

## 8227 & 10100PG Wireless Networks

### Project Implementation and Research Paper

#### 1. Instructions

In this assessment students are expected to design and implement a wireless network. The students must choose the application and type of wireless network that they wish to implement. It is expected to work in teams of 3-4 people. Your project should address a concrete problem that you want to solve and demonstrate/validate the solution in your implementation.

The assessment is divided into two parts:

1. Project Implementation
  - Value: 20% of your final mark
  - Demonstrations due:
    - 9:30-11:30am for **group A (Tuesday lab)** on Tuesday in week 13.
    - 11:30-1:30pm for **group B (Tuesday lab)** on Tuesday in week 13.
    - 3:30-5:30pm for **group A (Thursday lab)** on Thursday in week 13.
    - 5:30-7:30pm for **group B (Thursday lab)** on Thursday in week 13.
    - You can also demonstrate your project in week 11 or week 12 during your normal scheduled sessions (Tuesday 11:30-1:30pm and Thursday 5:30-7:30pm). If you demonstrate your project earlier, you do not need to attend to the demonstration session in week 13. Thus, it will give you extra time to work on your report or to prepare for your exams for other units.
2. Research Paper – based on your project implementation.
  - Value: 40% of your final mark
  - Submission deadline: 11:55pm Thursday in week 14.
  - **You need to obtain at least 50% in the research paper to pass this unit.**

The goal of this assessment is for students to apply wireless networks design and implementation skills learned in this unit to design and prototype a solution to a real-life problem. In addition, this assignment was planned so that students can practice and improve their skills in relevant areas, such as:

- Hands-on experience designing and implementing wireless networks.
- Use the Research Literature for Wireless Networks.
- Communicate results to an audience.
- Present key points to support your message.
- Write Technical documents in engineering.
- Teamwork.

At least 25-30 hours of serious work per student is expected to successfully complete both assignments.

You must demonstrate and submit your project before the due dates above. As University Policy, there are significant penalties for late submission (5% per day).

We have **seven sets of Xbess** for each lab (ideally, we will have seven groups in each session), as follows (you do not have to use all the components in your project):

- 1 Xbee coordinator (Explorer)
- 3 routers/end-points (Shields)
- 1 Raspberry Pi
- 3 Arduinos

In addition, the engineering lab have 10 kits with 37 different sensors in each kit. For a full list of sensors that you can choose from, you can access:

<http://openplatform.cc/index.php/home/index/details/apiid/79>.

Before you start your project, you should consult with the Lab Manager Mr. Jamie Plowman if the Lab has the additional equipment that you need (e.g., sensors, motors, shields, etc.). Once you have identified the extra components that you need, at the start of your lab session, you will provide to the Lab Manager your list with the additional equipment, so you can borrow that equipment during your session.

You will start working on your projects from week 11. There are **additional hours** (apart from the usual lab hours) to use the lab and work on your projects, these sessions are:

Mondays (Week 11,13):

- 9:30-11:30am – First-come-first-served basis, both groups A and B
- 11:30-1:30am – First-come-first-served basis, both groups A and B

Tuesdays (Week 11,12):

- 9:30-11:30am – only for people with the **usual scheduled lab session (11:30-13:30)** on that day

Thursday (Week 11,12,13):

- 9:30-11:30am – First-come-first-served basis, both groups A and B
- 11:30-1:30pm – First-come-first-served basis, both groups A and B

Thursday (Week 11,12):

- 3:30-5:30pm – only for people with the **usual scheduled lab session (5:30-7:30pm)** on that day

Suggested Project Topics/Ideas:

- Cloud-based Health Care Monitoring System using WSN.
- Fall Detection System for the Elderly using Personal Area Networks.
- Wireless Sensor based System for Home Energy Consumption.
- WSN based Application to Create a Farm Field Monitoring.
- Automated Irrigation System using WSN.
- Xbee based Remote Monitoring of Air Pollution.
- Urban noise monitoring with Smartphones (App solution).
- Indoor Localisation System for Everyday Items.

Please take time to read these guidelines carefully. Post any requests for clarification about this assessment in the Chat section in Canvas so that all students remain equally informed. If needed, further information may be provided as required during the labs.

## 2. Peer Review

This is a group assignment, thus, the final mark for this assignment will be based on a peer assessment from each member of the team. The purpose of this is to **value the work of those who contributed more towards the assessment**. In this way, those students who have put more time and effort into the assessment will receive better marks than those who did not contribute much to the assessment.

Each member will be asked to evaluate peers' individual contributions to the group work. For each student, a peer assessment factor (PAF) is calculated based on their contribution to the group assignment. The following table shows the individual PAF values and their interpretation.

PAF	Interpretation	Comments
>1.5	Alarm! Team failure	Something has gone wrong – either there is a student who is not participating at all or this student has taken all the work home and done it by themselves. Either way, learning objectives are probably not being achieved.
1.15 - 1.5	Super Leader	The team balance probably needs to be addressed as to achieve such a high score other students must not be participating, or this student is doing far too much.
1.05 - 1.15	Leader	The student is showing definite leadership qualities and/or has been putting in significant extra effort.
1.00 - 1.05	Good teamwork	The student is working well with the group and has been recognised as pulling their weight (1.00) and perhaps a little more (>1.00).
0.95 - 1.00	Acceptable teamwork	This student has probably only been penalised because another team member has shown leadership and put in extra effort.
0.85 - 0.95	Social Loafer	Any PAF below 0.95 is unacceptable. Social loafers who lie in this band can usually be mentored with the group's help and become productive members of the group.
0.75 - 0.85	Super Social Loafer	As above and below.
< 0.75	Alarm! Individual failure!	The individual is in grave danger of failing the course. Much work is required for this student to be accepted back into the group and there will be trust issues with allocating this student any work.

Reference: <https://elearning.uq.edu.au/guides/group-peer-assessment/paf-formula-and-moderation-overview>

For example, if the group assignment receives a mark of 80 out of 100 and each student receives an average PAF from the members of the team of:

	Peer Reviews from			
	Student A	Student B	Student C	Average
Student A	1.1	1.0	1.1	<b>1.066</b>
Student B	0.9	1.2	0.9	<b>1</b>
Student C	1.0	0.8	1.0	<b>0.933</b>
Total available marks	3.0	3.0	3.0	3.0

Therefore, the final mark for each student will be:

- Student A:  $1.066 \times 80 = 85.28$
- Student B:  $1 \times 80 = 80$
- Student C:  $0.933 \times 80 = 74.64$

If the group is formed by 4 people, the total available marks will be adjusted to be 4.0. More work is expected from a group with 4 students.

Each member of the team must **submit their peer assessment in the canvas site as a word/excel document** before the submission due date. If no submission is received, a 1.0 PAF mark will be used as your peer review for all members of your team. Two peer assessments are expected, one for the project implementation and another one for the research paper.

### 3. Marking Criteria

#### 3.1 Project Implementation (due 5:30-7:30pm on Thursday in week 13)

The grade for the project implementation will count for 20% of your final grade in the course. Your project will be marked based on the following criteria (**100 points**):

1. Quality of the implementation addressing the real-life problem.
  - Very good coverage of all aspects of the problem. (10-20 points)
  - Coverage of some aspects of the problem. (5-10 points)
  - Coverage is minimum with gaps to address the problem. (0-5 points)
2. Infrastructure used in the prototype.
  - Implementation of other technologies (in addition to Arduinos and/or Raspberry Pi) as part of the solution, e.g., own mobile app, cloud database, LCD screens for visualisation, in-situ prototype, dashboards for real-time monitoring, etc. (10-20 points)
  - Use of Arduinos and/or Raspberry Pi only. (0-10 points).
3. Satisfactory answers addressing the questions during the demonstration.
  - Enough in presented to indicate adequate knowledge of the topic. (10-20 points)
  - There is evidence of understanding, but some points may not be adequately explained. (5-10 points)
  - There is no evidence of clear understanding of the topic. (0-5 points)
4. Number of nodes. Each project may have different number of active wireless devices (Coordinator and routers/endpoints). However, all projects must have a single coordinator and at least one router/endpoint.
  - A coordinator with multiple routers/endpoints. (10-20 points)
  - A coordinator with two routers/endpoints. (5-10 points)
  - A coordinator and one router/endpoint. (0-5points)
5. Network topology. Each project may need a specific type of network topology for its correct implementation and use.
  - Cluster tree or Mesh. (10-20 points)
  - Star network. (5-10 points)
  - Peer to peer. (0-5points)

### 3.2. Research Paper (due 11:55pm on Thursday in week 14)

The following table presents the research paper marking scheme.

CRITERIA/ GRADE	Fail < 50%	Pass 50-64%	Credit 65-74%	Distinction 75-84%	High Distinction 85% +
ORIGINALITY & PERSONAL CONTRIBUTION  ___ / 10%	Work does not meet The University's Academic Board Policy	The work is the students own	Places new results in a credible research context	Makes a valuable contribution to the topic.	Shows an original understanding which interests the wider engineering community; suggests new directions for further research/design development
COMMAND OF SUBJECT  ___ / 10%	Does not link theory to research	Describes and uses theory to inform research/design question; uses set readings to develop topic	Demonstrates understanding of topic; uses models to inform research/design aim	Compares and contrasts several theories; reveals strengths and weaknesses of complex theoretical models	Critically analyses competing theoretical models; use the literature review to demonstrate theoretical insights
INTRODUCTION  ___ / 5%	Is absent or is poorly structured or lacks essential elements	Contains a structure; describes research/design project generally	Makes specific statements about the research/design field; introduces key authors; links aim to existing research/design work	Analyses literature to indicate gap in existing research/design work; outlines scope of the study and provides some rationale for the research/design project	Provides sound rationale for the research/design project; contextualizes project aim; well-structured and sequenced
LITERATURE REVIEW  ___ / 15%	Is too short; lacks detail and analysis; does not cite important work	Reports the literature; quotes paraphrase and summarizes appropriately; shows a competent grasp of key issues	Has a clear structure and groups literature into themes relevant to the research/design topic; makes a clear link to own project	Provides a comprehensive and analytical examination of topic; makes links with research/design methodology; demonstrates sound understanding of key issues	Critically analyses literature; uses the review to create a rationale for the whole thesis; demonstrates a scholarly grasp of the literature; appraises the relevant literature
DESIGN /METHODOLOGY  ___ / 25%	Uses inappropriate research/design methods; lacks a structure or argument	Describes research/design methods and materials used so that they could be repeated; methods show a structure and might yield appropriate data	Draws on published research to provide a rationale for research/design methods; links methods and results sections logically	Derives methods from an analysis of strengths and weaknesses of existing research/design work; provides sound rationale for research/design project	Uses innovative methods; discusses methodology limitations
DISCUSSION / CONCLUSION  ___ / 25%	Cannot reasonably explain results	Makes links to results with basic reasoning; states some usefulness of own research	Substantiates research/design claims with references; compares and explains (un) expected results with published results; suggests further work related to topic	Clearly interprets results; links to a theoretical understanding from the literature; anticipates criticism; identifies limitations to study and how they might be resolved	Uses results to critically interpret the theory/research supporting the study; explains how results advance the field; reveals an original understanding of own work
PRESENTATION FORMAT & REFERENCES  ___ / 10%	Writing does not clearly communicate message	Writes well; contains sections and subsections and a contents page; correctly employs departmental formatting and referencing guides	Writes in a consistently clear style without grammatical errors	Writes analytically; brings together all sections into a cohesive document	Uses the resources of written communication similar to a published research paper.

## **Academic Integrity**

Remember, these are some basic expectations of students with regards to academic integrity:

- Any work submitted should be your own individual thoughts and should not have been submitted for credit in another course (e.g., 11511 & 11513PG Internet of Things) unless you have prior written permission to re-use it in this course from your lecturer.
- All assignments must use proper attribution, meaning that you have identified the original source of words or ideas that you reproduce or use in your assignment.
- The code is the complete original work of the students except for instances where works with a creative commons license or works in the public domain are used. No copyrighted material is used.
- Paraphrasing and citations to the original material is expected. IEEE citation style is required.
- If you are unclear about expectations, ask your lecturer.

**Good Luck!**