Tentative Outline: SESSION 2 2008
Course staff and consultation

Course Coordinator and Lecturer in Charge:
A/Prof David Taubman
Room: 303, Electrical Engineering Building
Phone: 9385 5223
Email: d.taubman@unsw.edu.au

Laboratory demonstrators:
To be announced

Consultation hours:
The lecturer in charge will be available for student consultation during the one hour following each lecture.

Course information

Course size:
This course is 6 units of credit.

Units of credit indicate the nominal workload for students. UNSW expects approximately 25 hours of student time per Unit of Credit spread across all the learning activities. A six unit of credit course like this requires a typical average workload of 11 hours per week.

Course organisation:
The content of this course is divided roughly equally between formally taught (lecture-based) content and a group project. Project design teams are nominally composed of only two students. Project teams of three will be considered only where otherwise unavoidable. In order to achieve project teams of two, it is typically necessary for some students to change the laboratory session in which they are enrolled. This is because project team members must all attend the same scheduled laboratory session.

Project selection:
You must submit a project selection form (see end of this document) by Friday of Week 2. You should select a partner prior to doing this, so that only one project selection form is submitted for each project team. In the event that you have not been able to find a lab partner, it is possible to submit an individual project selection form and a partner will be found for you. This is not recommended, however.

More specific information on projects may be found at the end of this document.

How this course fits with others in your program:
For most students in Electrical or Telecommunications Engineering, this should be your second real design subject, the first having been ENGG1000. The subject draws heavily on skills in electronic circuit design, which you are expected to have developed through previously taken subjects. Without these, it will be difficult to complete a meaningful design. You are also expected to have developed a habit
of maintaining a laboratory notebook, which you will find particularly important for this course.

Through this subject, you should gain additional insight into the importance of technical courses such as control, signal processing, embedded systems and the like, although ELEC/TELE/PHTN 3117 projects do not generally depend on such knowledge.

**Learning and teaching philosophy:**

The design project plays a major role in the learning process for this course, since it provides an opportunity for you to practice many of the methods which are taught in lectures. In particular, project management, electronic prototyping, properties of electronic components and many other areas of teaching in this course cannot be properly appreciated without undertaking a serious concurrent design project.

Lectures also play a very important role in the learning process for this course. Lectures are designed to supply students with much valuable information to assist in their projects, while also providing a broad framework for design, including many facets which cannot be experienced properly within a student project. Lectures cover technical aspects of detailed design, as well as broader aspects of design, including marketing and economics. All material covered in lectures is examinable, not just that which directly relates to student projects.

Lecture notes will be provided incrementally, to accompany the lectures. You should note carefully, that the lecture notes and lectures are not the same. By and large, the lecture notes are carefully prepared written materials, designed to be read. With some exceptions, powerpoint slides are not lecture notes. You should realize by now that powerpoint slides are aids, designed to accompany an oral presentation. By themselves, lecture slides have little teaching value.

**Aims**

1. Expose students to the practical and technical challenges of serious Electrical Engineering design.
2. Develop teamwork and project management skills.
3. Provide a practical context for learning in other courses, so as to cement practical skills in electronic circuit design and reinforce the importance of disciplines such as control, signal processing, embedded systems, etc.
4. Impart an appreciation for the broader aspects of design, including consumer needs, marketing, product economics, manufacturing, standards, intellectual property and systems thinking.
5. Further develop written and oral technical communication skills.

**What you are expected to learn:**

By the end of this course, the student should:

- Be capable of initiating, designing and managing an electronic design project.
- Have developed software skills with project management, circuit schematic and PCB design software.
- Be able to work in a small development team, write formal project reports, deliver a product development proposal and present a technical seminar.
• Recognize the conditions under which it is important to conduct patent searches, file patents, follow and/or contribute to standards.
• Be able to apply knowledge of manufacturing processes, electromagnetic compatibility, safety and other areas to the design of quality products.

Assessment

The marks for this course will be assigned as follows:

<table>
<thead>
<tr>
<th>Assessment Component</th>
<th>Marks</th>
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<tbody>
<tr>
<td>Final Examination (3 hours)</td>
<td>50%</td>
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<tr>
<td>Project Development Proposal</td>
<td>10%</td>
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<tr>
<td>Project Seminar and Demonstration</td>
<td>20%</td>
</tr>
<tr>
<td>Final Project Report</td>
<td>20%</td>
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The marking criteria for these assessment components are described in the cover sheets and marking sheets which will be handed out later.

Note: It is a requirement of this subject that you obtain a mark equal to, or greater than, 25/50 for your project work in order to pass this subject. In addition, you must also obtain a satisfactory exam mark.
Academic honesty and plagiarism

What is Plagiarism?
Plagiarism is the presentation of the thoughts or work of another as one’s own.*
Examples include:
- direct duplication of the thoughts or work of another, including by copying material, ideas or concepts from a book, article, report or other written document (whether published or unpublished), composition, artwork, design, drawing, circuitry, computer program or software, web site, Internet, other electronic resource, or another person’s assignment without appropriate acknowledgement;
- paraphrasing another person’s work with very minor changes keeping the meaning, form and/or progression of ideas of the original;
- piecing together sections of the work of others into a new whole;
- presenting an assessment item as independent work when it has been produced in whole or part in collusion with other people, for example, another student or a tutor; and
- claiming credit for a proportion a work contributed to a group assessment item that is greater than that actually contributed.†

For the purposes of this policy, submitting an assessment item that has already been submitted for academic credit elsewhere may be considered plagiarism. Knowingly permitting your work to be copied by another student may also be considered to be plagiarism.

Note that an assessment item produced in oral, not written, form, or involving live presentation, may similarly contain plagiarised material.

The inclusion of the thoughts or work of another with attribution appropriate to the academic discipline does not amount to plagiarism.

The Learning Centre website is main repository for resources for staff and students on plagiarism and academic honesty. These resources can be located via:

www.lc.unsw.edu.au/plagiarism

The Learning Centre also provides substantial educational written materials, workshops, and tutorials to aid students, for example, in:
- correct referencing practices;
- paraphrasing, summarising, essay writing, and time management;
- appropriate use of, and attribution for, a range of materials including text, images, formulae and concepts.

Individual assistance is available on request from The Learning Centre.

Students are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting, and the proper referencing of sources in preparing all assessment items.

* Based on that proposed to the University of Newcastle by the St James Ethics Centre. Used with kind permission from the University of Newcastle
† Adapted with kind permission from the University of Melbourne.
**Course schedule**
Laboratories are scheduled at the following five times (if you previously enrolled in a different laboratory time slot, please move your enrolment immediately).
- Tuesdays 9-12
- Wednesdays 3-6
- Thursdays 9-12 and 3-6
- Fridays 2-5

Lectures are scheduled on Mondays, from 2pm to 4pm

*Tentative Timetable (lecture topics subject to change – see web-site)*

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<thead>
<tr>
<th>Wk</th>
<th>Begins</th>
<th>Lectures</th>
<th>Guide to Project Activities</th>
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<tbody>
<tr>
<td>1</td>
<td>28 Jul</td>
<td>Introduction to the projects Introduction to design</td>
<td>Labs begin in this week for the sole purpose of finding a lab partner. Be sure to show up and start your research into projects</td>
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<tr>
<td>2</td>
<td>Aug 4</td>
<td>Marketing Needs and Requirements</td>
<td>Discuss project ideas with lecturer, if reqd. Start market research and brainstorm ideas. <strong>Project selection form due Friday 10am</strong></td>
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<tr>
<td>3</td>
<td>Aug 11</td>
<td>Concept generation &amp; development System Design Project Management</td>
<td>Requirements analysis. Problem statement Continue concept generation</td>
</tr>
<tr>
<td>4</td>
<td>Aug 18</td>
<td>Electronic Components Electronic Components</td>
<td>Concept and feature selection Block-level system design Identify critical blocks</td>
</tr>
<tr>
<td>5</td>
<td>Aug 25</td>
<td>Electronic Circuit Ideas Prototyping Tools and Methods</td>
<td>Source reference designs Source critical components Development planning Early prototyping of critical elements</td>
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<tr>
<td>6</td>
<td>Sep 1</td>
<td>Technical &amp; Oral Communications Economics of Product Development</td>
<td>Write development proposal Ongoing planning Ongoing prototyping</td>
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<tr>
<td>7</td>
<td>Sep 8</td>
<td>Electromagnetic Compatibility Systems Engineering 1</td>
<td><strong>Development proposal due Monday 10am</strong> Start detailed design Ongoing prototyping and testing</td>
</tr>
<tr>
<td>8</td>
<td>Sep 15</td>
<td>Electromagnetic Compatibility Safe Design Considerations Systems Engineering 2 (TBD)</td>
<td>Develop specifications Ongoing planning Ongoing prototyping</td>
</tr>
<tr>
<td>9</td>
<td>Sep 22</td>
<td>Manufacturing Processes PCB Design</td>
<td>Construct first functional prototype for preliminary testing against specifications</td>
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<tr>
<td>10</td>
<td>Oct 6</td>
<td><strong>Public Holiday</strong></td>
<td>Refine functional prototype Prepare seminar presentation and demo</td>
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<tr>
<td>11</td>
<td>Oct 13</td>
<td>Standards Quality Assurance</td>
<td><strong>Project seminar and demonstrations</strong> Finish PCB design Start final report</td>
</tr>
<tr>
<td>12</td>
<td>Oct 20</td>
<td>Intellectual Property Wrap-up</td>
<td>Finish writing final report <strong>Final report due Friday 10am</strong></td>
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Resources for students

**Web-Sites and Course Notes**

For course notes, up-to-date lecture schedules and related links, the primary website for this course will be [http://subjects.ee.unsw.edu.au/~elec3117](http://subjects.ee.unsw.edu.au/~elec3117). You should check the website regularly, especially before attending lectures.

**Useful and Recommended Texts**

There are no required texts for this course. If there were one, it would be the first-named text from the following list of recommended books:

   - A good overview of the design process with a number of relevant case studies to illustrate the methods discussed. It includes sections on product costing and project management, as well as methodologies for market analysis and concept generation. This text is easy and enjoyable to read and may be purchased from the UNSW bookstore. However, it does not touch on the details of electronic design, or a number of other topics covered in the course.

   - Covers key aspects of design at a high level, but with quite a few examples. Strong on user needs/requirements and high level design. Covers a variety of design approaches, project management, and costing issues. This text is easy to read and may be purchased from the UNSW bookstore. However, it does not touch on the details of electronic design, or a number of other topics covered in the course.

   - This book is an excellent reference for electronic design issues that may be required to complete your project.

   - A very interesting read. Ever wondered why you just walked into a door, or tried to pull a sliding door? This book discusses the design of the everyday objects that we take for granted.

**Continual course improvement**

While this is not a new course, it has undergone significant changes over the past couple of years. The course structure has been reorganized, new material has been added and methods to improve the interaction of students within project teams and between project teams are constantly being considered. In addition to the standard UNSW Course and Teaching Evaluation and Improvement (CATEI) surveys, we welcome any additional suggestions you care to provide during the course.
Administrative Matters

University Expectations of students

UNSW expects regular attendance at lectures, laboratories and other scheduled classes. It is also expected that University commitments will take precedence over other activities such as paid work, holidays and so forth. Exceptions to this policy may be granted only in special circumstances.

UNSW has rules for computer use, for example, in the use of email and online discussion forums. You would have accepted these conditions when you first accessed the UNSW network.

What you need to bring to the Laboratory

You will need a **USB drive** for storing your personal drawing and other files. In addition you will need a **laboratory notebook** for recording your work. You should also find a **prototyping board** useful when developing your circuit. The prototyping board should be permanently labeled with your name and student number (so that there is some chance of getting it back if you accidentally leave it behind).

Prototyping boards and documentation are available from the Electronics Workshop in EE G14 (you can use the prototyping board you had in earlier years if it is still reliable).

The following tools are essential in laboratories where you work directly with circuit hardware: small screwdriver, small pointed pliers and side cutters. A wire stripping tool is also useful. The small pliers are indispensable for inserting component pigtail in prototyping boards.

Procedures for submission of assignments

<table>
<thead>
<tr>
<th>Assignment</th>
<th>When Due</th>
<th>Submit To</th>
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<tbody>
<tr>
<td>Project Development Proposal</td>
<td>Monday, Week 7</td>
<td>Box outside EE G12</td>
</tr>
<tr>
<td>Project Final Report</td>
<td>Friday, Week 12</td>
<td>Box outside EE G12</td>
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Occupational Health and Safety

Like the wider community, UNSW has strict policies and expectations on Occupational Health and Safety. The School of Electrical Engineering and Telecommunications has developed its own safety manual for new students. Most likely, you will have received a copy of this manual and signed a declaration that you have read and understood its contents, during your first year at the university. If you have not done so, please request a copy via the lab demonstrators and be sure to sign and return the declaration at the end of the manual, again via the lab demonstrators.

Please note the following points in particular:

1) The direct connection of 240 V mains power to any project developed in this course is not permitted – projects prototypes should not operate beyond the voltage levels available from the power supplies on laboratory benches.
2) Clothing bags and other articles must be stowed safely under the laboratory benches, where they cannot cause a person to trip. Falls are a surprisingly common cause of laboratory accidents.

3) If you have any doubts concerning the suitability of the device ratings you have used, do not risk overheating or explosion. Ask one of the trained laboratory personnel to check your work. Where appropriate, test your prototype initially with a low applied voltage, ramping up to normal operating levels only after measuring all critical circuit elements.

Examination procedures and advice concerning illness or misadventure

It may happen that a student performs far below their ability in an assessment or is unable to submit an assignment on time or attend an examination due to illness or misadventure.

Where students have a documented medical history or instance of misadventure they should submit a Special Consideration request form at NewSouth Q. The form must be lodged within 3 working days from the date of the assessment task and it must be accompanied by certified documentation.

A doctor's certificate must indicate the severity of the illness, AND ALSO the severity of the effect on the student's capacity to undertake the assessment. Please note that "headache", "feeling unwell", "nervous tension", etc are unacceptable grounds. NewSouth Q will not accept incomplete and/or undocumented applications.

Special consideration may lead to the granting of an extension, additional or supplementary assessment, but this is by no means automatic.

Equity and diversity

Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course coordinator in the first week of their course, or with the Equity Officer (Disability) in the Equity and Diversity Unit (9385 4734 or www.equity.unsw.edu.au/disabil.html). Early notification is essential to enable any necessary adjustments to be made.
Overview of the Design Project

The project is the major component of the work in ELEC/TELE/PHTN 3117. It represents half of the total marks for the subject. Therefore, to do well in this subject you must do well in your design project. Even more importantly, you must pass the laboratory component. Failure to do so may result in a UF (Unacceptable Fail), even if your overall final mark for the subject is greater than 50%.

This project requires much more than just designing and constructing an electronic circuit. It requires the consideration of a broad range of Engineering and strategic business issues, such as target market, competition, costing, timing etc.

In order to ensure a consistent context and approach to the management and costing of the project reports, it is important that we consider project development within a particular framework or scenario:

Imagine you are a young engineer in a large electronics manufacturing company. It is your responsibility to propose and develop new product concepts to management. These product concepts must fulfil actual or perceived user requirements and must be competitive, both in terms of price and technical functionality, with comparable products. Management are looking for product concepts that differentiate their company’s products from those of other manufacturers in the marketplace. They are looking for novel ideas, with intellectual property that can be protected, and product concepts that will give the company a competitive advantage. They are also looking for products which reinforce their existing strengths and command of certain market segments. For this reason, you would do well to identify a realistic market segment in which the fictitious company will be active.

Your task can be broken down into five stages:

1. Defining the scope of a new product concept, i.e., coming up with a concept idea;
2. Writing a proposal detailing the product concept;
3. Designing and testing a functional prototype;
4. Presenting a seminar and demonstrating the prototype to management;
5. Writing a report describing and evaluating the concept prototype and also detailing the work required to take the prototype into production.

The success of your company, as well as your career, may depend on how well you can communicate the value of your ideas to management.

This is not the only scenario we could work under. However, the assumption of a large company greatly simplifies the costing/management of project staff and resources. It is in your best interest to write all your reports based on this scenario, as this is the scenario that matches the marking scheme given to the tutors.

To ensure sufficient uniformity for assessment and learning, it is important that your product concept is electronics based. A purely software project is not acceptable for this course, even though practicing Electrical and Telecommunications Engineers often spend a great deal of their time developing software, either for general computing platforms or for embedded systems. Although product concepts which integrate with a PC are sometimes acceptable, you are strongly recommended to incorporate a micro-controller where programmable functionality is required; this forces you to think in terms of self-contained products, with a large potential market.
ELEC/TELE/PHTN 3117 Design Projects for S2, 2008

Obviously good product concepts are not easy to come up with (if they were we would all be rich!). The majority of product concepts that you may be able to think of may not be entirely original or may not be compelling enough to be truly successful in the marketplace. However, it is required that your project has a product concept which you can at least argue has some merit over the competition, i.e., it may offer new features or a new combination of features, or it may be a novel application of a (suitably modified) pre-existing device. Note: the unique selling point of your device cannot be a reduced price or a novel marketing approach alone.

The lecturer has provided the following 8 broad topics from which you can select a promising project. Alternatively, with the approval of the lecturer you can select your own topic. However, the project must be electronics-based, so as to facilitate comparison for assessment purposes. You should also consider how you can practically demonstrate your product prototype in Week 11.

**Topic #1: Surprising Sounds**
This is a suggestion for a novelty gift or toy, consisting of a wireless (e.g., RF or IR) controller and a collection of audio record/playback devices which can be individually addressed by the controller. Amuse your friends by activating pre-recorded sounds spontaneously at very locations in the house, without them knowing you're doing it. Consider adding extra features, so you can use the same devices to spy on people. Consider additional methods to trigger the audio. Think laterally. What will be your market? Can you target more than one market segment with the same device? Is the system fixed or expandable?

**Topic #2: Shoe Removal Detector**
In many cultures, it is considered unclean to wear shoes in the home. Do you have visitors from different backgrounds who sometimes forget to remove their shoes when they enter your home? The purpose of this product is to remind/alert visitors who forget to remove their shoes. It’s up to you to figure out how to do this (there are quite a few potential approaches) and what will be most appealing to your customers. It's also up to you to determine whether this should be an amusing in-your-face alarm to abuse offenders, or a more subtle system to help guests avoid embarrassment.

**Topic #3: Audio Delay Line**
Have you ever been annoyed when you don’t catch a key phrase in a television movie? No doubt you longed at that point for an audio delay line!?! Russel Crowe is one of many offenders in the slurred speech category (and other categories). Perhaps English is not your first language, or you are watching a movie in a foreign language to increase your proficiency. Perhaps you have friends with verbal diarrhea, who keep interrupting the movie. For all such applications, what you need is an audio delay line. The idea is to maintain a continuously moving window of recorded sound, such that the window always contains a record of the most recent T seconds of content – you would need to determine a suitable value for T. In the simplest case, an interactive user could press a button to request playback of the T second buffer. More sophisticated designs might allow the buffer to be temporarily saved to a second buffer for playback at a later point, to be determined (e.g., during ads, or lulls in the conversation). As with all projects, pay attention to what is actually required of such a product.
Topic #4: Counting Shoes
You’ve seen (or maybe worn) shoes that light up when you jump, but what about shoes which count events. The idea behind this project is to integrate counting display(s) and sensors into a pair of shoes (e.g., a pair of old joggers). Things you might sense, count and report via the display include steps, toe-only steps, toe and/or heel pressure, and maybe other things. You might consider connecting the shoes together via an IR or wireless link so that you can collect statistics related to coordination, but this will clearly add complexity. You might only pick one feature to demonstrate via a functional prototype due to time constraints. Think of novel ways for the user to interface with the display. Perhaps the display itself would not reside in the shoes. Clearly, there is a vast array of options here for you to explore if you’re up to it. Give a whole new meaning to the term “boot strapping” as you introduce counting shoes to the market.

Topic #5: Daisy Chaining Earphones
Are you an avid earphone sharer? Have you ever worried about catching an ear infection (perhaps a nasty brain parasite) from your friends? What about sharing the experience (not the parasites) with multiple friends? Solve these problems and more with daisy chaining earphones. The idea is to build a set of earphones that can plug into a regular MP3 player, iPod, whatever, but can also be used to send and receive music via an IR (or possibly wireless) link to another nearby audiophile. As with all projects, think carefully about the requirements before selecting a design concept here. There are a variety of physical configurations that you could consider and powering the circuitry is also an issue to be considered.

Topic #6: Unsolicited Call Handler
Over the ages, people have developed many strategies for dealing with unsolicited telephone calls. Some people have gone to such lengths as training a parrot to converse with the caller. Others engage their talkative children, or just leave the phone off the hook. Most people, however, find it hard to say no or rudely hang up the phone. For people such as this, a personalized unsolicited call handling machine may be the answer. Once the nature of the call is determined (by answering the phone in the normal way) the call handler can be activated. Simple versions might simply play an automated message and hang up. Other designs might play a random assortment of customized messages until the caller finally hangs up in confusion. Ingenious solutions might masquerade as automated call handling machines which present the caller with touch tone redirection options ad nauseam. The sky is the limit with this, but be mindful of requirements. What type of customers would this appeal to, and what type of machine would they prefer?

Topic #7: Wet Nappy Detector
Something every student thinks of?? Perhaps not, so this one will require some serious market research. Something discrete, comfortable and safe for the baby, which lets a parent or babysitter know that a nappy needs changing. Here are some questions for you to start considering: Will it work with cloth, disposable or both types of nappies? How will the signal be communicated? Could it be annoying or embarrassing? Could a variation of this idea be used to assist in toilet training by sending negative messages to a child who is too comfortable with nappies? Are there any relevant health regulations or guidelines?

Topic #8: Party Conversation Aid
This product may be tricky, but it’s well worth the effort. A common experience in large parties is that you cannot hear a thing that anybody says (due to the
presence of loud music usually). In the future, the techno-savy party-goer may come prepared for such difficulties and leave with their voice intact. The key to their success will be the party conversation aid – a small electronic communication device that allows two people to communicate effectively with each other without foregoing the experience of loud music in a crowded room. Essentially, this is a kind of walky-talky, but be prepared for lots of these in the same crowded space. Do you really want an RF walky-talky, or do you want something which is based on line-of-sight communications? Fashion and subtlety are also important. Perhaps you could integrate the device with other party accessories. Think about how the product would be used.
Please make EVERY EFFORT to find a partner. 
*Otherwise a partner & project will be assigned to you.*
Please return only ONE form per group.
Locked Box EE G12, 10am Friday, Week 2.

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<tr>
<th>LABORATORY SESSION</th>
<th>AM/PM</th>
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<th>NAME 1 (Family name first &amp; underlined)</th>
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**PROJECT SELECTIONS, IN DESCENDING ORDER OF PREFERENCE**

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<thead>
<tr>
<th>ORDER OF PREFERENCE</th>
<th>PROJECT NUMBER (1-8, or 0 for your own topic)</th>
<th>BRIEF TITLE OF PROJECT</th>
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Explaination of own topic 0 (mandatory for topic 0 – you may have at most one):  
