – transmission impairment, Digital Transmission – encoding, Analog Transmission – modulation and multiplexing, Using Telephone and Cable Networks for Data Transmission. Data Link layer: Error detection and correction, Control and protocols, Point-to-point and multiple access protocols, Local area networks, connecting LANs (bridges), ATM networks. Network layer: Internet protocols, Host-to-host delivery – routing (unicast, multicast) and addressing, Link state and distance vector routing, Sub-netting and super-netting. Transport layer: End-to-end protocols – UDP, TCP, TCP sliding window, TCP adaptive timeout interval. Congestion control and quality of service.

ICT 5201 Visual Programming 3 Credits

.NET Framework, Base Class Libraries (BCL), Common Language Run Time (CLR), Microsoft Intermediate Language (MSIL), Common Language Specification (CLS). Structure of a C# program, Compiling and

Executing, Value-Type Data, Arrays, Reference-Type Data. Arrays, Command Line Argument, Multi-Dimensional Arrays. Statement Blocks, Methods. if, switch, loop, break and continue, return Statements. Structs, Interfaces, Delegates, Enumerations, Namespaces, Applications and Libraries. C# Application Startup, Member Access, Overloading, Scope, Value vs. Reference Parameters, Conversions, Exceptions. Class, Class Methods, Constructors, Access Levels, Fields, Properties, Operators, Destructors, Static Constructor. Inheritance, Base Class Modifiers, Direct Inheritance, Abstract Classes, Interfaces, Base Class Interfaces. Delegates, Events. Data Streams, Readers, Writers, File I/O. Properties, Indexers, Attributes. Windows Forms, Visual Studio and the Forms Designer, Using Controls, List Controls, Working with Dialogs, Menus, Toolbars and Status Bars, Advanced Windows Forms Topics, Using Advanced Controls. ADO.NET Architecture, Data Providers in .NET, Connection, Command, Data reader, Data Adapter, Data Set, Command Builder, Data Relations. Architecture of CLR, Components in CLR, Type Safety. Overview of Threads, Using Threads in C#, Thread Properties, Managing Threads, Interrupting and Terminating Threads, Synchronization.

ICT 5202 Web Engineering 3 Credits

Web architecture and HTTP: history and architecture of the World Wide Web, overview of the Hyper Text Transfer Protocol, other related protocols; Hyper Text Mark Language (HTML): concept of markup, overview of HTML (table, form, frame, window, link etc.); Client side scripting: variables data types, control structure, functions, Document Object Model (DOC), event handlers, properties methods, cookies; Server side scripting: concepts, variables, data types, control structure, functions, objects; Database: content generation, data exchange; Regular expressions, mails, cookies, sessions; Middleware: object management architecture, object request brokers (CORBA, OLE/COM), services (trading, naming, event, transaction, security), interorb protocols (e.g. the Internet Interorb protocol).

ICT 5203 Multimedia Design and Development 3 Credits

Introduction to multimedia, image, sound, video formats and their different properties, compression, playing and recording techniques, merits and demerits, conversions between different formats and their

combinations; Multimedia authoring, introduction to web and HTML, basic HTML tags design principles; Drawing: image properties, image manipulation, layers, colors, text, texture, brightness, contrast, filters and effects; Interactive application development using multimedia tools.

ICT 5204 Mobile Application Development 3 Credits

HTML/HTML5: Used Editor, HTML elements, attributes, comments, heading paragraph, lists, head, Images, Table, form details, layout, Iframe, text field, dropdown list, color, color names, Color values, link, formatting, Div etc. HTML5 introduction, elements, canvas, Video, Audio, Input types, form attributes etc. CSS/CSS3: CSS Syntax, selector, unit, tables, Box model, border, outline, margin, padding, dimension, display, positing, floating, align, pseudo-elements & class, Image gallery, opacity, css ID & class, styling Background, Texts, fonts, links, Lists, Object positioning, CSS3 borders, text effects, 2D & 3D transformations, animations. JavaScript/JQuery: Statement of Javascript, comments, variables, data types, objects & events, functions, operators, comparison, conditional statement, error handling, input validation, array, strings, date & time, DOM (Documents object model), Object-based features, Different builtin objects etc. How jQuery Works, the jQuery ready Function, What are jQuery Selectors?, Selectors Overview, Basics & Hierarchy, Basic, Content, Visibility, Attribute & Child Filters, Forms & Form Filters, jQuery DOM Traversal & Manipulation, jQuery Event Model, Handling Events with jQuery, Ajax introduction, jQuery Ajax Functions etc.

ICT 5205 Electronic Commerce 3 Credits

Introduction to Internet Business, Infrastructure The Internet and Technology, Overview of electronic commerce, business models; E-commerce channels: portals, auctions, communities, marketplace; Managing the marketplace: Demographics and advertising; Customer relationship management, web services for B2B and B2C e-commerce, electronic payment systems; Network security, cryptography, digital certificates; Markup for e-commerce: ebXML, M-commerce, L-commerce, wireless and U-commerce, digital money and electronic banking; Ethical, legal, and regulatory environment: Intellectual property, copyright, trademark, patents, Social Networking, Communities, & Actions.

ICT 5301 Internet of Things 3 Credits

Internet in general and Internet of Things: layers, protocols, packets, services, performance parameters of a packet network as well as applications such as web, Peer-to-peer, sensor networks, and multimedia. IoT definitions: overview, applications, potential & challenges, and architecture. IoT Protocols: HTTP, CoAP, MQTT, AMQP, 6LoWPAN. IoT Data and the IoT Cloud Infrastructure. Performance and Security in IoT. IoT examples: Case studies, e.g. sensor body-area-network and control of a smart home.

ICT 5302 Cyber Physical System 3 Credits

Introduction to cyber-physical systems, CPS Principles, Models of physical systems, Models of cyber components, Cyber-physical systems models as interconnections, CPS Workload Modeling, Specification and critical properties of CPSs, Safety in CPS, Complex Systems Approaches to CPS. Discrete systems, Continuous and Hybrid Dynamics, Fractional Order Derivatives and Integrals, Information cellular processing, Control algorithms and embedded Software, Scheduling of Control Tasks Over Shared Wireless Channels, Sensing and fusion, Automotive Sensing and Intelligent Transportation, Wearable Sensing and Body-Area Sensor Network, Sensors and Actuators, Networked control systems, Molecular communication, Value added network, Controllability and Observability of Complex Networks. Internet of things (IoT),Internet of Service (IoS), Introduction to Industry 4.0, Big Data Issues, Introduction to hybrid systems, Real-Time Operating Systems, Holistic System Design, Controller design and synthesis, Multi Agent System, Real-Time Tools and Analysis, Inference Techniques, Embedded system design, feedback control.

ICT 6303 Cloud Computing 3 Credits

Definition and evolution of Cloud Computing, Enabling Technologies, Service and Deployment Models, Popular Cloud Stacks and Use Cases, Benefits, Risks, and Challenges of Cloud Computing, Economic Models and SLAs, Topics in Cloud Security. Cloud Infrastructure: Historical Perspective of Data Centers. Datacenter Components: IT Equipment and Facilities. Design Considerations: Requirements, Power, Efficiency, &

Redundancy, Power Calculations, PUE and Challenges in Cloud Data Centers, Cloud Management and Cloud Software Deployment Considerations. Virtualization: Virtualization (CPU, Memory, I/O). Case Study: Amazon EC2, Software Defined Networks (SDN), Software Defined Storage (SDS). Cloud Storage**:** Introduction to Storage, Systems Cloud Storage Concepts Distributed File Systems (HDFS, Ceph FS), Cloud Databases (HBase, MongoDB, Cassandra, DynamoDB), Cloud Object Storage (Amazon S3, OpenStack Swift, Ceph). Programming Models: Distributed Programming for the Cloud, Data-Parallel Analytics with Hadoop MapReduce (YARN), Iterative Data-Parallel Analytics with Apache Spark, Graph-Parallel Analytics with GraphLab 2.0.

ICT 5304 ICT Industrial Revolutions 3 Credits

Introduction to Industry 4.0: Various Industrial Revolutions, Digitalization and the Networked Economy, Drivers, Enablers, Compelling Forces and Challenges for Industry 4.0, Comparison of Industry 4.0 Factory and Today's Factory. Trends of Industrial Big Data and Predictive Analytics for Smart Business Transformation. Road to Industry 4.0: Internet of Things (IoT) & Industrial Internet of Things (IIoT) & Internet of Services, Smart Manufacturing, Smart Logistics, Smart Cities. Related Disciplines, System, Technologies for enabling Industry 4.0: Cyber physical Systems, Robotic Automation and Collaborative Robots, Support System for Industry 4.0, Mobile Computing, Cyber Security. Role of data, information, knowledge and collaboration in future organizations: Resource-based view of a firm, Data as a new resource for organizations, Harnessing and sharing knowledge in organizations, Cloud Computing Basics, Cloud Computing and Industry 4.0. Business issues in Industry 4.0: Opportunities and Challenges, Future of Works and Skills for Workers in the Industry 4.0 Era, Strategies for competing in an Industry 4.0 world.

ICT 5305 Artificial Intelligence 3 Credits

Introduction to artificial intelligence, History of AI, Proposing and evaluating AI applications. Problem spaces and search, Knowledge and rationality, Heuristic search strategies, Search and optimization (gradient descent), Adversarial search, Planning and scheduling. Logic and inference, Ontologies, Bayesian reasoning, Temporal reasoning. Machine

learning, Supervised vs. unsupervised learning, Regression - linear, logistic, ridge. Classification - decision trees, SVM, random forests. Dimensionality reduction: PCA, Clustering - k-means, hierarchical clustering, Semi-supervised methods, Reinforcement learning, Choosing among machine learning techniques. Neural networks and back-propagation, Convolutional neural networks, Recurrent neural networks and LSTMs. Introduction to natural language understanding, Sentiment analysis, Application of deep learning to NLP. Speech recognition, Hidden Markov Models, Chatbots, Natural language generation ○ Speech synthesis. Introduction to robotics, Sensing, Manipulation, Human-robot interaction. Navigation and path planning, Learning and robotics: Reinforcement learning.

ICT 5401 Information System Analysis and Design 3 Credits

System Life Cycle, The survey phase. Information gathering and interviewing, Requirements Models: data flow diagrams (DFD). Events and Data Stores, SallyCaseProject (regrouping of processes), Progress report specification. Entity Relationship Diagram. Data dictionary, Process specification. Trends in development, Project Planning & Management, progress report. Designing the System and User Interfaces, Drawing ERD with Visible Analyst. Class diagram. Activity diagrams, system sequence diagrams; State transition diagrams; Structured design with Structure Chart; Qualities of a good design: programming simplicity & coupling; Qualities of a good design. Design Principles, Use Case Realizations.

ICT 5402 Software Engineering 3 Credits

Introduction, software life-cycle models, software requirements specification, formal requirements specification and verification - axiomatic and algebraic specifications, function-oriented software design, object-oriented design, UML, design patterns, user interface design, coding and unit testing, integration and systems testing, debugging techniques, software quality - SEI CMM and ISO-9001. Software reliability and fault-tolerance, software project planning, monitoring, and control, software maintenance, computer-aided software engineering (CASE), software reuse, component-based software development, extreme programming.

ICT 5403 Software Quality Assurance 3 Credits

Definition of Software Quality, Quality Dimensions, The SQ Dilemma, Achieving Software Quality. Software Defects, Defect amplification and removal, Review Metrics and their use, Informal Reviews, Formal technical reviews, Review reporting and record keeping. Elements of SQA, SQA Task, Goals and Metrics, Formal Approaches to SQA, Statistical SQA, Software Reliability, The ISO 9000 Quality Standards, The SQA Plan. The Strategic Approach for Software Testing, Verification and Validation, Organizing for Software Testing, Criteria for Completing of Testing, Strategic Issues. Testing Strategies for Conventional Softwares: Unit Testing, Integration Testing, Strategies for OOS, Testing in OO context, Integration Testing in OO context, Strategies for Web Apps., Validation Testing, Alpha and Beta Testing. System Testing: Recovery Testing, Security Testing, Stress Testing, Performance Testing, Deployment Testing, The Art of Debugging. Testing Conventional Applications: White box testing, Basis Path Testing, Central Structure Testing, Black box Testing, Model Based Testing, Testing Client Server Architectures, Testing for Real Time Systems, Patterns for Software Testing. Testing Object Oriented Applications: Testing OOA and OOD Models, Object Oriented Testing Strategies, Testing methods applicable at Classes, Interclass Test case Design, Test Derived from Behavior Models. Testing Web Applications: Dimensions of Quality, Content Testing, User Interface Testing, Component Level Testing, Navigation Testing, Configuration Testing, Security Testing, Performance Testing.

ICT 5501 Remote Sensing and Geographical Information System 3 Credits

Remote Sensing (RS) Technologies: Basic Technology Requirement, Aerial Photography, Satellite Image, Microwave Remote Sensing, Electro-optical Remote Sensing, Wireless Sensor Network Based Remote Sensing. Introduction to Geographical Information Systems (GIS) and Remote Sensing (RS) Concepts; Basic Principles and Techniques used in GIS and RS; Practice Applications and their Evolutions using GIS and RS; Global Positioning System (GPS). Fundamentals of GIS, Basic Hardware, Software and Data Requirements for GIS; Evolution of GIS Technology, Key Areas of Application of GIS; Spatial Data and Modeling & Analysis, Issues in the Management of GIS, Organizational Role of

GIS, and Emerging trends in GIS Development and Future Usage.

ICT 5502 Internet Technologies 3 Credits

Introduction to the Internet: Introduction to XML, XHTML, XSL, integrating JavaScript and XSL; Internet Address, sockets; Application specific protocols and services: authentication, domain name services (DNS), electronic mail, world wide web, web caching, network management, internet control message protocol (ICMP), file transfer protocol (FTP), secured remote access; Voice over IP and its protocols, Next generation of internet, Revolutionary application of internet.

ICT 5503 Mobile Communications 3 Credits

Introduction to Personal Communications Services (PCS): PCS Architecture, Mobility management, Networks signaling. Global System for Mobile Communication (GSM) system overview: GSM Architecture, Mobility management, Network signaling, Performance Analysis: Admission control and handoffs. 2.5/3G Mobile Wireless systems: packet switched Data Introduction, 3G CDMA cellular standards, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of services in 3G. 2.5/3G TDMA: General Packet Radio Services (GRPS) and EDGE. Access Scheduling techniques in cellular systems: Slotted Aloha access, integrated access: voice and data, scheduling in packet based cellular systems. Mobile Data Communication: WLANs (Wireless LANs) IEEE 802.11 standard, Mobile IP. Wireless Application Protocol (WAP): The Mobile Internet standard, WAP Gateway and Protocols, wireless mark up Languages (WML).Wireless Local Loop (WLL): Introduction to WLL Architecture, wireless Local Loop Technologies. Global Mobile Satellite Systems; case studies of the IRIDIUM and GLOBALSTAR systems.

ICT 5504 Software and Database in Telecommunication 3 Credits

Introduction to hardware and software evolution; Software components: database, distributed database, real-time software, mapping of software components etc; Constraints on the software components: real-time behavior, service continuity, hardware limitations, software and hardware integration and dimensioning etc; Telecommunication software

development: examples of life cycles; Methods and tools for: requirement capture, analysis, specification, architecture, design and development; Interfaces definition: problem overview, transparency of distribution; System tests; Database in telecommunication systems, database environment, relational and object databases; Database planning, design and administration; Database trends in telecommunication: real-time database, multimedia database, WWW servers and database, 3D image handling in database, multimedia and existing RDBMS.

ICT 5505 Network Systems Design and Analysis 3 Credits

Computer network, purposes of a network, elements of communication and types of networks. Types of transmission media, functions of a network interface card. Characteristics of the mesh, bus, ring, star, and hybrid topologies, channel access method, advantages and disadvantages of contention, polling, token passing, and demand priority channel access methods. Ethernet architectures, features of a token ring network, how a wireless LAN functions, guidelines for designing a network. OSI reference model, functions of TCP/IP, functions of client and server network software. Features of a NetWare 6 server, Create and modify a new user account using NetWare 6, Explain the features of Linux, Use Linux to set file permissions. Proactive steps to be taken to keep a network server in operation, server performance monitoring, SNMP and network monitoring, features of common network troubleshooting tools. WAN definition, different WAN technologies.

ICT 5601 Information System and Network Security 3 Credits

Fundamentals of cryptography, security for communication protocols, security for operating systems and mobile programs, and security for electronic commerce, passwords and offline attacks, DES, RSA, DSA, SHA, SSL, CBC, IPSec, SET, DDOS attacks, biometric authentication, PKI smart cards, S/MIME, privacy on the Web, viruses, security models, wireless security, and sandboxing.

ICT 5602 Cyber Security 3 Credits

Introduction to cyber security, Interrelated components of the computing environment, Models of Cyber security (the CIA triad, the star model, the Parkerianhexad), Cyber vulnerabilities, and consequences, Cyber threats-

types of attacker, Motives-what drives an attacker, Means, Cyber attack, Methods, Classification of cyber attack & attack vectors, Risks of conducting a cyber-attack. Cybercrime, Cyber harassment, Cyber warfare, Cyber surveillance, Difficulties in cyber security, State of security today. Principles of risk, Types of risk, Risk strategies, Risk Management Framework (RMF), Disaster recovery plan and procedures, Challenges of disaster recovery plan, traditional disaster recovery. National ICT Act & Policy, National Information security policy guideline, government and private sector role's in securing cyberspace, International laws in securing cyberspace.

ICT 5701 Microprocessor and Microcontroller Architecture 3 Credits

Arithmetic Circuits, ALU, Number Systems. Instruction Data Set. Assembly Language, Machine Language, Programming, Addressing Modes. 8086 architecture- functional diagram, Register organization, memory segmentation, programming model, Memory addresses, physical memory organization, Signal descriptions of 8086-common function signals, timing diagrams, Interrupts of 8086. Instruction set and assembly language programming of 8086: Instruction formats. Addressing modes, instruction set, assembler directives. Macros, Simple programs involving logical, branch and call instructions. Sorting, evaluating arithmetic expressions, string manipulations. I/O Interface: 8255 PPI, various modes of operation and interfacing to 8086, interfacing of key board, display. Stepper motor interfacing, D/A & A/D converter. Interfacing With advanced devices: Memory interfacing to 8086, Interrupts of 8086, Vector interrupt table, Interrupt service routine, Serial communication standards, serial data transfer schemes, 8251 USART architecture and Interfacing. Introduction to microcontrollers: overview of 8051 microcontroller, Architecture, I/O ports, Memory organization, addressing modes and instruction set of 8051, Simple programs. UNIT-V 8051 Real Time Control: Programming Timer interrupts, programming external hardware interrupts, Programming the serial communication interrupts, Programming 8051 timers and counters.

ICT 5702 Embedded Systems Design 3 Credits

Core of the embedded system, Memory, Sensors and Actuators,

Commutation interface, Embedded firmware, Other system components. Characteristics and quality attribution of Embedded Systems. Computational models in embedded design, Introduction to Unified modeling language, Hardware software trade-off. Embedded firmware design approaches, Embedded firmware development language. Real-time operating system (RTOS) based embedded system design: Operating system basics, Types of OS, Tasks, Process and threads, Multiprocessing and multitasking, Task scheduling, Threads, Processing and scheduling: Putting them altogether, Task communication, task synchronization, Device drivers, How to choose an RTOS. The Integrated development environment (IDE), Types of files generated on cross compilation, Disassembler/Decompilers, Emulators and debugging, Target hardware debugging, Boundary scan. Processor trends in embedded system, Embedded OS trends, development language trends, Open standards, Frameworks and alliances, Bottlenecks.

ICT 5703 Digital Signal Processing 3 Credits

Introduction to discrete linear systems: Discrete time signals, Special sequences, Shift invariance, Stability and causality, Impulse response, Difference equations. Discrete-Time Fourier Transform and Linear Time Invariant Systems: Transform definitions, Theorems, Frequency response of linear time invariant systems, Phase and group delays. The Z transform: Z-transforms by summation of left, right, and two-sided sequences, Regions of convergence and Z-transform properties, Inverse Z-transform. Properties of digital filters: Averaging filter, Recursive smoother, First-order notch filter, Second-order unity gain resonator, All-pass filters, Comb filters, Equalization filters, Group delay, linear phase, all-pass, minimum phase. Fourier transforms, sampling: Fourier transform review, Sampling continuous-time signals: the sampling theorem, Aliasing, Re-sampling digital signals, A/D conversion and quantization, D/A conversion, Polyphase decomposition, Polyphase DFT filterbanks, Bandpass sampling. Discrete Fourier transform: Definition of DFT and relation to Z-transform, Properties of the DFT, Linear and periodic convolution using the DFT, Zero padding, spectral leakage, resolution and windowing in the DFT. fast Fourier transform: Decimation in time FFT, Decimation in frequency FFT. Finite impulse response (FIR) filters: Window design techniques, Kaiser window design technique, Equiripple

approximations. Infinite impulse response (IIR) filters: Bilinear transform method. IIR - Direct, parallel and cascaded realizations, FIR – Direct and cascaded realizations. Coefficient quantization effects in digital filters.

ICT 5704 Satellite and Radar Communication 3 Credits

Orbital aspects of Satellite Communication: Introduction to geo-synchronous and geo-stationary satellites, Kepler's laws, Locating the satellite with respect to the earth, sub-satellite point, look angles, mechanics of launching a synchronous satellite, Orbital effects, Indian scenario in communication satellites. Satellite sub-systems: Attitude and Orbit control systems, Telemetry, Tracking and command control system, Power supply system, Space craft antennas, multiple access techniques, comparison of FDMA, TDMA, CDMA. Introduction to satellite link design, basic transmission theory, system noise temperature and G/T ratio, design of down link and uplink, design of satellite links for specified C/N, satellite data communication protocols. Introduction to radar, radar block diagram and operation, radar frequencies, Applications of radar, Prediction of range performance, minimum detectable signal, receiver noise, probability density function, SNR, Integration of radar pulses, radar cross-section of targets, PRF and range ambiguities, transmitter power, system losses. Doppler effect, CW radar, FM CW radar, multiple frequency CW radar. MTI radar, delay line canceller, range gated MTI radar, blind speeds, staggered PRF, limitations to the performance of MTI radar, non-coherent MTI radar. Tracking radar: sequential lobing, conical scan, monopulse: amplitude comparison and phase comparison methods, Radar antennas. Radar displays. Duplexer. **Bangabandhu Satellite-1**: Evaluation History, Spacecraft Properties, Orbital Position, Transponders, Platform.

ICT 5801 ICT Ethics 3 Credits

Ethics & Info Technology, Ethics in the Field, Ethical Theories, Privacy & Surveillance, Internet of Things, Intellectual Property, Controlling Content, Love & Sex, War & Play, Human & Non-Human, Money & e-Waste, Hacking & Fake News, Info Justice, Professional Ethics.