



*The Science & Technology Center*  
*Charles Herbert Flowers High School*  
*Research Practicum "09"*



## **Research Requirement**

Each Science and Technology Program (STP) senior is required to design, execute and present the results of an individual research project. This senior research project is officially called a Research Practicum (RP) Project. (Note: Although the following information serves a general guideline for all RP Projects, these guidelines are designed with the flexibility to address individual RP Projects that vary in scope and dimension.)

## **Research Practicum**

RP is a yearlong research course required of all STP seniors. RP course curriculum is designed to assist students in the planning, execution, interpretation, and presentation of a highly technical research project. The RP course provides an opportunity for the student to explore a specific topic area related to the development and application of practical and theoretical research. Students may be assigned to one of two sections of RP: Off campus, dependent research section or an on campus, independent research section

## **Research Project**

Each RP student is required to select a research topic, develop and execute a research project and produce a formal paper to present the research, procedures, findings, and conclusions. Projects involve several constructive literary aspects: experimental design, review of the professional literature, experimental procedures, statistical presentation of data, conclusions and recommendations. Each of these is presented in a separate "chapter" of the formal research paper.

Outcomes for this course are comprised of two components: 1) development and execution of an in-depth research proposal designed to test a student-selected hypothesis or problem; and 2) a report of research findings via a formal research paper and an academic poster. Students conduct research in one of the general areas of Engineering Technology, Physical Science, Computer Science or Biological Science.

## **Research Mentor / Advisor**

All RP students are required to establish a formal student-professional relationship with a mentor / advisor in academia, business or civil service. These scientist, engineers, teachers, technicians and/or mathematicians provide guidance, expertise, and facilities unavailable in CHFHS Science and Engineering Laboratories.

**Chapter 1:** The Problem and its Setting

**Chapter 2:** Background / Review of Literature

**Chapter 3:** Methodology Procedures: Experimental and Statistical

**Chapter 4:** The Findings

**Chapter 5:** (Final) Conclusions / Recommendations

**Draft 5/29/2008**

## **Research Practicum “09”**

### **Junior Year (Class of 2009) Introduction to Research Practicum**

Although each STP students has followed the RP project format through three years of Science and Engineering Fair projects, the formal introduction to RP is presented to junior STP students in the fourth quarter of school year.

This is accomplished through advanced STP program sequence courses.

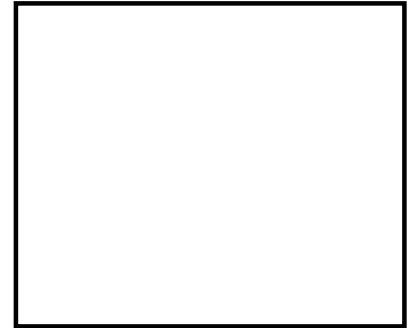
Eleventh grade STP students are currently scheduled in advanced STP program sequence classes in Computer

Science, Biological Science, Engineering, and Physical Science.

### **Senior Year (Class of 2009) Research Practicum Course**

Senior STP students are assigned to at least one classroom period for RP class.

RP students participating in school approved off campus internships are granted up to two additional internship periods.



### **The RP Teacher**

The RP classroom teacher guides the student through the RP project. The RP teacher steers and follows a student’s RP project and its presentation from start to finish. This involves a variety of activities focused on individual students. This teaching strategy is an alternative to the collective and more traditional classroom delivery method of instruction. The teacher is no longer instructing 25 students on the same topic, but they guide 25 students with different projects and different challenges toward their project’s success. Teacher’s grading rubric is based on periodic evaluations of the project’s expected time-line progress and quality.

### **Student RP Outcomes and Timelines**

#### **School Year 2008/09**

##### **Quarter 3 Advance Awareness Activities via Physics Classes**

Purpose: To develop a student mind-set for the scope and depth expectations of an RP Project

- Announcement Posters
- Coordinator’s Explanation Sessions
- ERHS – RP Symposium and Poster Session

##### **Quarter 4 RP Specifics via Advanced Sequence Courses**

(Advanced Chemistry, Engineering and Computer Science)

Purpose: To introduce students to the Process of RP

- Build a “Working Draft” Research Abstract of their Research Practicum Project. (Students use this tool to formulate their topic area, research design, statistical methodology and human and literature resources.)
- Identify and contact a Research Advisor / Research Mentor for consultation or internship purposes.
  - Create a letter of personal introduction and research interest.

**Draft 5/29/2008**

- Assemble a current formal academic resume.

**Quarter 4 RP Specifics via Advanced Sequence Courses Continued**

- Scholastically prepare for the summer literature search and research proposal assignment.
  - Review APA (American Psychological Association) writing style format.
  - Review traditional and electronic methods for locating information.
- Initiate a day-by-day logbook record of all personal RP “04” related activities.
- Submit a “Research Mentor Permission Form” or an “Internship Class Drop & Add Class” Form

**Summer 2008** Chapter 1 and 2 preparation (due 1<sup>st</sup> day of school)

- Research Proposal development
- Literature Search and Review

**2008/09**

**School Year**

**Quarter 1**

Assignment Due (day 1)

- Topic Selection/Proposal
- Procedures (Experimental and Statistical)
- Mentor contact and Log
- Ten References Summaries (.5 page each)

Chapter 1 Development -The Problem and its Setting

- Annotated Bibliography (20 references, may include 10 from summer)
- Assignment/Statistics Problems/Progress Checks
- Test: Descriptive Statistics

**Quarter 2**

Chapter 2 Development: Background/Review of Literature

Chapter 3 Development: Methodology/Procedures

- Experimental
- Statistical

Science/Engineering Fair Forms/Protocols

Assignments/Statistics Problems/Progress Checks

Test: Statistics (Inferential)/Appropriate Graphing

**Quarter 3**

Chapter 4 Development: The Findings

Maryland Jr. Science and Humanities Symposium

Science and Engineering Fair

Classroom Presentation

Chapter 5 Development: (Rough) Conclusions/Recommendations

**Quarter 4**

Chapter 5 (Final) conclusions/Recommendations

Prince George’s Area Science and Engineering Fair

Final Paper Submitted

Present in RP Symposium and Poster Session

AP Exam Review Sessions &

## **RP Definition and Descriptions**

### **Research Practicum:**

Research Practicum (RP) is a yearlong research course required of all Science and Technology Program (STP) seniors. RP experiences and instruction pertain to the design, execution, interpretation, and presentation of a highly technical research project

### **Independent Research Project**

The Independent Research Project is designed, executed and reported by an individual RP student. Approved Independent Research Projects are primarily conducted on campus in the assigned RP class. A student may enlist a number of "Research Advisors" as content and style resources.

### **Dependent Research Project**

The Dependent Research Project (DP) is a project conducted by a student who leaves the school during the day to work in collaboration with a scientist, engineer, and/or technician, who are known as the Research Mentor (RM). Approved Dependent Research Projects are conducted off campus at recognized institutions of Higher Learning or in facilities located in the business / industry community.

### **Research Mentor (RM)**

The Research Mentor is a practicing scientist, mathematician and/or engineer who is currently performing quantitative research in fields related to Mathematics, Science and Engineering. The Research Mentor enlists the RP students 3-4 times a week as a Research Intern to assist in his/her current research project.

### **Research Internship**

Students may assist a scientist or engineering (a Research Mentor) with part of a research project. The individual research conducted by the student may satisfy Research Practicum course requirements. Students may avail themselves up to three afternoon or morning classroom periods to participate in an off campus internship. Mentors/Internships\* Students may assist a scientist or engineering (mentor) with part of a research project. Mentor identification / selection and off-campus transportation is the responsibility of the student. The Science and Technology Office can assist with mentor identification and transportation arrangements where possible.

### **Research Advisor (RA)**

The Research Advisor is a qualified professional practicing in the applied fields of science, mathematics and engineering as well as other professionals working in fields related to the student's project. The Research Advisor assists RP students with the practical applications of their Independent Research Project. The Research Advisor is not engaged in conducting research but is willing to advise the student on their project. Research design, statistics, writing style and proofing are among the areas a Research Advisor may be solicited.

### **Research Practicum Teacher**

The Research Practicum Teacher is a CHFHS teacher to which the RP student is assigned. The Research Practicum Teacher directs and supervises the time management and quality control of the RP student. The RP teacher establishes and monitors criteria and time line milestones for the RP projects in general. The teacher's attention to individual student needs traverses a variety of areas. These areas include:

- Interviewing each student to establish research area topic.
- Assisting each student to develop project related professional contact networks.
- Communicating with student Research Mentors and/or Research Advisors.
- Reading and correcting RP project chapter drafts and a final paper.
- Assisting each student with the oral presentation and poster display.

**Research Abstract:**

The research abstract is a compact narrative that answers the adverb questions of “ who, what, where, when, and how.” A research abstract is a succinct summary of the RP project. It should be clear enough to convey its purpose without requiring one to read the full text. Abstracts should include the following: a statement of the problem, procedures, methods and statistics used, the results, and the conclusions.

**Research Proposal:**

- Definition: A research proposal sets forth both the exact nature of the matter to be investigated and a detailed account of the methods to be employed. In addition, the proposal usually contains material supporting the importance of the topic selected and the appropriateness for the research methods to be employed.
- Function: The research proposal may function in at least three ways: as a means of communication, as a plan, and as a contract.

**Research Proposal Elements**

- Study Introduction
  - Provide background information.
  - State the importance of the study.
  - Review related research publications (what others have done).
- Set the question or hypothesis:
  - Provide a rationale for the study,
  - Present delimitations (describe the population to which generalizations of the results might be safely made).
  - Present limitations (describe the factors that might limit the validity of the study).
- Provide Definitions: (define all terms that are systematic language specified to the field of research being proposed.)
- Explain Procedures:
  - Identify and describe target population and sampling methods to be used.
  - Present instruments and techniques for measurement.
  - Present a design for the collection of data.
  - Present procedures for collecting and recording data.
  - Develop a backup plan for contingencies (research mentor moves, lab animals die).
  - Formulate a time line of completion for each chapter of completion

**Experimental Design:**

The RP Project must follow either the format for “Experimental Design” or a “Design and Developmental design.” Projects in the Biological Science or Physical Sciences must use the experimental design. Engineering and Computer Science projects may use either the experimental design or a design and development design.

**“Experimental Design” must:**

- Contain a dependent and independent variable, must be part of the design (observational studies are permitted only if the student researcher is on an internship with an approved research mentor).
  
- Includes a hypothesis, which can be tested statistically.
  
- Focus involves changing the independent variable, and then measuring the dependent variable.
  
- Include a statically analysis of data.
  - Select a statistical test for **significance**.
  - Statistically analyze data for **correlation** between the independent and dependent variables (This means that you will determine if a plot of the independent variable vs. the dependent variable yields a linear relationship).

**“Design and Development” Design must:**

- Address a problem that requires an engineering solution.
  - Refine of a current solution.
  - Develop of a new solution
  - Analyze possible solutions
- Include a statistical analysis of data for **significance**
- Statistically analyze data for correlation between the independent and dependent variables (Does a plot of the independent variable vs. the dependent variable yield a linear relationship?).



*The Science & Technology Center  
Charles Herbert Flowers High School  
Research Practicum "09"*



**Research Mentor Permission Form**

**Student's Name** \_\_\_\_\_  
**STP Program Sequence** \_\_\_\_\_  
**Student Number** \_\_\_\_\_  
**Date** \_\_\_\_\_

**EVIDENCE of Research Mentor**

Name of Research Mentor \_\_\_\_\_

Research Mentor's Title/Position: \_\_\_\_\_

Research: Location \_\_\_\_\_

Street Address \_\_\_\_\_

City, ZIP \_\_\_\_\_

Phone Number: \_\_\_\_\_

e-Mail Address: \_\_\_\_\_

Title of Research: \_\_\_\_\_

Comments/Explanations

Days of Internship: (circle) Monday Tuesday Wednesday Thursday

Time of Internship: AM – Period \_\_\_\_ through and including Period \_\_\_\_

PM – Period \_\_\_\_ through and including Period \_\_\_\_

Transportation Arrangement:

Parents Signature of Concurrence and Approval:

Return this form to Mr. Strain, Mrs. Lee, Ms. Blake, Mr. Sharif, or Mr. Eiholzer by June 2nd. Internships opportunities will be withdrawn for those who choose not to turn the form on time or submit a written explanation of pending internship opportunities.



*, The Science & Technology Center  
Charles Herbert Flowers High School  
Research Practicum "09"*



**Internship Class Drop & Add Class Form**

Student's Name \_\_\_\_\_

STP Program Sequence

Student Number \_\_\_\_\_

Date \_\_\_\_\_

STP Sequence (Circle) Biological Science, Physical Science, Computer Science, Engineering

I have decided to stay on the CHFHS campus for Research Practicum. Please make the following adjustment in my selection of classes. Check what you want dropped and added. The number of course credits added must equal the number of course credits dropped.

DROP	Course No.	ADD Course Name
_____ RP Internship (1 period)		One additional period of on campus RP
_____ Internship 1 (1 period)	_____	(your selection)
_____ Internship 2 (2 periods)	_____	(your selection)
		(your selection)

Return this form to Mrs. White, Mrs. Lee, Ms. Blake, Mr. Sharif, or Mr. Eiholzer by June 2nd. Internships opportunities will be withdrawn for those who choose not to turn the form on time or submit a written explanation of pending internship opportunities.