



COURSE OUTCOMES

(R 2013)

Branch: B.E. Biomedical Engineering

Course Code: C101 Course Name: HS6151 Technical English – I

C101.1	Speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
C101.2	Write cohesively and coherently and flawlessly avoiding grammatical errors
C101.3	Using a wide vocabulary range, organizing their ideas logically on a topic.
C101.4	Read different genres of texts adopting various reading strategies.
C101.5	Listen/view and comprehend different spoken discourses/excerpts in different accents.

Course Code: C102 Course Name: MA6151 Mathematics – I

C102.1	Develop the use of matrix algebra techniques this is needed by engineers for practical applications
C102.2	Make the student knowledgeable in the area of infinite series and their convergence so that he/ she will be familiar with limitations of using infinite series approximations for solutions arising in mathematical modelling
C102.3	Familiarize the student with functions of several variables. This is needed in many branches of engineering
C102.4	Introduce the concepts of improper integrals, Gamma, Beta and Error functions which are needed in engineering applications
C102.5	Acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage

Course Code: C103 Course Name: PH6151 Engineering Physics – I

C103.1	Apply knowledge on the basis of physics related to properties of matter
C103.2	Apply knowledge on the basis of physics related to optics
C103.3	Apply knowledge related to acoustics
C103.4	Apply these fundamental principles to solve practical problems
C103.5	The materials are used for engineering applications

Course Code: C104 Course Name: CY6151 Engineering Chemistry – I

C104.1	Make the students conversant with basics of polymer chemistry
C104.2	To make the student acquire sound knowledge of second law of thermodynamics and second law based derivations of importance in engineering applications in all disciplines
C104.3	Acquaint the student with concepts of important photophysical and photochemical processes and spectroscopy
C104.4	Develop an understanding of the basic concepts of phase rule and its applications to single and two component systems and appreciate the purpose and significance of alloys
C104.5	Acquaint the students with the basics of nano materials, their properties and applications

Course Code: C105 Course Name: GE6151 Computer Programming

C105.1	Learn the organization of a digital computer
C105.2	Be exposed to the number systems
C105.3	Learn to think logically and write pseudo code or draw flow charts for problems
C105.4	Be exposed to the syntax of C
C105.5	Be familiar with programming in C, Learn to use arrays, strings, functions, pointers, structures and unions in C

Course Code: C106 Course Name: GE6152 Engineering Graphics

C106.1	perform free hand sketching of basic geometrical constructions and multiple views of objects
C106.2	do orthographic projection of lines and plane surfaces
C106.3	draw projections and solids and development of surfaces
C106.4	prepare isometric and perspective sections of simple solids
C106.5	demonstrate computer aided drafting

Course Code: C107 Course Name: GE6161 Computer Practices Laboratory

C107.1	Introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics and properties of matter
C107.2	Get the practical skills in the field of thermal physics
C107.3	Acquire the industrial knowledge in the field of properties of matter
C107.4	Acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
C107.5	acquaint the students with the determination of molecular weight of a polymer by viscometry

Course Code: C108 Course Name: GE6162 Engineering Practices Laboratory

C108.1	To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering
C108.2	Study of plumbing and carpentry components of residential and industrial buildings. Safety aspe
C108.3	Ability to fabricate carpentry components and pipe connections including plumbing works
C108.4	Ability to use welding equipments to join the structures
C108.5	Ability to fabricate electrical and electronics circuit

Course Code: C109 Course Name: GE6163 Physics and Chemistry Laboratory - I

C109.1	To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics and properties of matter
C109.2	To get the practical skills in the field of thermal physics
C109.3	To acquire the industrial knowledge in the field of properties of matter
C109.4	To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
C109.5	To acquaint the students with the determination of molecular weight of a polymer by viscometry

Course Code: C110 Course Name: HS6251 Technical English – II

C110.1	acquire listening and speaking skills in both formal and informal contexts
C110.2	develop reading skills by familiarizing them with different types of reading strategies
C110.3	Equip writing skills needed for academic as well as workplace contexts
C110.4	acquire language skills at their own pace by using e-materials and language lab components
C110.5	listen/view and comprehend different spoken discourses/excerpts in different accents

Course Code: C111 Course Name: MA6251 Mathematics – II

C111.1	Acquire sound knowledge of techniques in solving ordinary equations that model engineering problems
C111.2	Apply the concepts of vector calculus needed for problems in all engineering disciplines
C111.3	Develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence
C111.4	Application areas such as conduction, elasticity, fluid dynamics and flow the of electric current
C111.5	Create a new domain which it is easier to handle the problem that is being investigated

Course Code: C112 Course Name: PH6251 Engineering Physics – II

C112.1	The students will have the knowledge on physics of materials and that knowledge will be used by them in different engineering and technology applications
C112.2	Get knowledge on the functioning of conducting and semiconducting materials and their applications
C112.3	Understand the functioning of magnetic and superconducting materials
C112.4	Get knowledge about various dielectric materials
C112.5	Have the necessary understanding on various advanced materials

Course Code: C113 Course Name: CY6251 Engineering Chemistry – II

C113.1	Make the students conversant with boiler feed water requirements, related problems and water treatment techniques
C113.2	Principles of electrochemical reactions, redox reactions in corrosion of materials and methods for corrosion prevention and protection of materials
C113.3	Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells
C113.4	Preparation, properties and applications of engineering materials
C113.5	Types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels

Course Code: C114 Course Name: EC6202 Electronic Devices and Circuits

C114.1	Explain the structure of the basic electronic device
C114.2	Design applications using the basic electronic devices
C114.3	Understand the amplifiers and multistage amplifiers
C114.4	Understand the characteristics of transistors and p n junction
C114.5	Understand the p n junction

Course Code: C115 Course Name: EE6201 Circuit Theory

C115.1	Introduce electric circuits and its analysis
C115.2	Impart knowledge on solving circuits using network theorems
C115.3	Introduce the phenomenon of resonance in coupled circuits
C115.4	Educate on obtaining the transient response of circuits
C115.5	Apply Phasor diagrams for the analysis of three phase circuits

Course Code: C116 Course Name: GE6262 Physics and Chemistry Laboratory - II

C116.1	
C116.2	The students will have the ability to test materials by using their knowledge of applied physics principles in optics and properties of matter
C116.3	To make the student acquire practical skills in the wet chemical and instrumental methods for quantitative estimation of hardness
C116.4	Alkalinity, metal ion content, corrosion in metals and cement analysis
C116.5	The students will be conversant with hands-on knowledge in the quantitative chemical analysis of water quality related parameters, corrosion measurement and cement analysis

Course Code: C118 Course Name: EC6211 Circuits and Devices Laboratory

C118.1	To provide practical experience with simulation of electrical circuits and verifying circuit theorems
C118.2	Experimental verification of Kirchhoff's voltage and current laws
C118.3	Design and Simulation of series and parallel resonance circuit
C118.4	Experimental determination of power in three phase circuits by two-watt meter method, Calibration of single phase energy meter
C118.5	Ability to understand and apply circuit theorems and concepts in engineering applications

Course Code: C201 Course Name: MA6351 Transforms and Partial Differential Equations

C201.1	Application of Fourier series analysis in engineering apart from its use in solving boundary value problems.
C201.2	Illustrate Fourier transform techniques used in wide variety of situations.
C201.3	Explain the effective mathematical tools for the solutions of partial differential equations that model several physical processes.
C201.4	Develop Z transform techniques for discrete time systems.
C201.5	Relate the one and two dimensional equation for different condition

Course Code: C202 Course Name: BM6301 Bio Chemistry

C202.1	Explain the fundamentals of biochemistry
C202.2	Relate the metabolic activity of carbohydrates and its cyclic actions
C202.3	Outline the study about the classification, architecture and significance of lipids
C202.4	Interpret the importance of the nucleic acids and its importances
C202.5	Categorize about the Enzymes actions in the human body

Course Code: C203 Course Name: EC6303 Signals and Systems

C203.1	To understand the basic properties of signal & systems
C203.2	To know the methods of characterization of continuous LTI systems in time domain
C203.3	To analyze continuous time signals and system in the Fourier and Laplace domain
C203.4	To know the methods of characterization of discrete LTI systems in time domain
C203.5	To analyze discrete time signals and system in the Fourier and Z transform domain

Course Code: C204 Course Name: BM6302 Sensors and Measurements

C204.1	Illustrate the methods of measurements and its purpose
C204.2	Make use of modern tools to eliminate errors associated with measurements
C204.3	Recall appropriate light sensors for measurement of physical phenomenon
C204.4	Evaluate the principle of signal conditioners and signal analysers
C204.5	Describe about the sorting and searching

Course Code: C205 Course Name: EC6301 Object Oriented Programming and Data Structures

C205.1	Explain the concepts of Object oriented programming.
C205.2	Write simple applications using C++.
C205.3	Discuss the different methods of organizing large amount of data.
C205.4	Study about the linear data structures
C205.5	Describe about the sorting and searching

Course Code: C206 Course Name: BM6303 Anatomy and Human Physiology

C206.1	Describe basic structural and functional elements of human body.
C206.2	Explain organs and structures involving in system formation and functions
C206.3	Identify all systems in the human body
C206.4	Develop clear knowledge about the renal actions and its functions
C206.5	Infer about the nervous system of humans

Course Code: C207 Course Name: BM6311 Bio Chemistry and Human Physiology Laboratory

C207.1	Interpret the changes in biomolecules.
C207.2	Analyze the importance of macromolecules.
C207.3	Infer the importance of assay in biological testing.
C207.4	Enumerate the importance of electrophoresis technique in biological study
C207.5	Apply the fundamental test on blood

Course Code: C208 Course Name: BM6312 OOPS and Data Structures Laboratory

C208.1	Design and implement C++ programs for manipulating stacks, queues, linked lists, trees, and graphs.
C208.2	Apply good programming design methods for program development.
C208.3	Apply the different data structures for implementing solutions to practical problems.
C208.4	Solve problem involving graphs, trees and heaps
C208.5	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data

Course Code: C209 Course Name : MA6451 Probability and Random Processes

C209.1	Analyse various distribution functions and help in acquiring skills in handling situations involving more than one variable
C209.2	Analyze the response of random inputs to linear time invariant systems
C209.3	Explain the function of random variables based on single & multiples random variables
C209.4	Evaluate and apply moments & characteristic functions and understand the concept of inequalities and probabilistic limits
C209.5	Summarize the concept of random processes and determine covariance and spectral density of stationary random processes

Course Code: C210 Course Name: BM6401 Medical physics

C210.1	Assess effects of sound and light in human body
C210.2	Analyze effects of radiation in matter and how isotopes are produced
C210.3	Importance of ionization radiation in medical field
C210.4	Demonstrate the sound interaction with body
C210.5	Interpret the radioactivity and its medical application

Course Code: C211 Course Name: BM6402 Basics of Electrical Engineering

C211.1	Illustrate Magnetic circuits, principle and application of transformers
C211.2	Summarize principle and application of transformers
C211.3	Explain operation of DC Machines
C211.4	Explain principle of operation of AC Machines
C211.5	Interpret the operation of fractional-kW motors and their applications.

Course Code: C212 Course Name: BM6403 Analog and Digital ICs

C212.1	Understand the basic of the digital system
C212.2	Do application of digital ICs
C212.3	Design various functional Circuit using this ICs
C212.4	Discuss the importance of Filters and waveform generator
C212.5	Explain the application of analog ICs in the designing circuit

Course Code: C213 Course Name: BM6404 Pathology and Microbiology

C213.1	Student can perform practical experiments on tissue processing, cryoprocessing, staining, Processes etc.
C213.2	Identification of disease condition by processing tissue
C213.3	Importance of staining technique
C213.4	Understanding the functioning of equipments used in microbial study
C213.5	Study of biological fluids and its importance

Course Code: C214 Course Name: CS6304 Analog and Digital Communication

C214.1	Apply analog communication techniques
C214.2	Apply digital communication techniques
C214.3	Use data and pulse communication techniques

C214.4	Describe the source and Error control coding of information
C214.5	Utilize multi-user radio communication

Course Code: C215 Course Name: BM6411 Circuits and ICs Laboratory

C215.1	Design digital logic and circuits
C215.2	Learn the function of different Ics
C215.3	Understand the applications of operation amplifier
C215.4	Learn the working of multivibrators
C215.5	Design circuits for generating waveforms using ICs.

Course Code: C216 Course Name: BM6412 Pathology and Microbiology Laboratory

C216.1	Infer the practical experiments on tissue processing, cryoprocessing, staining, Processes etc.
C216.2	Make use of disease condition by processing tissue
C216.3	Demonstrate the importance of straining technique
C216.4	Analyze the functioning of equipments used in microbial study
C216.5	Interpret the study of biological fluids and its importance

Course Code: C301 Course Name: BM6501 Bio Control Systems

C301.1	Describe about the mechanical translational and rotational system also to know about the block diagram reduction rule and signal flow graph
C301.2	Analyze the time domain of the given system using different mathematical techniques
C301.3	Analyze the frequency domains of the given system using different mathematical techniques
C301.4	Understand to make a frequency response plot
C301.5	Learn about the modelling of physiological system

Course Code: C302 Course Name: BM6502 Diagnostic and Therapeutic Equipment - I

C302.1	illustrate different medical devices applied in measurement of parameters related to cardiology
C302.2	Discuss the use different medical devices applied in measurement of parameters related to neurology
C302.3	Measure signals generated by muscles
C302.4	Explain about cardiac assist devices, its continuous monitoring and transmission
C302.5	Explain about extra corporeal devices and its special diagnostic techniques

Course Code: C303 Course Name: BM6503 Bio Materials and Artificial Organs

C303.1	Analyze different types of Biomaterials and its classification.
C303.2	Compare the different types of metal alloys, ceramics and the characteristics of different metal alloys, ceramics
C303.3	Classify the types of polymeric materials and their importance in hard and soft tissue replacement
C303.4	Develop a materials that could be used as a tissue replacement implant.
C303.5	Design a materials that could be used for developing artificial organs

Course Code: C304 Course Name: BM6504 Biomedical Instrumentation

C304.1	Differentiate different bio potentials and its propagations.
C304.2	Illustrate different electrode placement for various physiological recordings
C304.3	Design bio amplifier for various physiological recordings
C304.4	Explain various technique for non-electrical physiological measurements
C304.5	Demonstrate different biochemical measurement techniques.

Course Code: C 305 Course Name: EC6504 Microprocessor and Microcontroller

C305.1	Design and implement programs on 8086 microprocessor.
C305.2	Design I/O circuits.
C305.3	Design Memory Interfacing circuits.
C305.4	Study the architecture of 8051 microcontroller
C305.5	Design and implement 8051 microcontroller based systems.

Course Code: C 306 Course Name: MD6501 Hospital Management

C306.1	To understand the basic structure of hospital management
C306.2	Summarize the principles of Human Resource management in hospital
C306.3	Analys about marketing principles and consumers behaviours
C306.4	to know hospital information systems & supportive services
C306.5	Examine the quality and safety aspects in hospital

Course Code: C 307 Course Name: BM6511 Microprocessor and Microcontroller Laboratory

C307.1	Write ALP Programmes for fixed and Floating Point and Arithmetic
C307.2	Interface different I/Os with processor
C307.3	Generate waveforms using Microprocessors
C307.4	Execute Programs in 8051
C307.5	Explain the difference between simulator and Emulator

Course Code: C 308 Course Name: BM6512 Bio Medical Instrumentation Laboratory

C308.1	Design the amplifier for Bio signal measurements
C308.2	Recording and analysis of bio signals
C308.3	Inspect common biomedical signals and distinguish characteristic features
C308.4	Measure various non-electrical parameters using suitable sensors/transducers
C308.5	Identify, explain and study the patient safety issues related to biomedical instrumentation.

Course Code: C 309 Course Name: GE6674
Communication and Soft Skills - Laboratory Based

C309.1	Develop listening skills for academic and professional purposes.
C309.2	Gain familiarity with learning approaches connected to successful writing
C309.3	Take international examination such as IELTS and TOEFL
C309.4	Make presentations and Participate in Group Discussions.
C309.5	Successfully answer questions in interviews.

Course Code: C 310 Course Name: BM6601 Radiological Equipment

C310.1	Explain the different radio diagnostic and therapeutic techniques
C310.2	Describe the development of computer tomography
C310.3	Learn about the structure and functional capabilities of MRI scan
C310.4	To study and understand the basic concepts of radio isotopes
C310.5	To understand the safety precautions of handling a radiological equipments

Course Code: C 311 Course Name: BM6602 Biomechanics

C311.1	Illustrate the mechanics of physiological systems.
C311.2	Analyze the biomechanical systems
C311.3	Evaluate orthopaedic applications.
C311.4	Demonstrate an understanding of kinetic concepts including inertia, force, torque, and impulse.
C311.5	Inspect the major factors involved in the angular kinematics of human movement.

Course Code: C 312 Course Name: BM6603 Diagnostic and Therapeutic Equipment - II

C312.1	Explain about measurements of parameters related to respiratory system
C312.2	illustrate the measurement techniques of sensory responses
C312.3	Analyze different types and uses of diathermy units
C312.4	Discuss ultrasound imaging techniques and its usefulness in diagnosis
C312.5	Outline the importance of patient safety against electrical hazard

Course Code: C 313 Course Name: EC6502 Principles of Digital Signal Processing

C313.1	Apply DFT for analysis of digital signal and systems.
C313.2	Design IIR and FIR filters.
C313.3	Analyze the effects of finite word length on filters
C313.4	Design multirate filters.
C313.5	Explain the concept of adaptive filters for equalization

Course Code: C 314 Course Name: GE6351 Environmental Science and Engineering

C314.1	To introduce the nature and facts about environment, inter-relationship between organisms and biodiversity.
C314.2	To create a awareness about causes of various environmental pollutions and its control measures.
C314.3	To realise the importance of natural resources and to give warning about over-utilization of resources.
C314.4	To find and implement scientific, technological, economic and political solutions to environmental problems
C314.5	To educate on impacts of population growth and explosion.

Course Code: C 315 Course Name: BM6002 Biometric Systems

C315.1	Summarize the technologies of biometrics systems
C315.2	Illustrate the principles of design of finger print biometric system
C315.3	Analys the design of face and hand geometry biometric system
C315.4	To understand the evaluation multimodel biometrics based systems
C315.5	Intreprets the Biometric Authentication Systems

Course Code: C 316 Course Name: BM6611 Digital Signal Processing Laboratory

C316.1	Build simulation of DSP systems
C316.2	Demonstrate their abilities towards DSP processor based implementation of DSP systems
C316.3	Analyze Finite word length effect on DSP systems
C316.4	Demonstrate the applications of FFT to DSP
C316.5	Make use of adaptive filters for various applications of DSP

Course Code: C 317 Course Name: BM6612 Diagnostic and Therapeutic Equipment Laboratory

C317.1	practice on recording of Biopotentials
C317.2	practice on analyzing Biopotentials and Biomedical Signals
C317.3	practice on recording of Lung Volumes and Audiometry
C317.4	Check the transmission of Biological signal using telemetry concepts
C317.5	check the safety of any medical equipments and to have the knowledge about therapeutic equipments.

Course Code: C 401 Course Name: BM6701 Pattern Recognition and Neural Networks

C401.1	Explain the fundamentals of supervised learning
C401.2	Explain the fundamentals of unsupervised learning
C401.3	outline the fundamentals of simple neural net
C401.4	Design and apply different pattern recognition techniques in neural network using associative memory
C401.5	Design and apply different pattern recognition techniques in neural network using competitive networks

Course Code: C 402 Course Name: BM6702 Medical Informatics

C402.1	Discuss about health informatics and different ICT applications in medicine.
C402.2	Explain the function of Hospital Information Systems
C402.3	Analyze medical standards
C402.4	Discuss on bioinformatics and different application of it.

C402.5	Illustrate the application of medical informatics in recent trends.
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Course Code: C 403 Course Name: BM6703 Medical Optics

C403.1	Demonstrate the knowledge of the fundamentals of optical properties of tissues
C403.2	Illustrate surgical applications of laser.
C403.3	Interpret photonics and its therapeutic applications.
C403.4	Analyze biological systems and recommend possible photonic techniques/instruments that can be used to probe these systems
C403.5	Understand and recognize the limitations of current optical imaging technologies and propose new approaches to overcome/improve upon them

Course Code: C 404 Course Name: IT6005 Digital Image Processing

C404.1	Learn digital image fundamentals and colour models.
C404.2	Be exposed to simple image processing techniques in spatial and frequency domain.
C404.3	Be familiar with image restoration and segmentation techniques.
C404.4	Be familiar with image compression and Wavelets techniques.
C404.5	Learn to represent image in form of features.

Course Code: C 405 Course Name: MD6010 Telehealth Technology

C405.1	To Learn the key principles for telemedicine and health
C405.2	To Understand the telemedical technology.
C405.3	Summarize the telemedical standards and its operations
C405.4	Apply the mobile telemedicine and its operations in healthcare
C405.5	Contrast the application of telemedicine in various area of healthcare sector

Course Code: C 406 Course Name: CS6551 Computer Networks

C406.1	Explain the components requirement of networks and link layer service
C406.2	Classify the Media Access Control Protocols and different Internetworking
C406.3	Demonstrate various types of routing techniques
C406.4	Outline the mechanisms involved in transport layer
C406.5	Experiment with different application layer protocols

Course Code: C 407 Course Name: BM6711 Hospital Training

C407.1	understand the basic structure of hospital management
C407.2	understand the principles of Human Resource management in hospital
C407.3	Perform segmentation operations in the images
C407.4	Perform Morphological and edge detection techniques on the images
C407.5	Apply image processing technique to solve real health care problems.

Course Code: C 408 Course Name: BM6712 Digital Image Processing Laboratory

C408.1	Perform enhancing operations on the image using spatial filters and frequency domain filters.
C408.2	Use transforms and analyze the characteristics of the image.
C408.3	Perform segmentation operations in the images
C408.4	to know hospital information systems & supportive services
C408.5	to know the quality and safety aspects in hospital

Course Code: C 409 Course Name: BM6801 Rehabilitation Engineering

C409.1	Gain adequate knowledge about the needs of rehabilitations and its future development
C409.2	Interpret in depth knowledge about Engineering Concepts in Sensory & Motor rehabilitation.
C409.3	Apply the different types of Therapeutic Exercise Technique to benefit the society
C409.4	Design and apply different types Hearing aids, visual aids and their application in biomedical field and hence the benefit of the society.
C409.5	Gain in-depth knowledge about different types of models of Hand and arm replacement.

Course Code: C 410 Course Name: BM6010 Assist Devices

C410.1	Study various mechanical techniques that will help failing heart.
C410.2	Explain the function of Hospital Information Systems
C410.3	Understand the tests to assess the hearing loss and development of electronic devices to compensate for the loss.
C410.4	Know the various orthotic devices and prosthetic devices to overcome orthopaedic problems.
C410.5	Understand electrical stimulation techniques used in clinical applications.

Course Code: C 411 Course Name: GE6083 Disaster Management

C411.1	Differentiate the types of disasters, causes and their impact on environment and society.
C411.2	Assess vulnerability and various methods of risk reduction measures as well as mitigation.
C411.3	Understand the inter-relationship between disasters and development.
C411.4	Evaluate the hazard and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment and management.
C411.5	To apply the knowledge in understanding various prone zones in India.

Course Code: C 412 Course Name: BM6012 Wearable Systems

C412.1	Infer about sensors and its application in wearable systems
C412.2	Demonstrate about applications of wearable systems
C412.3	Analyze the application of signal processing in wearable system.
C412.4	Extend the importance of energy harvesting in wearable system
C412.5	Inspect the importance of technology in wireless system in medical field

Course Code: C 413 Course Name: BM6811 Project Work

C413.1	On Completion of the project work students will be in a position to take up any challenging
C413.2	Relate the theoretical studies with experimental work.
C413.3	Gain Knowledge on real time problem related to project work
C413.4	Knowledge on design calculation based on design specification
C413.5	Explore the communication skill by project presentation