BEng Programme Curriculum Development and Requirements

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Development of a 5-Year General Engineering Programme with focus on Electric Vehicle Engineering and Technology.

This is a draft of the possible potential 5 years engineering programme with a focus on Electric Vehicle engineering and technology. The programme has several technical and non-technical modules that split over a course of 5 years. Each module specifications will play a vital development of the students engineering and technology knowledge and skills to meet the existing and future industrial market needs and revolution. The recommended titles of the module are reflecting the possible contents that can be included. It could also be used to reveals the intended learning outcomes to achieve in each module. It can also be used to conclude the learning outcomes to prepare the industrial knowledge and skills mapping platform, if there is an accreditation by professional bodies needed, such as Institute of Engineering and Technology (IET) and or Institute of Mechanical Engineering (IMechE). The modules weight represented by the number of credits are following the UK systems in general and consistent with other courses delivered in Brunel University, e.g., 15 credits for a full module. Table 1 shows the overall programme structure for every year including the list of suggested modules.

The potential aims of the proposed programme are:

- Provide student with a stimulating and challenging undergraduate programme of study in general engineering with focus on electric vehicle engineering and technology in order for student to take a systematic approach for sustainable solutions to problems by enabling, often complex concepts, to become reality and commercially viable.
- Provide for flexible learning opportunities and widening access and thus facilitate study in the discipline by learners from as broad a background as possible, enabling you to become an independent learner, developing as an individual expertise in general engineering with focus on electric vehicle engineering and technology for the rest of your life.
- Enable student to develop a practical approach to industrial technological and non-industrial technological problems solving and decision making, including the use of safe working practices within the field of general engineering with focus on electric vehicle engineering and technology.
- Provide an academic education focussing on the principles of analysis, design and build, management, health and safety, sustainability and professional and industrial standards pertaining to the field of work of general engineering with focus on electric vehicle engineering and technology.
- Deliver a rigorous in general engineering with focus on electric vehicle engineering and technology-based programme of study, informed by research, which successfully balances practical skills with theoretical understanding.
- Prepare and provide graduates with the potential knowledge, and skills in engineering and technology with a focus on electric vehicle systems.
- Prepare graduates with the critical thinking skills, knowledge, and ability of problem solving with a focus on in product, system, and service development from concept to realisation.
- Provide knowledge and skills that enable student, on graduation, to engage with continuing professional development and postgraduate studies in general engineering with focus on electric vehicle engineering and technology and other related disciplines.
- Allow you to become familiar with the nature of business and enterprise in the creation of economic and social value.

- Appreciate the global dimensions of engineering, ecommerce, and communication.
- Be able to formulate and operate within appropriate codes of conduct, when faced with an ethical issue.

Table 1: BEng Programme Structure									
Y_1	Mathematics for Engineering_1	Physics	Chemistry	Applied Electromechanical Systems	Computing skills	English for academic purposes	Health and Safety Issues and Ethics	Engineering Workshop_1	Culture Module-1
Y_2	Mathematics for Engineering_2	Mechanics and Materials Sciences/ thermodynamics	Software and programming Principles	Principles of Electrical and Electronics	Computer Aided Design	Analogue and Digital Systems	Technical Communications Skills	Engineering Workshop_2	Culture Module -2
Y_3	Engineering Design Fundamentals	Power Electronics	Mechatronics _1 (Systems)	Sensors, Control and Instrumentations_1	Power System Engineering	Engineering for the Society	Professional Development and Project Management for Engineers	Engineering Workshop_3	Culture Module -3
Y_4	Design for Sustainable Manufacturing	Electromagnetic Fields	Mechatronics _2 (Robotics and Automation)	Control Theory	Communication Systems_1	Battery and Energy Storage Technology	Integrated Engineering Studies (30 credits) – Team		
Y_5	Vehicular Systems Engineering and Charging Technology	Electrical Machines Principles	Autonomous Electric Vehicle Technology	Industrial Control for Evs (IC and PLC)	Communication Systems_2 (Wireless & Advanced Protocols)	Transport Systems	Individual Engineering Project (30 credits)		

Modules List, Credits and Learning Outcomes:

Level	Module title	Credit	LOs
Y-1	Mathematics for Engineering_1	15	• Manipulate mathematical expressions, formulae and equations by applying the basic rules of algebra; • Solve linear, quadratic and simultaneous equations; • Describe and manipulate the algebra used for partial fraction expansions; • Understand algebraic functions (linear, parabolic, exponential) and logarithmic with their applications in engineering problems; • Describe and manipulate complex numbers in Cartesian and polar forms; • Describe and manipulate matrices, determinant of 2 by 2 and 3 by 3 matrices; • Differentiate mathematical expressions by using standard rules; • Integrate mathematical expressions by using standard rules.
	Physics	15	• good understanding of the fundamental principles of mechanics and the properties of matter, waves, and light. • ability to solve basic problems related to coursework and critically assess the solution using logic and physical principles. • understanding of the importance of physical principles in the context of Engineering Sciences. • ability to use library, eBooks and ICT resources to research the technical literature. • Knowledge and appreciation of the safe laboratory practice in the use of a range of laboratory equipment. • skills to collate and meaningfully present engineering information, adhering to standard conventions of technical reporting.

	Chemistry	15	• skills on how types of chemical bonding in organic molecules influence structure and reactivity of molecules. • use of chemical search engines to identify suitable chemical reactions for use in the laboratory. • conduct simple and complex experiments in the chemistry laboratory to obtain the data required for assessment and evaluation. • present chemical information and interpret its meaning. • skills to collate and meaningfully engineering information, adhering to standard conventions of technical reporting.
	Applied Electromechanical Systems	15	• Understand the nature and interactions of electric, mechanical, and magnetic fields produced by simple charges and current distributions. • Understand the operation and application of a range of electrostatic, magnetic, electromagnetic and electromechanical devices. • Apply experimental methods and analytical techniques to evaluate the performance of electromechanical and electromagnetic devices, incorporating mechanical elements.
	Computing skills	15	• Describe computer architecture concepts and mechanisms related to the design of modern processors, memories, accelerators and networks. • Develop complex digital systems using VHDL, and prototype using FPGA Incorporate pre-existing logic cores into a design. • Create and implement appropriate verification methodologies for digital designs. • Develop concise yet comprehensive technical reports that describe designs and explain the testing strategy used to verify functionality.
	English for academic purposes	15	• Use strategies for effectively reading academic English texts. • Recognise and understand a range of academic texts. • Critically evaluate texts. • Manage (determine the meaning of and record for personal use) unknown general academic and subject specific vocabulary.
	Health and Safety Issues and Ethics	7.5	• understand the legal framework of the Health and Safety at Work etc. Act 1974 and Regulations associated with it • understand the employers', employees' and visitors' duties • evaluate hazards and risks in order to carry out a risk assessment • understand the legal requirement to report any accident or dangerous occurrence • develop risk assessments for scientific laboratories that use chemicals or biological organisms or both
	Engineering Workshop_1	7.5	• Demonstrate knowledge and practice of safe working in an electronics laboratory. • Safely use and manage the tools in an electronics laboratory.

			• Recognise and identify the basic electronic components and devices used for different electronic functions. • Build simple electronic circuits using permanent (soldering) and non-permanent methods. • Demonstrate knowledge and understanding of a systems approach to electronics, including sub-systems (e.g. building and programming a solution to a problem using an Arduino platform, or similar). • Demonstrate basic skills in testing and evaluating circuit solutions using a range of test equipment (Digital Multi-meter, Function Generator, Digital Oscilloscope).
	Culture Module-1	15	"The details of this module are recommended by the KSA partner and details will be decided in the implementation phase"

Level	Module title	Credit	LOs
Y-2	Mathematics for Engineering_2	15	• Apply appropriate tabular and graphical methods of data presentation and calculate and interpret appropriate summary statistics; calculate continues probabilities using the Normal distribution ; calculate and interpret point and interval estimates of population parameter based on empirical data; conduct a variety of standard statistical hypothesis tests for one sample problems; use excel to conduct simple regression analysis for modelling relationships between physical quantities from experimental data; • Solve 1st order and second order ordinary differential equations using some traditional methods; solve 1st order ordinary differential equations numerically (Euler method) using Excel; use table to determine Laplace Transforms and inverse Laplace Transforms; manipulate unit step function; apply Laplace Transforms to solve 1st and 2nd order linear, constant coefficient ordinary differential equations, possibly containing step or Dirac delta functions; • Evaluate double integrals expressed in Cartesian form; interchange the order of integration of a double integral; convert a double integral from Cartesian to polar form; • Determine the (real, distinct) eigenvalues and eigenvectors of a matrix up to order 3; determine the solution to systems of ordinary differential equations using matrix methods; define a Fourier series of a periodic function; • Determine Fourier coefficients using MATLAB; approximate the Fourier coefficients of a sampled function (or signal) using integration techniques; • Continue to develop analytical and numerical skills, through the study of a variety of mathematical techniques; and the statistical element of the module should enhance the student's ability in organising and interpreting data.

	Mechanics and Materials Sciences/ thermodynamics	15	• Describe the internal structure of atoms and molecules. • Describe the different types of crystals and the defects evident within them, and explain how these defects affect the mechanical properties of materials. • Discuss how the bonding within materials affects the properties of the material. • Carry out the standard tests to determine the mechanical properties of materials. • Describe the Electrical and Thermal properties of materials Demonstrate transferable skills.
	Software and programming Principles	15	• Describe the characteristics, constraints and performance capabilities of a representative and wide range of computer-based systems and their typical software applications. • Understand how data is represented and manipulated by representative computer languages and CPU instruction sets. • Describe the microarchitecture of the basic von Neumann machine at the level of the fundamental building blocks - registers, data paths, ALU, control-unit, peripheral interface. • Describe the basic functionality and typical usage of representative storage devices and typical I/O devices.
	Principles of Electrical and Electronics	15	• Apply the fundamentals concepts, principles and theories that underpin electric ac and dc circuit theory and magnetic field theory. • Use appropriate mathematical methods, electrical circuit principles and network theorems to model and analyse the behaviour and performance of electrical circuits. • Employ appropriate computer-based methods in the modelling and analysis of the dc, transient and frequency response of circuits. • Set up and use appropriate laboratory instruments to test, evaluate and communicate the behaviour and performance of practical electrical circuits.
	Computer Aided Design	15	• Model an engineering system as an assembly suitable for mechanism analysis in order to establish parameters such as acceleration, velocity, displacement and force. • Critically evaluate the important considerations for the conduct of sensitivity and optimisation studies for selected components e.g. statics, dynamics or thermal problems. • Understand the concepts of Design of Experiments and Six Sigma analysis and the application of these techniques to the optimisation of engineering components. • Critically evaluate the important considerations for the conduct of a fluid analysis involving laminar and turbulent flow, and the differences between these.
	Analogue and Digital Systems	15	• Apply the fundamental concepts and principles that underpin the application of semiconductor devices and op-amp circuit configurations.

			• Use appropriate mathematical methods and electrical circuit principles to model, design and evaluate the behaviour and performance of analogue and digital circuits. • Apply appropriate computer-based methods in capturing, modelling and analysing the dc, transient and frequency response of analogue and digital circuits that represent realisable physical solutions. • Setup and use appropriate laboratory instruments to test, evaluate and communicate the behaviour and performance of practical electronic circuits. • Design and analyse combinational logic circuits using standard logic gates and devices and applying optimisation methods to digital functions where appropriate on programmable devices.
	Technical Communications Skills	7.5	• Understand and apply communication theory. • Critically think about communication processes and messages. • Write effectively for a variety of contexts and audiences. • Interact skilfully and ethically. • Develop and deliver professional presentations • Engage in scholarly inquiry and social scientific research. • Recognize the effects of diversity, access, and power on communication.
	Engineering Workshop_2	7.5	• Demonstrate a basic knowledge and understanding of errors, their quantification and control in measurements and apply to using standard laboratory instruments to test and evaluate circuits. • Maintain a lab book of activities and develop communication skills via engineering sketches. • Communicate design using Computer-Aided Design (CAD) drawing tools. • Demonstrate an understanding of the nature of team working and the relevant issues.
	Culture Module -2	15	"The details of this module are recommended by the KSA partner and details will be decided in the implementation phase"

Level	Module title	Credit	LOs
Y-3	Engineering Design Fundamentals	15	• Determine component stresses due to torsion bending, axial and combined loading. • Analyse complex loaded beams with regard to shear, thrust and bending moment diagrams • Calculate the deflection of standard beams loaded laterally. • Perform analyses of 2D stress and strain systems and determine principal stresses and strains. • Perform the vibration analyses of one-degree of freedom systems with and without damping. • Solve design problems for machine elements such as spur and epicyclic gears including gear tooth force generation and resultant forces produced in shaft support bearings, with reference to current codes of practice.

			• Solve design problems for machine elements such as spring, shaft, clutch, belt drive, brake and power screw systems
	Power Electronics	15	• Describe the characteristics of a range of power electronic devices and relate these to typical applications. • Describe and analyse AC/DC, DC/DC, DC/AC and AC/AC static power conversion schemes using MATLAB as appropriate. • Describe applications of power electronic conversion schemes and develop a product specification for such schemes synthesised from the needs of the application. • Determine and implement an effective measurement and analysis strategy for testing/evaluation of power electronic systems. • Describes the principles of EMC and device protection and synthesise solutions to problems in this area. • Work in a project team to solve a power electronic application problem.
	Mechatronics _1 (Systems)	15	• Critically analyse and evaluate Advanced Mechatronic Systems, and its implementation in EV applications including drive and steer by wire. • Analyse, design, simulate, and build an EV application using Programmable Logic Controller Embedded Mechatronic Controller. • Identify, select, and evaluate the necessary programming, digital electronics, and controlled systems in the design of advanced mechatronic systems for EV applications. • Develop innovative solutions to automation problems that arise in advanced manufacturing for EV applications.
	Sensors, Control and Instrumentations_1	15	• INSTRUMENTATION: • Describe the principle of operation of a variety of transducers/sensors and the electrical signals obtained from transducers. • Design suitable signal conditioning / instrumentation for a variety of transducers in various applications. • Calculate the static characteristics of transducer / instrumentation systems, e.g linearity, hysteresis, resolution. • Identify applications where transducers and their associated signal conditioning circuits are used, in particular control system applications. • ACTUATORS • Describe the operation of basic actuators, e.g. hydraulic/pneumatic pistons, electric motors etc, and sketch their performance characteristics. • Describe the power components required to drive and control actuators e.g. amplifiers, pneumatic valves etc. • Describe the use of actuators in open-loop control systems. DISCRETE (ON/OFF) CONTROL. • Identify and Describe applications where simple ON/OFF control is used.

			• Design pneumatic and hydraulic circuit diagrams using ISO1219 Fluid Power symbols for the controlled reciprocation of pneumatic/hydraulic cylinders. • Describe the basic architecture, operating principles and application areas of Programmable Logic Controllers (PLC's). • Select transducers, actuators and associated components for interfacing to Programmable Logic Controllers to create ON/OFF type closed-loop control systems, for a variety of control processes. • Design Ladder Diagram Programmes to control these processes. • CONTINUOUS CONTROL. • Identify application areas and requirements of continuous control systems and describe the ideal operation of open and closed-loop continuous control systems. • Select suitable transducers, actuators and other components for use in continuous closed loop control applications. • Describe how to construct and test continuous closed-loop control systems by interfacing to PLC's, microcontrollers and computer systems. • Calculate and describe basic control system performance characteristics, e.g. rise time, steady state error, settling time etc. • Describe the use of controllers in closed-loop control systems to improve performance. • Calculate three term controller settings (PID settings)
	Power System Engineering	15	• Demonstrate an understanding of the concepts and operation of electrical power systems and plant items. • Analyse a power system, including the application of appropriate computer-based tools, to determine fault level, load flow, and stability. • Critically evaluate the performance of a power system under different types of faults.
	Engineering for the Society	15	• Understand the importance of cultures and disciplines that overcome global environmental challenges. • Develop and demonstrate appropriate competence in, and an understanding of sustainable development and its practical implications. • Demonstrate an awareness of corporate individual roles and responsibility. • Demonstrate awareness and understanding of engineering ethics. • Reflect upon their competences in teamwork, professionalism, leadership, oral and written communication, problem solving, innovation and creativity.
	Professional Development and Project Management for Engineers	7.5	• Synthesise and monitor a project plan for a team to carry out the development of a practical and realistic design for a solution to a problem relevant to their specialism, including costing and the relation to breakeven analysis and profit and loss.

			• Select and use relevant technical and professional skills, techniques and practices in the development of a problem solution. • Develop and demonstrate appropriate competence in, and an understanding of, the roles and transferable skills required in the project's development. • Understand the structure of the business organisation and its associated functions. Reflect upon their strengths and weaknesses and those of their team. • Demonstrate information gathering and enquiry skills appropriate to their programme level. • Demonstrate the ability to report upon the project in a written and oral form. Incorporate an assessment of the sustainability and ethical issues that are relevant to the product.
	Engineering Workshop_3	7.5	• Apply advanced and modern skills of product design, development, and prototyping with due consideration to health and safety issues, to fabricate simple electronic or electrical devices. • Transfer a simple and complex schematic design to a PCB layout. • Apply systematic test, validation, and verifications methods to commission successfully an electrical or electronic product.
	Culture Module -3	15	"The details of this module are recommended by the KSA partner and details will be decided in the implementation phase"

Level	Module title	Credit	LOs
Y-4	Design for Sustainable Manufacturing	15	• Understand concepts involved in sustainable materials and manufacturing process. Appreciate the possibilities to reduce environmental impact by design. • Use analytical tools to assess environmental sustainability and value of manufacturing processes and production lines. • Understand the concepts of Sustainable Supply Chains. • Understand how value can be created for Sustainable Manufacturing. • Production Optimisation, The Digital Twin and Predictive Maintenance. • Be able to specify and design an Industry 4.0 IoT ready Robotics Manufacturing Cell. • Understand and specify Robot/ Collaborative robot (Cobots) under Industry 4.0 Including advantages/limitations. • To be able to produce a digitalised specification of a Robotics system based on simulation tools.
	Electromagnetic Fields	15	• Should be able to specify the "constitutive relationships" for fields and understand why they are required. • Have an ability to determine and describe static and dynamic electric and magnetic fields for technologically important structures: the coil, charge

			distributions, the dipole, the coaxial cable, dielectric and conducting spheres immersed in electric fields. • Knowledge of, physical interpretation, and ability to apply Maxwell's equations to determine field waves, potential waves, energy and charge conservation conditions. • Experimental measurement of voltages induced by time varying magnetic flux. Flux determination. • A knowledge of and experimental measurement of the influence of boundaries on waves. Thus, knowledge of and the application of boundary conditions for fields, Brewster's angle to eliminate reflections and polarize radiation, total reflection from a boundary, evanescent fields, and some knowledge of their application to modern optics. • Basic concept of the guiding of electromagnetic waves by constructive multiple reflections from conductors and dielectrics
	Mechatronics _2 (Robotics and Automation)	15	• Select and utilise appropriate sensory devices for a specific task. • Apply relevant data acquisition techniques in conjunction with sensory devices in embedded systems within a robotics environment. • Utilise machine vision techniques such as object tracking for use with robotic systems. • Critically evaluate the various methods of mobility and navigation for robotic systems. • Apply and implement various machine learning techniques available in robotic systems. • Design and implement an intelligent robotic system on an embedded platform utilising the various techniques above. • Demonstrate an awareness of the ethical issues associated with developing intelligent machines.
	Control Theory	15	• Distinguish between on/off, open-loop and closed-loop control systems and identify suitable applications for these control systems. • Derive transfer functions for basic electrical and mechanical system components (mathematical modelling). • Calculate using block diagram reduction techniques the transfer function of open and closed-loop continuous control systems. • Calculate and sketch the response of first-and second order systems in the time and frequency domain. • Plot poles and zeros on the S-plane and use dominant pole simplification techniques to predict the dynamic response of 3rd, 4th, 5th and higher order systems. • Calculate gain and phase margins using Nyquist and Bode plots and estimate the stability of closed-loop control systems. • To improve control system performance using compensators and PID controllers.
	Communication Systems_1	15	• Theoretically and practically work with frequency-domain representations of signals and convert signals between the time and frequency domains;

			• Explain conceptually and mathematically a range of analogue and digital modulation methods; • Describe time-division and frequency division multiplexing and multiple access; • Describe and analyse key characteristics of analogue and digital line transmission systems and design simple antennas; • Describe and analyse key characteristics of wireless transmission systems; • Describe key characteristics of satellite communication systems.
	Battery and Energy Storage Technology	15	• Outline the fundamentals associated with the renewable energy resources and the storage systems linked to them. • Critically evaluate the different storage systems and compare them to each other in term of capacity, durability and cost. • Modelling and analysis of battery systems with applications to EVs • Battery storages for energy and transport systems which include cooperation between energy and transport systems through electrification. • Critically evaluate battery management systems for efficient energy conversion. • Evaluate the supply chain of lithium batteries. • Understand the environmental impact of batteries.
	Integrated Engineering Studies (30 credits) - Team	30	• Develop, synthesise and monitor a project plan for a team to carry out the development of a practical and realistic product to meet business needs, making use of relevant design and development technologies. • Select and use relevant technical, professional and entrepreneurial skills, techniques and practices throughout the life cycle of a marketable product concept and business plan development including a global manufacturing strategy. • Demonstrate information gathering and enquiry skills appropriate to the programme level. • Demonstrate ability to produce an innovative, complete and commercially viable solution to a design challenge that is ethically and sustainably sound. • Demonstrate ability to evaluate and report upon the environmental impact of the produced product solution through its life cycle. • Demonstrate an understanding of, and appropriate competence in, the roles and transferable skills required in a project's development. • Demonstrate business awareness through understanding broad trends in a product marketplace and the attributes and performance that customers require. • Demonstrate ability to report upon the project in a written and oral form. • Demonstrate ability to reflect upon their own strengths and weaknesses and those of fellow team members, and to identify methods to improve their performance in future projects.

Level	Module title	Credit	LOs
Y-5	Vehicular Systems Engineering and Charging Technology	15	• Comprehensive knowledge and the ability to apply concepts from electrical and electronic engineering in complex problems in electric vehicle systems and a critical awareness of new developments and the wider context of engineering. • Ability to formulate and critically evaluate complex problems involving uncertain or incomplete data using data analytics in electric vehicle systems design. • Ability to select and apply modelling techniques and technologies for complex problems in electric vehicle systems and discussing the limitations of the techniques employed. • Ability to analyse, simulate and design various charging techniques, and possible infrastructure challenges involved. • Select and critically evaluate literature about current and future vehicular technology with respect to current engineering practices; as well as social, legal, ethical, and professional issues. • Communicate effectively on complex electric vehicle systems matters with technical and non-technical audiences and the ability to evaluate the effectiveness of the methods used.
	Electrical Machines Principles	15	• Describe the general structure and components of a range of electrical machines. • Develop models and characterising equations for a range of electromagnetic and electromechanical systems. • Be able to describe the basic tests for parameter identification. • Apply these models and equations to analyse the performance of these systems.
	Autonomous Electric Vehicle Technology	15	• Develop knowledge, skills, and ability to critically assess all major operations of manufacture, and improvement of next generation of Autonomous EV engineering and technology. • Identify, and describe the roles of mechatronics systems in a modern motor vehicle technology. • Develop knowledge on data collection using sensor and Sensor-less technology, and the use of signal conditioning and information technology relevant to automotive systems. • Develop an understanding of all the major automotive mechanical and electrical components including chassis, powertrain, suspension.
	Industrial Control for EVs (IC and PLC)	15	• Identify a system model in various formats; • Select appropriate control strategies for a particular application; • Determine the likely performance of a system based on system specification and the particular application. • Design optimal and robust controllers in state space.
	Communication Systems_2 (Wireless & Advanced Protocols)	15	• Deal systematically and creatively with the complexity of current wireless, optical communication and industrial communications systems and make sound technical and commercial judgements;

			• Demonstrate originality and self-direction in problem solving related to wireless system implementation and evaluation; • Further develop their knowledge and understanding to embrace new theories, techniques and issues related to antennas and propagation as they emerge; • Develop a sound knowledge of state-of-the-art simulation tools for the investigation of wireless system functionality, evaluation and design. • Critical evaluation of current research in wireless, optical and industrial communications systems and demonstration of the ability to interpret research in terms of potential practical usefulness. • Develop an awareness of issues at the forefront of modern wireless communication systems by critical appreciation of current research, relating current research to practical applications and knowledge of developments in national and international radio regulatory requirements.
	Transport Systems	15	• Understand the technologies involved with the delivery and operation of a modern intelligent transport system. • To evaluate current transport systems and solutions. • 3. Be able to present coherent solutions to given transport scenarios.
	Individual Engineering Project (30 credits)	30	• Critically analyse and evaluate technical and non-technical information from a variety of high-quality information sources. • Synthesise new ideas/knowledge through critical analysis and evaluation of the literature in the context of the project subject area. • Demonstrate deep knowledge of theories, techniques, technologies and tools appropriate to the chosen topic area. • Design and develop systems / technology / experiments with the aim of addressing the stated aims of the research project. • Demonstrate communication and presentation skills through presentation and discussion of the project findings. • Working independently, design, plan and carry out an in-depth research-based study.

Pre-requisites of modules

Modules at lower level should be passed before joining the higher level, modules that are continuing from one level to the next higher level must be passed first before moving to higher level year,