BRUNEL UNIVERSITY
SCHOOL OF ENGINEERING AND DESIGN

SYSTEMS MODELLING & SIMULATION
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GUIDELINES FOR THE ARENA ASSIGNMENT AND PROJECT
For details on submission date refer to lecture notes No. 1 on:
http://people.brunel.ac.uk/~emstaam/ or the Course Officer at TPO

Individual Assignments (for All Students)

Reports for the assignment and project comprise the following three elements:

1. Main body of assignment

The key issues to be addressed in the main body of the assignment are in brief the following:

Flowchart Description: A clear explanation of how the model was built should be provided. This should mainly refer to the modules that were used and their exact place in the flowchart. This part should also provide an indication of how the major parameters of these modules have been set. One good way to achieve this is by using screenshots of the windows/dialog boxes presenting the modules' parameters. →**Note:** You are not expected to describe how you literally built the model using Arena. Descriptions of how the modules were selected from the project bar and then placed on the model window or of how the property dialog boxes of each module were accessed so as to enter data are considered to be obvious and therefore should be omitted.

Run Setup Parameters: Based on the requirements of each specific problem/exercise, you are expected to make decisions on how the simulation run setup parameters should be determined. The simulation run setup refers mainly to the number of replications, replication length, time units and in general all the parameters included in the Replication Parameters tag appearing in the Setup option of the Run menu. The determination of setup parameters that conform to the requirements of the assignments is a key point. Incorrect selection of the run setup parameters will result in findings different from those expected (regardless of the fact that the model can be absolutely correct).

Answers to the exercises' questions: Following the presentation of the model, the main part of the assignment should serve the purpose of identifying the questions that need to be answered for each problem/exercise. Furthermore, it is expected that a **complete** and **clearly stated** answer should be provided for **each** of these questions. Whenever the problems' questions are related to one or more of the collected statistics, the answers presented should be in accordance with those appearing in the statistics reports (see section below for the appendix).

In some cases the problems/exercises require, in addition to a number of statistics, information on e.g. the system performance under a number of alternative scenarios or a number of plots, animations etc. It is important to note that you will be assessed against all the required information.

2. Report Appendix

In the appendix you are expected to provide the Statistics Reports. You are advised to prefer the Summary Statistics Reports, which are considerably shorter than those appearing in the Reports Panel (in the Project Bar) of the Arena interface. The Summary Statistics Reports are generated automatically by Arena after each simulation run and are saved in the form of a text file (*.out) in exactly the same folder where you saved the model. In order to be able to get such (*.out) files you may need to make appropriate changes in the fields Default Report and Display SIMAN summary report (*.out file) in the Reports tag appearing under Tools >Options.

There are a number of issues that will be checked during the marking. Apart from the correctness of the collected statistics attention will also be paid to the:

- Run set up parameters that should be consistent with those presented in the main body of the assignment,
- Analyst's name that in turn should point to the student submitting the assignment.

3. Submission of models on CD

Along with the assignment you are also expected to submit a CD where you should have saved the *.doe file/s containing your model/s.
More specifically, the **CD** should:

- be accessible,

- include only the final version of the file/s that correspond to the required model/s,

- contain files that the Arena software **can** run and can thus generate results (bear in mind that even using unacceptable filenames can result in Arena being unable to run the model in spite of the fact that the latter can be absolutely correct. In such cases it is also impossible to collect any statistics reports). Failed runs during assessment will result into **F**.

- Contain files which correspond to the models that have been presented in the assignment (both main body and appendix). In other words, it is unacceptable to discover that running the model contained in the CD generates different results from those presented in the assignment report.

- Contain the student's (submitting the assignment) name as well as the reference number of the assignment on the label of the CD.

- Be attached to the assignment so that it should not get lost or examined separately from the assignment.

Students are also requested to provide their email so that they will be contacted in case there are problems with accessing their CDs.

Assignments' Submission Deadlines

The submission of the assignments should not under any circumstances exceed the relevant submission deadlines (For the dates please refer to Lecture Notes No. 1 on http://people.brunel.ac.uk/~emstaam/ and following the links to the module webpage). However, when special cases apply (e.g. whether there are mitigating circumstances) justifying late submission, assignments will be accepted and marked

beyond the submission deadline only when they are accompanied by the late submission cover sheet bearing the Module Coordinators' signature.

Marking scheme

INDIVIDUAL ASSIGNMENT SYSTEMS MODELLING AND SIMULATION

MARKING SCHEME[1]

Section		Description	Total Mark
A	**Overall Modelling Approach**	1. Model organisation	10
		2. Data accuracy	
		3. Run Setup	
		4. Bonus[2]	
B	**Entity Modelling and Routing**	1. Accurate generation entities and assignment of attributes	10
		2. Accurate assignment of variables and changes required during simulation run	
		3. Accurate process planning and sequencing	
		4. Accurately routes different types of components according to given plan	
		5. Bonus[2]	
C	**Resources and Stations**	1. Used stations and routes well	10
		2. Used schedules well	
		3. Modelled resource failures well	
		4. Used sets	
		5. Use of expressions and variables	
		6. Queue priorities	
D	**Animation**	1. Has animation	10
		2. Displays statistics	
		3. Animation works well	
		4. Bonus[2]	
E	**Results and Analysis**	1. Achieving expected results (output)	20
		2. Interpretation of results	
		3. Identification of problems (e.g. bottlenecks, congestions, imbalanced lines, layout, etc.)	
		4. demonstrate full understanding of the simulation results of current system	
G	**Improvements & Analysis**	1. Providing proposal for improvements and change (what if scenarios)	30
		2. Modelling and Simulation of proposals	
		3. Providing reasonable arguments for proposed system in the form of comparisons between original and new models	
		4. Arguments related to specified performance measures	
I	**Conclusions**	1. Detailed conclusion closing argument, reflection on the approach and what could have been done better	10

[1] Note that this scheme is adjusted every year based on the type of the assignment. But the essence of assessment scheme remains universal. This is just a sample guide.
[2] Bonus marks (normally between 1-3% in the corresponding section) is for relevant initiative and innovative approaches)

Group Project (For Full Time Students Only)

All the rules of report writing and submission described in the previous sections (the assignment submission) apply to the project submission.

In addition for the group project, all members of each group MUST make equal contributions to the development of the models, simulation project, project management and group analysis).

All group reports must include a page label "Group member assignment" which **clearly shows** the name of each group member and which part of the project he/she contributed to, each member would be responsible for writing and compiling that part of the project. This must also be indicated in the body of the report.

The introduction and conclusions where improved models are discussed should have equal contribution by each member.

Remember that the group performance can affect individual performance.

The group project consists of:
- Finding a suitable subject and negotiating with the business/company/centre owner. For example a factory operations, banking, healthcare, service, restaurant, or purchasing an artefact (by group members) not exceeding £20. It could then consist of breaking the product into its components and development of a production process plan. The production process plan should include the methods, pathways, sequences of the production process. Also a research into the number of orders can be made by estimation. For example for a remote control toy car the number of weekly, monthly or annual orders needs to be made. A proper production plan and schedules should be created. The assembly line should be designed based on the sequence of work, system capacity, schedules, possible breakdowns, line-balancing and plant layout design.
- Process times for each work-station can be defined through time and motion studies. This can either be done by practically using a stopwatch to assess the time or usage of techniques such as Maynard Operation Sequence Technique (MOST) for time studies.

This exercise is designed for you to appreciate the work and effort required to conduct a full plant layout design, creation of a workable production process and deal with system limitations. And above all utilising the capabilities of Systems Modelling and Simulation to plan and design a real system.

The assessment criteria would also include intuitive problem solving, approaches to problem definition, system design, and usage of the main subject covered in this module to solve the problem.

Additional Help

For further support you can contact my Teaching Assistants at designated times and with prior arrangements.

You can also always contact me.