# Recommendations from GT and the University of Michigan for Structuring, Starting, and Running a VIP Program

We now have more than 10 years experience starting and running VIP programs. This means we have made most of the mistakes that can be made – and we hope to help you avoid repeating them. We also want to highlight the policies, practices and tools that enable VIP to run smoothly, count appropriately for students and faculty, and to scale-up nicely in terms of the number of students, faculty, and disciplines that participate.

Courses and Registration Policies

**Credits Per Semester**

The general goal is to enable students to participate in VIP for the equivalent of a half-course each semester. At GT, a standard course is 3 credits, which would imply that VIP should count for 1.5 credits per semester. Unfortunately, fractional credits are not allowed. We thus give students a choice of 1 or 2 credits per semester when they are juniors or seniors.

**Course Numbering**

Ideally there are courses with a VIP designation/title. At GT there are currently five ECE special-projects courses ECE- 2811, 381x, and 481x, that support the VIP program. The first number indicates the year of the students that should participate via that course: 2=sophomore/second-year, 3=junior/third-year, 4=senior/fourth-year. The last digit in each course number indicates the number of credits, where “x” stands for 1 credit hour or 2 credit hours. Thus sophomores can only take VIP for 1 credit per semester; juniors and seniors can choose to take VIP for 1 or 2 credits each semester. We have started the process of creating university-wide courses with the subject-code of VIP instead of ECE or any other discipline’s code.

In the numbering system above, there are five course numbers for VIP (2811, 3811, 3812, 4811, 481). Each VIP team is one section of each of the VIP courses, such as section VP1 for team one, section VP2 for team two, etc. These sections numbers are used for all five of the VIP course listings. This means that team one, which is section VP1, will have students enrolled in ECE 2811 VP1, ECE 381X VP1 and ECE 481X VP1.

**Enrollment Management: Permit-Based Registration**

VIP directors and/or instructors can optimize team size and composition by not allowing open registration for VIP courses, but by limiting registration through registration permits or by a permission-of-instructor process. This allows the director/instructor to maintain a mix of majors, as well as a balance of sophomores, juniors and seniors. This balance ensures younger students are available to continue in the program, creating continuity from semester to semester.

In the application/permit process, students apply though a website to join teams of their choice. When an application is approved, a permit is issued to the student, enabling him/her to register for the specific course and section for which the student was approved. If an application is rejected, the student can apply for another team. By requiring permits to register, you can optimize the composition of the teams, including the total number on the team, the number of students from each year, and the number of students from each discipline sought by the team.

Requiring students to pick a team to join before the semester begins – as opposed to joining the program and then selecting a team the first week of the semester – ensures that teams can start/restart their operations the first week of classes. This is critical for scaling to a large number of teams but also streamlines operation for smaller numbers of teams.

**Returning Students**

Students who have been on a VIP team one semester and apply to join the *same* team the next semester, are automatically issued a permit to register for that team’s section of the appropriate VIP course. The only exception to this policy, and it is a very rare exception, is when that team’s adviser requests that a specific student not be allowed to participate again.

**Switching Teams**

A sophomore who has been on one team can switch to any other team the next semester. This is allowed because sophomores are generally still deciding what discipline or what part of a given discipline is of the most interest to them.

A junior or senior who has just completed a semester on one team is not allowed to switch to another team the next semester. They can only switch to another team after they spend at least a semester outside of VIP. This policy discourages juniors and seniors from switching teams. The policies concerning how VIP credits count toward degrees also discourage juniors and seniors from switching teams. Students are expected to deepen both their technical skills and professional skills within the context of one team over an extended time period, not to always be a newbie on a team by hopping around from team to team.

**Approving Applications, Maintaining Balance**

The person(s) managing the permit-application process should work to ensure that each team has a size and composition that supports both the continuity and productivity of the team. *Continuing* teams should generally have about 15 undergraduates each semester. They should generally be split almost evenly between sophomore, juniors and seniors…or a few sophomores and the rest of the team split between juniors and seniors. This ensures that at least ¼ to ½ of the team, *with* their knowledge and skills, will return the following semester. The returning students are responsible for brining the new students up to speed on the project. If there are many disciplines in a team, then larger team sizes make sense so that continuity is possible within each participating discipline.

The best size for *new* teams is generally 8 to 10 students for teams with two disciplines. For teams with more disciplines, 10 to 12 may be better. A new team is thus smaller than a continuing team. With too many students, the team start-up process can become chaotic, especially for those advisers who have a VIP team for the first time.

There is always some attrition between the time permits are issued and when the students register. Our experience at GT is that the attrition rates are approximately 20% for the Fall to Spring transition and about 33% for the Spring to Fall transition. Compensating for this by issuing proportionally more permits will produce teams of the desired size and composition.

**Permit-Application Software**

Software supporting the permit-application and team-assignment processes is available from GT upon request. It connects to the universities registration system in order to auto-fill some important information (student ID and login, student’s official major, correct spelling of name, etc.), so some local IT help will be needed to adapt the GT software to your local environment.

Grading and Assessment

**Participating for a Grade**

It is very important that every student participate in VIP for a grade (A,B,..,F). The Pass/Fail option is very destructive to team dynamics as some students will try to get by with the minimum work required to pass. This can be frustrating to students who want to make rapid progress in order to get a high letter grade.

Do not allow auditors or volunteers to participate in VIP teams. In our experience, at least 95% of them disappear after the first third or first half of the semester, often leaving some critical task unfinished or in an unknown state.

**Documentation, Teamwork & Accomplishments**

Keys to individual success and team success in VIP are documentation, teamwork and accomplishments. To this end, the three are weighted equally in grading.

Documentation (33%)

Students are told at the beginning of every semester, that if they do not document what they have done – in their notebooks, on their team’s wiki, in a software repository, etc. – then they did not do it. This is a *critical* point because it makes sure that you do not end up in arguments between students about who did what or whether a student did anything at all. This ability to track what each student does on a team is also critical when seniors on a VIP team are using their activities on the team for senior design credit – please see section the section on culminating design course credit under how VIP credits count.

Teamwork (33%)

Teams need to have some degree of self-management.  Experienced students are a useful resource in assisting new students and this relieves the advisor of some burdens in a mature team.  This self-management is promoted by developing teamwork and leadership skills.  Effective teamwork and leadership include communication, helpfulness, time management, and assertiveness.

As a graded area in VIP, teamwork includes attendance at and participation in team and sub-team meetings, contributions to team presentations, interaction and coordination with teammates, assisting teammates, and participation in the peer-evaluation process. Results of the peer evaluations are an important tool in assessing teamwork.

The peer evaluation and grading software that we have developed at GT is available for any site that would like to use it. We recommend that you use this software, or that we all agree to a common set of software tools – because one goal of the Consortium is uniformity of grading processes across VIP sites for the purpose of thorough assessment of learning outcomes in VIP.

Accomplishments & Contributions (33%)

Accomplishments and contributions are easier to identify and describe than teamwork. These include contributions to the progress of the team; graded assignments (quizzes on start-up assignments, presentations), pursuit of knowledge needed for the project and engagement. For more experiences members, this may also include contributions to project management.

**Grading: Mid-semester and End-of-semester**

Grading takes places in the middle and at the end of each semester. In both cases, all aspects of each student’s performance are evaluated. In the mid-semester process, each student is given a grade range (say B+ to A+, or C to B) and explicit advice about what they are doing well and in which areas they need to improve. They are invited to talk with their adviser if they disagree with the assessment. In this way, the final grade at the end of the semester is almost never a surprise, essentially eliminating grade appeals while also ensuring the advisers have a very clear idea of each student’s performance/contribution.

For new students on a team, the mid-semester grade is advisory. Most students have never been involved in anything like VIP before, so we allow an adjustment period. A new student who receives a poor grade range, such as D to C+, in the mid-semester grading process can still earn an A or B if they correct the things they are doing wrong –they are typically being too passive, not attending meetings, not interacting with other team members, or not completing the team’s start-up process quickly or well.

The target GPA over all VIP teams should be in the range of 3.2 to 3.5 each semester. See the section on quality control for why this is recommended.

The details of the grading process we have developed at GT can be found on the VIP website at <http://vip.gatech.edu>

* 1. Please go to the “Grading Tools” and “Documents” menu items under the “Current VIP Faculty” tab at the GT VIP website.
  2. Of particular note: The syllabus and the sample design notebook that are posted under “Documents.”

Onboarding – Establishing and Mentoring New Teams

**Voluntary**

At GT faculty are never assigned by a department to develop or take over teams. Instead, it is a voluntary program, with faculty requesting teams to work with them and their graduate students. In general, the Director of VIP talks about VIP at faculty meetings in different departments and requests that interested faculty contact her/him if they would like to have a team. After the initial VIP advisers in a department have success with their teams, other faculty step forward and ask to have teams of their own.

When a potential adviser wishes to discuss joining VIP, the first conversation is about the nature and expected duration of the project. In general, projects should be open-ended and given broad titles to allow the project to evolve in directions that cannot be foreseen when they are launched. The shortest expected duration that should be allowed at launch is four years.

**Team Info Page**

Each new VIP adviser(s) is asked to develop a one-page description of their team, which will be posted on the VIP web page at <http://vip.gatech.edu/teams>. The format for these descriptions is appropriate for engineering, computing, digital humanities, etc. As new disciplines are added, different categories may be used in the project descriptions.

**Documentation: The Students’ Responsibility**

Team documentation is a critical part of embedding knowledge in a team.  Students must learn to not only accomplish tasks, but to effectively convey those accomplishments and the necessary steps in a way that new students and teammates can follow and understand.  An effective team cannot require the team advisor to be the sole repository of the team knowledge.

**Team Meeting 1:**

* The faculty member who is mentoring the new team, or the Director of the VIP Program, leads off the discussion to set the tone, and should make the following points:
  + VIP is not a regular class. Students are expected to be active, not passive; to work together, not in isolation; to speak up when they have completed a task or have nothing to do.
  + Documentation is essential. They must each have a log book (design notebook, lab notebook, journal, etc) in which they record meeting notes, record their own thoughts and activities, and maintain an explicit to-do list. They should be referred to the on-line example of an outstanding log book.
  + The log book must be one with a glued or sewn binding so that new pages can not be inserted. All notes must be in pen and each page should be numbered, dated and signed.
  + The mentor should clearly state: “If it is not recorded in your log book or documented on your team’s website/wiki/etc., or checked into your teams’ software or other repository, then you did not do it.” This is crucial for establishing a grading process that can track what each student actually accomplishes – not what they claim to have accomplished – while on the team. These log books are resources for subsequent teams that need information on earlier activities, accomplishments, and problems encountered.
  + Answer any questions the students have about grading or anything else related to VIP.
* The faculty adviser for the team should then introduce him or herself and have the students go around the table and introduce themselves. The adviser should then:
  + Give an overview of the project at a high level, followed by a break down into specific areas on which the team will focus on as it starts up.
  + Assign reading or background info searches for the team to accomplish by next meeting. Continuing teams often have labs and other assignments that the new members are to complete under the guidance of returning members.
  + Each student should that have something explicit that they can work on – together where appropriate – for the first week.
  + They should be talk that they will be asked during the next meeting that they will be expected to report on what they have done.
  + Any returning students on the team are tasked with helping new students come up to speed while also picking up and restarting their own tasks from the previous semester.

**Team Meeting 2:**

* The mentor for the team starts off by checking that each student has an acceptable log book and that they are already recording what they are doing.
  + At this point is often necessary to make students close or shut off all electronic devices during the meeting. Otherwise, you have students who are “at” the meeting but not “in” the meeting.
  + Note that at some point the team may define subteams to pursue different parts of the large-scale, long-term project.
  + Answer any questions about VIP.
* The adviser and her/his graduate students can continue introducing the project, should ask the returning students to report on their progress, delve further into the projects goals and tasks, etc.
  + It is perfectly acceptable to give quizzes covering what students were asked to read or research. This helps establish accountability and keeps students from falling behind.
  + Asking them to state in the meeting what they have done in the last week also gets them to engage and become comfortable speaking in a meeting.
  + Again, assign reading, labs, etc. for the next week.

**Team Meetings 3, 4, … to Midterm:**

* The mentor may or may not attend, depending on how things went during the previous meeting.
* The adviser should see things start settling down into well defined tasks for the students, with new students continuing to come up to speed, and returning students back on task.

**Mid-term Grading:**

* For new VIP teams, the mentor attends and explains the process, which includes collecting all log books, reviewing all other documentation, conducting the peer evaluation etc. The mentor also shows the faculty adviser how grading is done and what pitfalls to avoid.
* The most important things for the faculty advisers to learn at this point is the need for and methods to ensure accurate grading of students on the team. Feedback on the grading is performed for every student, in the form of written comments, a grade sheet detailing grades in each possible area of contribution, and suggestions for improving performance. The mid-term grade is typically a range as opposed to a single grade.

**Final Grading:**

* For new VIP teams, the mentor again assists with this process, describing it to the students and the adviser at the beginning of a team meeting. The grading process is a repeat of the mid-semester grading process but the result is a single grade for the student for that semester.
* VIP advisers need to learn to grade accurately, not just give all A’s. If they do give all A’s then students who worked hard and were committed to the project become resentful of their less productive colleagues that received the same high grade. At the same time, the adviser needs to be able to explain to each student why they received the grade they did. When this is done well, the result is a productive team that has a positive, can-do spirit, and is a pleasure to work with.

**Common Student Issues**

Students often have skills targeted at lecture classes, and lab assignments.  The idea that the instructor (employer) does not know the precise answer and often not even the optimum approach to a posed question leaves many students confused, yet it is a common workplace issue.  Instructors need to encourage students to approach problems without explicit procedures.

Lacking explicit procedures, students often fall idle or become consumed with work in other courses.  Students need to learn skills in self productivity, including when to ask questions, how to self-engage in new areas, and effective time management.  VIP teams work best were new team members have some structured assignments to help bring them up to speed on team topics, but the transition from assignments to self-motivated productivity requires guidance from team advisors, to assure students make this transition.

How VIP credits count toward student’s degrees

Students learn and accomplish a lot on their VIP teams, so it is appropriate that they be rewarded with credit toward their degrees. Each discipline may develop different policies for these credits, but the general guideline should be that:

1. The way the credits count should encourage students to participate for two or more years.
2. A substantial number of the credits earned should count toward the core of the student’s discipline.

**Free Electives vs. In-Major Electives**

To encourage students to participate for two or more years (item “a” above), the credit policy should state that only after a minimum credit level has been achieved can any VIP credits count as a core credit in the student’s major; otherwise the credits taken count only as free electives. For example, at Georgia Tech, an electrical engineering student who takes 6 credits of VIP can count 3 of them as technical electives, with the remaining 3 (or more) counted as free electives. Thus, a student taking 5 or fewer VIP credits can only apply those credits toward their degree as free-elective credits. It is also possible in some majors to use VIP for junior or senior design credit.

**Culminating Design Experience, Junior Design Experience**

In at least three disciplines at GT, participation in VIP can lead to junior or senior design credit. The details are under the College of Computing, EE, CmpE, and ISyE entries at: <http://vip.gatech.edu/new/how-vip-credits-count>. Briefly, and considering senior design in ECE: First, a student participates for at least five credits of VIP on the same VIP team over their junior year and first semester of their senior year. Then the student registers for the VIP section of the regular senior design course. Upon completion of the senior design course, the VIP-related credits the student will have earned are: 3 senior design credits, 3 technical elective credits, and 2 to 3 free elective credits. The advantage of this approach is that the ECE senior-design staff enforce the requirement of ECE for senior design while the adviser of the VIP team continues to advise the student as a member – but for 3 credits – of the VIP team. The adviser grades the student as usual on the VIP team and that grade is used as the technical accomplishment grade that is factored in with other senior-design grades on presentation, writing, etc.

One major advantage of the VIP approach to senior design is the way it enables students of *different* disciplines to complete senior design while participating in the *same* VIP team. For example, both ISYE seniors and ECE seniors on the same VIP team can complete Senior Design through VIP without disrupting the operation of their VIP team. This is also optimal from the VIP adviser(s) point of view, because they do not need to know the specific requirements and deadlines for senior design for each discipline on their team, because they are tracked and enforced by the senior design staff of each department.

Working with each discipline to determine how credits count toward their students’ degrees is the most time consuming part of establishing VIP. Fortunately, there are now several templates that have been proven to work well. One of them, the six-credit requirement for in-major credit, is a very good first step. It can then be followed, after details and processes are worked out, for integrating VIP into a discipline’s specific senior design/project/thesis requirements.

Allocating Resources

Each VIP team is embedded in the research activities of its adviser(s). It is thus assumed that the equipment, software, and other needs of the team will be met through the research funding the advisers have secured. The VIP program itself is thus not expected to provide seed or other funding for needs that are specific to a given VIP team. The VIP program should focus on needs that span many teams, including the following:

* + 1. **Space for VIP team meetings:** Most research groups do not have ready access to a space that is suitable for a group of 20 to 25 people. The VIP Program should thus seek to identify and outfit such space and establish ways for it to be shared amongst many teams. Those teams that do have access to suitable meeting space are expected to use that for their activities.
    2. **Web Servers:** Many VIP teams develop and deploy web servers and other publicly available IT services. The students on such teams learn the most when they have full admin rights on such servers. Rather than have each VIP team address this issue on its own, and to achieve significant economies of scale, the VIP Program can negotiate a uniform policy with the campus infrastructure and enable teams to share servers. At GT, VIP has its own Class C subnet that is firewalled off from the rest of campus. We also support a server cloud, currently hosted on a set of six servers plus a large RAID array, that supports 30 or more virtual servers at any given time.
    3. **Cultivating Industry Partners:** The VIP Program is very attractive to industry because of the unique preparation that it provides for students. Companies are thus often eager to donate equipment to support one or more projects or the entire VIP Program. The VIP program can make this equipment available to teams as needed.

The staff of the VIP Program, including the Director and Program Manager, provide the following services for the VIP teams:

1. **Interfacing with Departments, Schools and Colleges:** The Director works with administrators and the curriculum committees in each discipline to develop appropriate ways for VIP to count toward degrees in those disciplines.
2. **Recruiting Students:** The VIP Program provides a centralized process for recruiting students for all VIP teams. Email, pizza callouts, posters, etc. are used to recruit for all teams. Targeted recruiting for specific teams is also possible, especially for new teams.
3. **Mentor New Teams:** The VIP Director and other VIP faculty mentor new teams to ensure that they get off to a good start and that grading and other processes are implemented as uniformly as possible across all VIP teams. Also see the section on quality control.
4. **Supporting Tools:** Centralized tools should be managed by VIP staff, including permit-application and management, peer evaluation software, and program evaluation tools.
5. **Letters of Support:** Providing letters of support, VIP descriptions, etc. as needed for the education sections of NSF proposals, especially CAREER proposals.
6. **Program-serving Grants:** The Director should identify and apply for grants, equipment, endowments, etc. that would benefit the entire VIP program. At GT this has included proposals prepared for NSF related to education research; to the Helmsley Trust for planning, growth and dissemination of VIP; to individuals for endowments for the VIP program; to companies for the creation of and prizes for the annual VIP Innovation Competition; to GT’s Tech Fee program to secure funding for equipment for VIP central resources like the VIP server cloud, etc.

**Teaching Credit**

In ECE and ISyE at GT, course credit is available for faculty advising VIP teams. In general, the primary adviser for a new VP team is provided with credit for teaching one course for the first, and sometimes the second year of operation of a VIP team. The reason is that the primary education burden on the faculty is bringing the team up to speed in its first year or two. Faculty also receive teaching credit for advising VIP students enrolled in the VIP section of senior design, just as other faculty receive credit for advising senior-design students/teams.

Evaluation process

It is important to have an active evaluation process in place for each VIP Program. The VIP Consortium will have the development and sharing of evaluation tools and processes as one of it primary missions.

This evaluation process should assess the progress of students towards the outcomes desired by VIP in both technical skills and professional skills. It should also determine how well a team is functioning by, for example, looking at knowledge exchange within and between VIP teams.

Quality control

The evaluation process is important for monitoring the effectiveness of the overall program and of individual teams. When the program is not being effective or individual teams are not functioning well, it is important that mechanisms be in place to correct the situation. The following tools and processes have been helpful in this regard.

**Screening of New Advisers/Teams**

One of the most effective ways of maintaining quality is to do a good job of vetting and mentoring new advisers and teams. Each newly proposed team must be evaluated for its potential to provide long-term, large-scale challenging projects that are still within the reach of a talented team of undergraduates. As VIP expands across campus, a committee composed of people from different disciplines is required to perform this function. They should preferably be familiar with VIP or, even better, have their own successful VIP teams.

**Mentoring New Teams**

It is important to set the right tone for students during the first semester and to ensure that grading standards are maintained across teams. In general, advisers who give an A to every student every semester will have teams that exhibit low productivity. The reason is that students will gladly accept an A for very little work and spend their time working on other classes or activities. A team that has a reputation for getting an easy A will attract many students expecting to do little work. An average GPA over all teams of 3.2 to 3.5 is what should be expected, even aimed for. This is similar to a GPA for senior design courses and also similar to graduate student grades. The reason is that a student who receives a C, D or F in VIP one semester rarely returns to the team the next semester. Thus, non-performing students tend to leave well-run VIP teams.

**Shutting A Team Down**

It is crucial that teams that are not performing well be shut down. Because participation in VIP is by permit only, a team can be shut down in one semester by not allowing any more permits to be issued for that team. The Director of the VIP Program must have the authority to make this decision, supported by a committee of other advisers if needed.

**Calibrating Team Productivity**

Having an annual Innovation Competition in which all VIP teams participate is a great and quite fun way for the VIP Director, advisers and teams to see what each VIP team has accomplished ... or not accomplished … from one year to the next. Prizes for the best team in each area and for the best overall teams also provide incentives for teams to perform well. Careful monitoring of the document and presentations by the VIP Director can help measure team productivity and identify teams that are in trouble.