BTEC Assignment Brief

Qualification	Pearson BTEC Higher Nationals in Digital Technologies
Unit number and title	Unit 4: Programming
Learning aim(s)	**LO1** Define basic algorithms to carry out an operation and outline the process of programming an application **LO2** Explain the characteristics of procedural, object-orientated and event-driven programming **LO3** Implement basic algorithms in code using an IDE **LO4** Determine the debugging process and explain the importance of a coding standard.
Assignment title	PATIENT'S RECOVERY SYSTEM
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Issue date	March 13, 2025
Hand in deadline	

	Assignment Title: PATIENT'S RECOVERY SYSTEM **Introduction and requirements:** Human life and health are priceless. In some medical cases surgery is required. After surgery patients' recovery is a crucial step. Patient's treatment does not finish on performing a surgery. After the surgery, a patient stays at hospital and recovers. The duration of stay depends on a kind of operation. However, it is believed that stay should be as short as possible. It is only because of a patient's convenience and his/her health as well, what may seem as a paradox. Longer stay at hospital may be harmful for a patient. Long stay at bed may lead to bedsores, venous embolism and thrombosis which may cause stroke or heart attack. Right after the operation the patient is moved to E.R (Emergency Room). Depending on his state and a kind of surgery, he/she stays there for at least twenty-four hours. A patient is constantly controlled there by special equipment and doctors- there might be need of an instant intervention in case of emergency. After a patient leaves E.R, he/she is moved to a recovery room. Our solution would help medical personnel to monitor patient's recovery during that time in order to allow the patient to leave hospital as soon as possible. The data should be put by medical personnel and it may contain both the indispositions mentioned by the patient and measures taken

Scenario or Context	– it may be a body temperature, blood pressure, ECG or any other depending on a case. The solution would store medical data and give medical personnel information about what was done in similar cases and what are the recommended ways of treatment. If a patient suffers from a disease, it may be needed to carry out additional examination. The system could monitor and remind about such examinations.
	After leaving a hospital patient continue recovery at home. Usually, the patient visits a doctor after the several days. During that time the doctor has no contact with the patient. However, our system would interview the patient twice or more in a day. The patient can consult the system about the steps he/she should take. If he/she feels an indisposition, it may be a good idea to consult the doctor. In some c cases, the solution may be to change drugs or just be informed that this is normal in this case.
	Sometimes it is necessary for a patient to start rehabilitation. This process can also be monitored by systems. Both the patient and the doctor can check the progress of the rehabilitation. What is more, the doctor can receive guidelines what helped in similar cases and what should be done. The main goal of the system is to support currently existing process. It would store medical data, suggest possible ways of treatment and monitor patient's health. Any emergency would be handled as it is nowadays by calling for ambulance or if the user's entered data is alarming then the solution will automatically call the emergency services. The system can inform to paramedical staff detailed information about recently illness and currently taken drugs.
	Organizational Model-OM-1

Organization Model	Problems and Opportunities
Problems and opportunities	Lack of communication between patient and doctor after discharge from hospital. No official record of unexpected symptoms (It is impossible for a humane to remember symptoms which he/she faces) Patient's uncertain feelings about recovery Limited Hospital Capacity Flow of information between hospital officials Availability of medical Staff
Organizational context	The major purpose and mission of the organization is to observe and supervise patient's health during the recovery period in order to prevent side effects and complications In case of unusual and unpredicted indisposition or symptoms medical personnel took immediate measures according to their knowledge and/or medical books to overcome the condition Every patient required a different way of treatment because each surgery having different side effect and the reaction of medicine is different for every patient having same or different scenario. Every patient should be examined and reviewed on quarterly basis in a day.
Solutions	System to assist the physician in patient examination and decision making which enables remote monitoring and medical treatment while patient stays at home, which is convenient for both medical personnel and patient. System for permanent contact with doctor Updating patient's record periodically

	Available online prescriptions for any unusual symptoms happen.

Organizational Model- OM-2

Organization Model	Variant Aspects
Structure	Structure that takes care of patient's recovery can vary, but usually consist of a Medical Superintendent, Physician, a Nurse and other Medical / Supporting staff (depending on a hospital, it can be e.g., another doctor that gives second opinion about patient). System Administrator to provide online facility to doctor and patient.
Process	Diagnose Monitor Rehabilitation
People	Patient Physician (may be two for consulting) Nurse (Supporting staff)
Resources	Experts' knowledge (usually known by Physician, Nurse and other medical personnel, but also in medical books and journals) Medical Record (Preferably computer system or paper form) Latest Medical equipment required to do the needful (vary from case to case) Latest and advance Techniques / Methodology needed Vehicles
Knowledge	Knowledge used in the system can be divided into medical history and experts (doctors) knowledge. Medical history influences the treatment patient receive and experts' knowledge determine the medical diagnose and treatment. Physician's experience Patient's information Previous prescriptions Medical Reports Symptoms Medical Procedures
Culture and Power	"Culture and Power" vary in every Organization / Hospital (e.g., sometimes it is a Nurse who can view a surgery wound and sometimes it is a doctor).

Organizational Model- OM-3

Organization Model		Process Breakdown				
No (identifier)	Task (Task name)	Performed By (agent)	Where? (location)	Knowledge asset	Knowledge Intensive?	Significance
1	Diagnose	Physician	Hospital	Expert Knowledge, Medical History	Yes	5
2	Monitor	Physician / Nurse / Supporting	Hospital / Home	Expert Knowledge, Medical History	Yes	5

		Staff				
3	Rehabilitation	Physician / Nurse / Supporting Staff / Patient	Hospital / Home	Expert Knowledge, Medical History	Yes	5

Organizational Model- OM-4

Organization Model		Knowledge Assets				
Knowledge Asset	**Possessed by Agent**	**Used in Task**	**Right Form? Yes/no**	**Right Place? Yes/no**	**Right Time? Yes/no**	**Right Quality? Yes/no**
Experts Knowledge	Physician	Diagnose, Monitor, Rehabilitation	Yes	Yes	Yes	No
Medical history (Computer system)	Physician Nurse System	Diagnose, Monitor, Rehabilitation	Yes	Yes	Yes	Yes
Medical history (Paper form)	Physician Nurse	Diagnose, Monitor, Rehabilitation	No (Paper Form is not Sufficient)	Yes	No (It is very tough to calculate the time)	No (Paper Form is much limited)
Patients Unexpected Symptoms	Patient	Diagnose, Monitor, Rehabilitation	Yes	Yes	Yes	No

Organizational Model- OM-5

Organization Model	Checklist for Feasibility Decision Document
Business Feasibility	Organization will have following economic benefits: Single Medical expert can deal with the huge number of patients in less time Patient's shorter stay in hospital will provide economic benefit to hospital. Intangible benefits: Stress-free environment for patient at home. Patient will never feel carelessness from doctors. Huge change will occur in the current system due to this system, first, new style of database requires which can support web applications as well. Regular upgrading and maintenance of system is very important. It requires much funds to implement. Alternate solutions are time consuming and costly. Organization must have changes in it. Computer experts are required to maintain the database and servers.

		Training of medical experts to use the system.
	Risks	
		The system is implemented for greater number of users. If its beneficiaries are not much then it can be a risk for business.
		Misjudgments and wrong description is possible
Technical Feasibility		This is true that medical knowledge is limitless. System would have to perform very complex and sophisticated tasks. This is true as well that proposed system will not perform all medical problems. It only deals with surgery cases. It will attempt to gain maximum information from user and support doctor to take decision about patient's problem. Available techniques are adequate.
		There are some critical aspects, because it directly deals with the human life. Time and Quality of solutions are critical aspects.
		To test and validate the system, medical experts can do good job by giving old patient's data as test data and success can be measured.
		All the interfaces whether it is end -user interface or interaction with medical experts will be a simple web-form which is dynamically changed its values.
		Risk of technology crash is always there. But if system crash during communication between patient and doctor, it will be overcome by using current emergency services.
Project Feasibility		Implementation with limited scopes e.g., one city or small state, all actors, resources and knowledge is sufficient. But large-scale implementation requires more budget, time, medical and IT experts.
		Project is engineered to get expected results which are realistic.
		For now, project organization and its communication is adequate.
		Success of the project is totally dependent on the knowledge which is using by expert system and the perfect use of technology. Else project is on Risk.
		Many medical experts and Computer experts should involve in this project to create flawless patient recovery system.
Proposed Actions		Focus must be on quality of knowledge base.
		A quality knowledge base is most important part of this project.
		Expected result of this project is to support doctor with monitoring patients, while stay at hospital, and keep medical resources free by allowing discharging the patient from hospital with a perfect monitoring system and supporting the patient's recovery while he is at home.

Task Model TM-1- DIAGNOSE

Task Model	Task Analysis	
Task	cf. OM-3	Diagnose –No1
Organization	cf. OM-2	The task is performed in monitoring patient's health during his / her stay at the hospital. This task is also be performed when the patients is shifted to home
Goal and Value		The goal of this task is to measure which type of treatment and care is requires to patient and how can be avoided the uncertainty of the patient.
		The value required accuracy and perfection in

			diagnosing the real problem
	Dependency and Flow	Preceding Tasks Follow-up Tasks	1. Monitor 2. Rehabilitation
	Objects Handled	Input Objects Output Objects Internal Objects	• Input: Unexpected Symptoms • Output: To diagnose • Internal: Existing condition of patient
	Time and Control	Frequency, Duration Control Constraints & Conditions	• The task is performed, at least four times a day and is should be continued as long as it required i.e., depending upon the condition of the patient (may be in hospital or in home after discharging). • Diagnostic process should be controlled by the physician **Preconditions** Physician as well as the system has such knowledge to evaluate the situation of the patient. **post-conditions** It is also responsibility of the physician to watch out the patient's current situation. Physician should have ability to perform the task up to the mark and having a knowledge base in his field. System must be capable of helping the physician.
	Agents	OM-2: People, System Resources; OM-3: Performed-by	• Nurse (Supporting staff) • Medical History • Physician
	Knowledge and Competence	cf. OM-4	• Medical Experience • Medical Knowledge (Updated)
	Resources	Detailing of OM-2	• Experts' knowledge (usually known by Physician, Nurse and other medical personnel, but also in medical books and journals) • Medical Record (Preferably computer system or paper form) • Latest Medical equipment required to do the needful (vary from case to case) • Latest and advance Techniques / Methodology needed • Vehicles
	Quality and Performance	Measures	In the execution of the task, it is necessary for an organization to take care and fulfill all the necessities of the patient in the hospital. It is also, organization's duty to take all possible measure of recovery of patient's health when He/ She is shifted to home

Task Model TM-2- DIAGNOSE

Task Model		Knowledge Item
Name		Diagnose
Possessed by		Physician
Used in		Diagnosing stage 1
Domain		(Medicine & Medical professional community)
Nature of the knowledge		Bottleneck/to be improved
formal, rigorous	x	
empirical, quantitative	X	
heuristic, rules of thumb	X	
highly specialized, don specific	X	
experience-based	X	
action-based	X	
Incomplete	X	
uncertain, may be incorrect	X	
quickly changing	X	
hard to verify	X	
tacit, hard o transfer	X	X
Form of the knowledge		Bottleneck/to be improved
Mind	X	
Paper	X	
Electronic	X	X
Action skill	X	
Other	X	X
Availability of knowledge		Bottleneck/to be improved
Limitations in time		
Limitations in space		X
Limitations in access		X
Limitations in quality		X
Limitations in form		

Task Model TM-1- MONITOR

Task Model	Task Analysis	
Task	cf. OM-3	Monitor –No2
Organization	cf. OM-2	The task is performed in monitoring patient's health during his / her stay at the hospital and as well as in the home. It is quite major issue during completion of the task which starts from hospital and end in the home when the patient is recovered.
Goal and Value		The goal of this task is to make update the doctor about any uncertain condition and unexpected symptoms happened to the patient.
Dependency and Flow	1- Preceding Tasks 2- Follow-up Tasks	1. None 2. Rehabilitation
Objects	Input Objects	• **Input:** Use of medicine

Handled	Output Objects Internal Objects	• **Output:** To get update about patient's health • **Internal:** Evaluation the condition of patient
Time and Control	Frequency, Duration Control Constraints & Conditions	Task is performed after receiving new data about patients. It should be quick (within a few minutes, preferably less than one minute). Privileged people enter input and thus have control over it. Systems evaluate whatever further actions should be taken (e.g. taking medicines, visiting a doctor) and send a report to the hospital. **Preconditions:** Regular and in time use of medicine. **Post-conditions:** Evaluation of a patient's health and make the physician update. **Constraints:** Time and communication with Hospital
Agents	OM-2: People, System Resources; OM-3: Performed-by	• Patient (feelings, uncertainty) • Nurse (Supporting staff) • Medical History (Existing) • Physician (Other physician for consultation)
Knowledge and Competence	cf. OM-4	• Medical Experience • Medical Knowledge (Updated) • Perfect use of medical equipment
Resources	Detailing of OM-2	• Experts' knowledge (usually known by Physician, Nurse and other medical personnel, but also in medical books and journals) • Medical Record (Preferably computer system or paper form) • Latest Medical equipment required to do the needful
Quality and Performance	Measures	In the execution of the task, it is necessary for an organization to take care and fulfill all the necessities of the patient in the hospital. It is also, organization's duty to take all possible measure of recovery of patient's health when He/ She is shifted to home

Task Model TM-2- MONITOR

Task Model	Knowledge Item	
Name **Possessed by** **Used in** **Domain**	Monitor Nurse/Medical Personal/Patient Stage 2 (Medicine & Medical professional community)	
Nature of the knowledge		**Bottleneck/to be improved**
formal, rigorous	x	
empirical, quantitative	X	

heuristic, rules of thumb	X	
highly specialized, don specific	X	
experience-based	X	
action-based	X	
Incomplete	X	
uncertain, may be incorrect	X	
quickly changing	X	
hard to verify	X	
tacit, hard o transfer	X	X
Form of the knowledge		**Bottleneck/to be improved**
Mind	X	
Paper	X	
Electronic	X	X
Action skill	X	X
Other	X	X
Availability of knowledge		**Bottleneck/to be improved**
Limitations in time		
Limitations in space		X
Limitations in access		X
Limitations in quality		X
Limitations in form		

Task Model TM-1- REHABILITATION

Task Model	Task Analysis	
Task	cf. OM-3	Rehabilitation–No3
Organization	cf. OM-2	Rehabilitation task is about patient's recovery after operation during his / her stay at the hospital and as well as in the home. It is quite major issue during completion of the task which starts from hospital and end in the home when the patient is recovered.
Goal and Value		The goal of this task is complete recovery of the patient after the surgery The value is maximum improvement in patient's health
Dependency and Flow	1- Preceding Tasks 2- Follow-up Tasks	1. Diagnose 2. Diagnose / Rehabilitation
Objects Handled	Input Objects Output Objects Internal Objects	• **Input:** Diagnose • **Output:** To get update about patient's health • **Internal:** Evaluation the condition of patient
Time and Control	Frequency, Duration Control Constraints & Conditions	Frequency and duration vary from case to case. If the operation is minor recovery is fast and if the operation is major recovery is much slow Experienced and skilled person is responsible for the control. **Preconditions**: Proper diagnosing **Post-conditions:** Evaluation of a patient's

		health
		Constraints: Improving health day by day in necessary
Agents	OM-2: People, System Resources; OM-3: Performed-by	• Patient (feelings, uncertainty) • Nurse (Supporting staff) • Medical History (Existing) • Physician (Other physician for consultation)
Knowledge and Competence	cf. OM-4	• Medical Experience • Medical Knowledge (Updated) • Improving patient health
Resources	Detailing of OM-2	• Experts Physician, Nurse and other medical personnel, • Medical Record (Preferably computer system or paper form) • Skilled supporting staff
Quality and Performance	Measures	Patient's satisfaction for complete recovery is good measure

Task Model TM-2- REHABILITATION

Task Model		Knowledge Item	
Name		Rehabilitation	
Possessed by		Patient	
Used in		Stage 3	
Domain		(Medicine & Medical professional community)	
Nature of the knowledge		**Bottleneck/to be improved**	
formal, rigorous	x		
empirical, quantitative	X		
heuristic, rules of thumb	X		
highly specialized, don specific	X		
experience-based	X		
action-based	X		
Incomplete	X		
uncertain, may be incorrect	X		
quickly changing	X		
hard to verify	X		
tacit, hard o transfer	X	X	
Form of the knowledge		**Bottleneck/to be improved**	
Mind	X		
Paper	X		
Electronic	X	X	
Action skill	X	X	
Other	X	X	
Availability of knowledge		**Bottleneck/to be improved**	
Limitations in time		X	
Limitations in space		X	
Limitations in access		X	
Limitations in quality		X	
Limitations in form			

Agent Model's View AM-1 : Physician

Agent Model	AM-1
Name	Physician / Medical Expert
Organization	• Physician is the person who has the responsibility of diagnosing the patient • Physician is the key person of the organization
Involved in	• Diagnose • Monitor
Communicates with	Patient, Nurse, Supporting Staff, Second Physician (for consulting)
Knowledge	Medical Knowledge Experience Latest Techniques
Other competencies	Agent must be adept and loyal with his / her passion.
Responsibilities and Constraints	Physician has responsibility of health of the patient by • Diagnosing accurately • Treating in good manner • Keeping in mind previous medical history of patient

Agent Model's View AM-1 : Nurse

Agent Model	AM-1
Name	Nurse
Organization	Nurse is also very important figure in a hospital. She is responsible for monitoring the recovery process. She has to follow the description made by the doctor.
Involved in	• Monitor • Rehabilitation
Communicates with	Patient, Physician, Supporting Staff, Second Physician (for consulting)
Knowledge	Medical knowledge, knowledge about the usage of different medical equipment
Other competencies	Punctual, Caring
Responsibilities and Constraints	A nurse is responsible for monitoring patient's health (i.e., providing medicine in time) and/or rehabilitation.

Agent Model's View AM-1 : Patient

Agent Model	AM-1
Name	Patient
Organization	Patient is the person that comes to the organization to recover after the surgery.
Involved in	• Monitor • Rehabilitation
Communicates with	Physician, Nurse, Supporting Staff, Second Physician (for consulting)
Knowledge	Uncertainty about fast recovery

Other competencies	None
Responsibilities and Constraints	None

Agent Model's View AM-1 : System

Agent Model	AM-1
Name	System
Organization	System is a system containing patients' medical history (Previous and current records); it can be either a computer system or online system
Involved in	• Monitor • Diagnose
Communicates with	Physician, Nurse, Patient him/her self
Knowledge	Uncertainty about fast recovery
Other competencies	User friendly
Responsibilities and Constraints	24 hours working ability

ORGANIZATIONAL TASK AGENT MODEL OTA-1

Organization Task-Agent Models	Checklist for Impact and Improvement Decision Document OTA-1
Impacts and Changes Organization	Health is wealth so human health is priceless. According to current scenario it is impossible to replace Physician's role with a computer system, however the computer system may help the physician, patient, nurse and other medical personal. Patient can store his data about uncertainty and unexpected symptoms happened to him during his recovery process. The computer system might be a good advisor also for a patient when he necessary. System should not have a big impact on the organization It makes smooth the process of patient's recovery by supporting medical personnel's work. It helps with gathering and maintaining both expert's knowledge and medical records about medical history of the patient.
Task/Agent Specific Impacts and Changes	A doctor can use a support (knowledge-based system) while diagnosing the patient. • Monitoring patient's health will be performed using • Hospitals (some of them) will require the computer equipment. • There will be required an additional staff (a system administrator). • Staff should complete training using the knowledge-based system. Describe which impacts and changes the considered knowledge system solution brings with respect to individual tasks and agents, by comparing the differences between the task and agent models (TM-1/2 and AM-1) in the current

	situation, and how they will look like in the future. It is important to look not only at the staff members directly involved in a task, but also to other actors and stakeholders (decision makers, users, clients). 1. Changes in task lay-out (flow, dependencies, objects handled, timing, control) 2. Changes in needed resources 3. Performance and quality criteria 4. Changes in staffing, involved agents 5. Changes in individual positions, responsibilities, authority, constraints in task execution 6. Changes required in knowledge and competences 7. Changes in communication
Attitudes and Commitments	Medical personnel may be unwilling to change the way they use to perform their tasks. Training staff to use this solution should be connected with showing benefits of it and how it can improve work and make it easier. Consider how the individual actors and stakeholders involved will react to the suggested changes, and whether there will be a sufficient basis to successfully carry through these changes
Proposed Actions	This is the part of the impacts and improvements decision document that is directly subject to managerial commitment and decision making. It weights and integrates the previous analysis results into recommended concrete steps for action:

Each iteration consists of four activities: risk, plan, monitor and review. All activities create one step, which is reiterated.

Firstly, it is necessary to review current project status and establish a direction of the following steps. Then, risks should be identified in order to avoid or minimize them. Next, the task and schedule should be planned. Finally, the progress of tasks is monitored and evaluated. This evaluation is used in next cycle while reviewing the current project status.

Iteration (0)
Review
- Assessing the proposal's response
- Assessing difficulties in communication between patient and medical expert
- Assessing the uncertain feelings to the patients

Risk
- Unavailability of medical experts
- Misunderstanding between patient and physician
- Lack of time for medical personnel

Plan
- Interview Different Physicians
- Analyze information about patient's recovery step

Monitor
- All activities and tasks, which are described in review, are monitored

Iteration (1)
Review
- Basic knowledge about the recovery process gained during literature study

- Deficiency of medical personnel
- Cycle objective: build model without expert knowledge without any information

Risk
- Risk of patient's life
- Prescription may be not appropriate
- Patient's personal feelings may cause some serious threats

Plan
- Plan is based on literature study
- Build process model
- Fill worksheets

Monitor
- Partially filled Common models
- Process model

Task 1: Implementation

Task 1: Implementation

PART 1

1. Make a presentation to the management in which you define an algorithm in detail and describe the steps involved in creating an application. Determining an algorithm for the scenario, too.
2. Prepare a report Determine the steps taken from writing code to execution. Making a flowchart for the scenario in question.

PART 2

1. Give explanations of what procedural and object-orientated paradigms are; their characteristics   and the relationship between them in manner which can be understood by programmers that have just switched the industry domains
2. You should produce a report that analyze the common features that a developer has access to in an IDE by describing the most popular IDEs and their features, this may not be specific to a programming language. Give an explanation of the IDE you used for your development as well as its benefits. Justify your decision.

In this report include code that will critically evaluate the implementation of the programming paradigms, in terms of the code structure and characteristics. It is recommended to write the same functionality in different paradigms to show how each paradigm solves the problem and implements algorithm

PART 3

1. Develop a fully functional application for the given scenario above.

   Development Stack

   - Java Spring Boot + Thymleaf
   - DB either MySQL or PosgreSQL

P Criteria: MVC with good Java Programming Practices and Code Documentation

M Criteria: Microservices Architecture

D Criteria: RabbitMQ

2. Evaluate the use of an IDE for development of applications contrasted with not using an IDE

PART 4

1. You are to select the debugging process by doing research about the relevant debugging process and explain the debugging facilities available in the IDE in relation to the IDE that you have selected
2. To choose a coding standard for the programming language you have chosen, you must research the pertinent coding standards currently in use in the industry. Outline the coding standard you have used in your code.
3. Prepare a report by including followings:
   3.1. Evaluate how the debugging process can be used to help develop more secure, robust applications.
   3.2. Critically evaluate why a coding standard is necessary in a team as well as for the individual

Learning Outcomes and Assessment Criteria

Pass	Merit	Distinction
LO1 Define basic algorithms to carry out an operation and outline the process of programming an application		**D1** Evaluate the implementation of an algorithm in a suitable language and the relationship between the written algorithm and the code variant.
P1 Provide a definition of what an algorithm is and outline the process in building an application	**M1** Determine the steps taken from writing code to execution.	
LO2 Explain the characteristics of procedural, object orientated and event-driven programming		**D2** Critically evaluate the source code of an application which implements the procedural, object-orientated and event driven paradigms, in terms of the code structure and characteristics
P2 Give explanations of what procedural, object orientated and event driven paradigms are; their characteristics and the relationship between them.	**M2** Compare and contrast the procedural, object orientated and event driven paradigms used in given source code of an application	
LO3 Implement basic algorithms in code using an IDE		**D3** Evaluate the use of an IDE for development of applications contrasted with not using an IDE.
P3 Write a program that implements an algorithm using an IDE.	**M3** Use the IDE to manage the development process of the program.	

LO4 Determine the debugging process and explain the importance of a coding standard		D4 Critically evaluate why a coding standard is necessary in a team as well as for the individual.
P4 Explain the debugging process and debugging facilities available in the IDE. P5 Outline the coding standard you have used in your code.	M4 Evaluate how the debugging process can be used to help develop more secure, robust applications.	

Sources of information to support you with this Assignment	**Submission Requirements:** Each student has to submit their assignment as guided in the assignment brief. The students are guided what sort of information is to produce to meet the criteria targeted. You are required to make use of headings, paragraphs and subsections as appropriate, and all work must be supported with research and referenced using the Harvard referencing system. **Important:** • Word-limit- 8,000-10,000 words (excludes cover page, table of content, figures, graphs, reference list, appendix and logbook) • Accepted Sources: Research Papers (Journal Articles, Conference Proceedings, Thesis), Text Books, Governmental Data, Websites (only a registered organization, an educational institution, government agency) • Information taken from unreliable sources will not be accepted • Must follow Harvard Reference Style. **Books:** AHO, A. V. et al. (1987) Data Structures and Algorithms. 1st Ed. Addison-Wesley. HUNT, A. et al. (2000) The Pragmatic Programmer: From Journeyman to Master. 1st Ed. Addison-Wesley. MCCONNELL, S. (2004) Code Complete: A Practical Handbook of Software Construction. 2nd Ed. Microsoft Press.