



SEMESTER II TEAMS

GUIDELINES FOR WRITING THE SUMMARY OF WORK-IN-PROGRESS (SOW)

Because Semester II teams have already established a project direction during the previous semester's **DESIGN CHALLENGE**; the option exists to submit a brief "Summary of Work-in-Progress [SOW]" rather than a "full-blown" proposal or midterm. The SOW **updates the customer** regarding work in progress and plans for continuation.



Options include:

- submit a full proposal, making use of information submitted in last semester's final report; updating as necessary to reflect the team's plans for the new semester. **OR**
- provide SOW using below format to guide (or variation); attach reference copy of final report. **OR**
- provide Sem II documentation in the format required by the team's faculty advisor for class.

Suggested General Format		<ul style="list-style-type: none"> - MAY VARY – see sample of an alternate "Section II" below - 1" margins; no minimum - no max limit – content is what is important - Font face: Verdana, Arial or Helvetica. Font size: 10 or 12. - Address any problems cited by end-of-semester review of final report - Attach Level I Checklist / Email copy to TSGC, Faculty Advisor and Mentor.
Section I	Cover Page	<ul style="list-style-type: none"> - design project name [team-given] & topic title - team name [optional], team or institution logo [optional] - institution, department, mailing address - team leader, team mbrs, faculty advisor, dept, email address - JSC mentor name, research group, email address
	Table of Contents	Reflects the exact sequence of information presented in the SOW.
	List of Figures	Lists any illustrations or tables that are included in the proposal.
Section II	Abstract /Intro	Re-Introduction of Project. Address any changes as necessary – referring to the text of the Final Report as needed.
	Mentor ID	
	Collaboration	
	Team ID / Profile	
	Background	Recap of Semester I. Refer to details and results achieved during Semester I
	Accomplishments	Cite Key Accomplishments made in meeting the design objective.
	Design Objective	List Semester II Objectives.
	Design Plan	Detail the current Design Plan. Include any new considerations you will use in testing or evaluating design performance, including any safety and hazard analysis. Provide cost-estimate. Use potential outside of the space environs.
	Evaluation	
	Risk Analysis	
Cost Analysis		
Timetable	Update.	
Budget Plan	Update to include actual earnings/expenses from Semester I and <u>projected cost</u> of continuation; list of funding resources.	
S-III	Conclusion	Sums up Section II.
	References/ Bibliography	Minimum of ten points of reference using both current literature and internet sources. [Wikipedia is not acceptable]. Usual academic standards regarding original work apply to all submissions.
App	Final Report copy	Provide reference copy of final report from last semester.
	Trip/Budget Rpts	Attach reports of any actual excursions or expenditures made this period.
	Option Reports	Document completion of any Option Area during this period.
	May also include	Updates to Collaboration Efforts; Team Membership; Design Objective; Plan/Methodology; Graphics

SAMPLE ALTERNATIVE FORMAT SUMMARY:

Ford-MIT Alliance

Robot Kinematic Coupling Project Summary as of 09/28/2001

MIT PI: Alex Slocum

Acad. Year 2002

Ford Sponsor: Zafar Shaikh

Funding: 60,000

Project Description and Ford Benefits			
Kinematic couplings for quick-change of factory tools and automation equipment.			
Interfaces have high repeatability and exchangeability, reducing installation and calibration time.			
With direct measurement of the contact points of the coupling and calculation of associated error transformation, mounting accuracy is dependent solely on error of the measurement system and interface repeatability.			
*See more project information and results at http://pergatory.mit.edu/kinematiccouplings/research/wip . Authenticate with username 'kinematiccouplings' and password 'threegrooves'.			
Key Milestones			
<u>Event</u>	<u>Schedule</u>	<u>Actual</u>	<u>% Comp</u>
Complete concept design and error modeling for robot base	Dec 2000	Dec 2000	100
Develop coupling solution for portable calibration unit	Jan 2001	Jan 2001	100
Complete concept design for wrist	Feb 2001	Feb 2001	100
Test repeatability and exchangeability of scale model couplings	March 2001	March 2001	100
Complete manufacturing of wrist prototypes and initial testing at MIT	March 2001	Jul 2001	100
Mount ABB IRB6400 and conduct static and dynamic repeatability assessments of existing and proposed kinematic designs	March 2001	Jul/Aug 2001	100
Test wrist prototypes on robot at ABB in Sweden	Aug 2001	Jul/Aug 2001	100
Key Accomplishments to Date			
Built and tested scale model of kinematic coupling base to confirm feasibility and gather preliminary repeatability data. Demonstrated central base frame repeatability of 0.015 mm.			
Developed calibration unit in conjunction with ABB. Unit allows quick and precise zeroing of the six robot axes using standard three ball and groove coupling with a magnetic preload. Device is being patented and will be in production in approximately 6 months. Initial testing shows repeatability of 0.01 degrees.			
Developed and validated computer models of canoe ball and three-pin interface exchangeability, allowing Monte Carlo simulation of kinematic error as related to placement tolerances of the contact points, accuracy of the measurement system, and detail level of the interface calibration procedure.			
Built full-scale prototypes of canoe ball and three-pin wrist mountings and tested on ABB IRB6400R. Demonstrated repeatability of 0.04-0.06 mm, versus existing ABB wrist repeatability of 0.10 mm.			
Built full-scale prototypes of canoe ball, three-pin, and groove-cylinder base mountings and tested on ABB IRB6400R. Demonstrated repeatability of 0.03-0.07 mm, versus existing ABB base repeatability of 0.40 mm.			
Objectives for Six Months			
Compare repeatability of canoe ball and three-pin mountings for wrist using bench-level fixture with high-resolution capacitance probes at MIT.			
Demonstrate concepts for wireless communication of measurement parameters from kinematic coupling interfaces to machine controller, where interface transformation is added to the static kinematic chain of the manipulator.			
Develop production specifications for kinematic couplings and transfer design capability to ABB and Ford engineers. Synthesize project learning, past research on kinematic couplings, and specific measurements from robot application into a design guide for kinematic couplings.			
Project Direction Changes and/or Issues Since Previous Report			
Etc etc			