

# PMI-CPM Professional Education Program

## Introduction

The Training Seminars offered at this conference are part of the Professional Education Program (PEP) of the PMI College of Performance Management (PMI-CPM). Attendees may take any of the Training Seminars they wish to take without registering to participate in the PEP. Participants in the PEP, however, are afforded additional benefits, including achievement testing and certificates. Registration forms are available at the conference registration desk.

Two kinds of achievement certificates are awarded in the PEP: Course Certificates and a Graduate Certificate. Course Certificates are awarded to registered PEP participants who successfully complete Course Testing. A Course Test and a Course Certificate is offered for each of the six Core Courses (each consisting of six Course Lessons):

- CPM-100 Principles of Project Management–Special Topics
- CPM-200 Principles of Schedule Management
- CPM-300 Principles of Earned Value Management
- CPM-400 Principles of Earned Value Metrics and Analysis
- CPM-500 Principles of Technical Management
- CPM-600 Principles of Project Integration

A Graduate Certificate is available to registered PEP participants who earn each of the Course Certificates and satisfy the requirements for one of the two Graduate Electives:

- CPM-700 Attendance at Eight Practice Symposia
- CPM-710 A Research Paper on an Approved Topic with a target of 30 pages.

Practice Symposia are part of the afternoon program at the conference and do not conflict with the morning Training Seminars. Forms for documenting Symposia attendance for CPM-700 are available at the conference registration desk, as is additional information on the second Graduate Elective, CPM-710.

Course Testing is based on the same learning objectives that determine the content of the six Core Courses. Registered PEP participants may take a Course Test without taking the Course Lessons if they are confident that they have acquired the requisite knowledge by another means (training, self-study, experience or the like). Course Testing for Course Certificates is available in the afternoon immediately following the conference. Please see the conference schedule for the time and place of the Course Testing. Registered PEP participants will be notified of the particulars of online testing when they are available.

Course Lessons are delivered by volunteer trainers. Their Course Lesson materials are based on learning objectives developed by PEP volunteers (often including the trainers), with coordination provided by the PMI-CPM Vice President for Education and Certification. These materials are the property of the trainers or their employers and rights to their use are not granted to conference attendees or registered PEP participants without permission.

## Core Course Summary

**CPM-100 Principles of Project Management–Special Topics** – The Principles of Project Management course presents the general framework of project management. Organized around the PMI’s A Guide To The Project Management Body of Knowledge (PMBOK® Guide), this course contains 6 lessons covering topics in project integration, scope management, time management, cost management, quality management, human resources management, communications management, risk management, procurement management, and professional responsibility. The course also includes an overview of PMI® EVM Practice Standard, capital asset plan and business case, and EVMS surveillance.

**CPM-200: Principles of Schedule Management** – The Principles of Schedule Management course covers scheduling theory, terms, and analysis techniques. The six lessons cover topics like; Gantt charts, milestone charts, tiered schedules, schedule development, critical path scheduling, schedule analysis techniques, schedule risk assessment, and enterprise wide scheduling.

**CPM-300: Principles of Earned Value Management** – This intermediate level course introduces participants to the principles of earned value (EV) management. It is designed for individuals who have one or more years of general project management experience or who have completed CPM-100 and CPM-200 courses. Topics covered in this course include: EVM principles and terminology, EV data interpretation, project control system design, development and maintenance of the performance measurement baseline, and the use of EV data for cost and schedule performance management.

**CPM-400: Principles of Earned Value Metrics and Analysis** – This intermediate level course is designed for participants with one or more years experience in an EV project management environment. The course introduces the participant to more advanced EV measurement methods and analytical techniques. The course topics include; developing and maintaining the baseline, EV data analysis techniques, calculating estimates at completion, advanced EV management analysis, and managing funds using EV information.

**CPM-500: Principles of Technical Management** – This advanced course assumes the participant has sufficient academic or practical preparation to appreciate the basic technical management practices encountered in projects. Course topics include; development of Work Breakdown Structures (WBS), systems engineering on projects, use of Integrated Project Teams (IPTs), technical performance measurement, risk management, and quality management.

**CPM-600: Principles of Project Integration** – The Principles of Project Integration course is the “capstone” course for the series. Using lecture, case study and group exercises, this course integrates and reinforces principles taught in the other courses. Course topics include: project integration, master schedules and planning, integrating schedules and EVM metrics, and using risk to establish baselines.

## Detailed Course & Lesson Descriptions

**CPM-100: Principles of Project Management–Special Topics** – This course is based on the Project Management Institute’s (PMI’s), A Guide To The Project Management Body of Knowledge (PMBOK® Guide). The course addresses nine categories of the PMBOK® Guide to include: (1) Project Integration, (2) Scope Management, (3) Time Management, (4) Cost Management, (5) Quality Management, (6) Human Resource Management, (7) Communications Management, (8) Risk Management, and (9) Procurement Management. Special attention is given to explaining the relevancy of each category to the project control professional including PMI® EVM Practice Standard, capital asset plan and business case development, EVMS surveillance, and professional responsibility. The course provides participants with an excellent framework for the rest of the CPM Program of Instruction. For those interested in certification as a PMI® Project Management Professional (PMP®), this course will provide an important grounding in the nine knowledge areas of the PMBOK® Guide. For those pursuing PMP® certification, it is also recommended that a PMP® certification preparation course be taken subsequent to CPM-100.

**Lesson A: Integration, Scope, Time, and Cost Management** – This lesson defines basic project management principles and introduces the participant to the Project Management Institute’s (PMI®) A Guide To The Project Management Body of Knowledge (PMBOK® Guide). The lesson focuses on integration, scope, time, and cost management knowledge areas of the PMBOK® Guide. The definition of project scope and managing the changes to the scope are essential to a successful project. This lesson will discuss the critical techniques used to manage project scope. To most practitioners we simply refer to time management as scheduling. There are many types of scheduling techniques used to manage projects. This lesson will introduce you to some of the more popular techniques. Developing an understanding of the initial cost estimate, budgeting, monitoring, and forecasting completion costs is critical to a successful project. A more detailed treatment of these topics will be provided later in the POI.

**Lesson B: Overview of PMI® EVM Practice Standard** – This lesson provides an insightful review of the EVM Practice Standard published by PMI® in 2005. The lesson highlights the main issues addressed in this important standard and provides examples of relevant applications.

**Lesson C: Capital Asset Plan and Business Case** – This lesson focuses on a new, very important area of project management: Capital asset plan and business case development. The lesson is based on the requirements of the US Office of Management and Budget (OMB) Exhibit 300 and is applicable in many capital project environments.

**Lesson D: Earned Value Management System Surveillance** – Earned Value Surveillance is an essential component of a company’s implementation of EVMS. The goal of surveillance is to demonstrate continued compliance with the ANSI/EIA 748 EVMS guidelines. It is a requirement for all contracts with requirements to comply with the EVMS guidelines. Effective surveillance also benefits any company implementing EVMS internally. Decisions may be based on EVM results, and the validity of the information reported is essential. The industry published in 2004 a guide to the surveillance process incorporating successful practices and warnings compiled to have successful surveillance. This lesson trains the participant in these best practices and

lessons learned. The material includes the National Defense Industrial Association (NDIA) Program Management Systems Committee (PMSC) Surveillance Guide.

**Lesson E: Human Resources and Communications Management, and Professional Responsibility** – This lesson focuses on three more very important areas of project management: Human Resources management, Communications management, and Professional Responsibility/ethics. While sometimes not seen as core project management activities, these areas like the others are critical to a successful project. Having a commanding technical understanding of the technical aspects of a given project without the ability to manage interpersonal relationships is often a recipe for disaster. The project manager depends on his/her ability to work with a team of people to accomplish the project's objectives. Selecting the right people and understanding how to use the team within the larger organizational context is very important to success. Another critical area is that of managing the flow of information among stakeholders of a project. This lesson will introduce the participant to a variety of issues ranging from communications planning to administrative close out of the project. Considerations of professional responsibility issues to be observed by project managers are also addressed in this lesson.

**Lesson F: Developing and Implementing an Integrated Project Management Information System (PMIS)** – This lesson focuses on applying the principles of project management, information systems, and systems engineering together for effective Earned Value Management Systems. The lesson provides guidance for designing and implementing an Earned Value Management System using the proven principles of integrated systems engineering. This “Systems Engineering for Earned Value” approach provides a set of techniques and tools for organizing the development of an Integrated Earned Value Management System.

**CPM-200: Principles of Schedule Management** – This course introduces the participant to the principles of schedule management in support of the project control function. Special emphasis is given to the schedule - EVM interface. The course begins with an introduction to scheduling techniques that may be used in a variety of applications. This course teaches the participant how to recognize, develop, status, and analyze a variety of schedules. The course will discuss the development of the proposal schedule, in response to the customer's request for proposal. It will provide perspective and context for quantifying and analyzing schedule risk. Since, every project has cost, schedule, and technical risk that are interrelated, this course will prepare the participant to manage schedule risk.

**Lesson A: Critical Path Method Scheduling** – This Lesson reviews the basics of critical path method scheduling. The process that all project scheduling software packages use to calculate the critical path is reviewed. Part of this process is to perform forward and then a backward pass. The objective is to show how all of these network calculations are performed so that when the participants are reviewing the schedules generated by scheduling software packages, they will understand how to interpret it.

**Lesson B: Introduction to Resource Loading / Analysis Techniques** – This lesson focuses on the importance of careful planning and management of multiple projects. The lesson explores why success by today's standards require an organization to go beyond well managed individual programs to manage an assemblage of programs and projects as

though they were one enterprise. Enterprise-wide project scheduling and resource planning requires the solution of a number of challenges that are not apparent to the individual project planner. Consequently, this lesson presents strategies for meeting these challenges, supporting the balancing act with a range of processes and techniques based on the organization's project management maturity level, and corporate planning culture.

**Lesson C: Schedule Status Updates and Analysis Techniques** – Schedule traceability is consistently between schedule dates, status and revisions. Horizontal and vertical schedule traceability will be discussed with emphasis on schedule/cost integration. Schedule status and impact analysis are a routine on-going activity during the life of a program. Performing schedule variance analysis that includes explanations for late starts/finishes, analysis of impacts to future tasks, impacts to the critical path provides insight and value throughout the contract performance will be discussed. The use of schedule diagnostics is an approach to support scheduling organizations to produce valid logically linked networked schedules. Their use is a technique that tests the schedule database for anomalies that could invalidate the accuracy of the schedule. Examples will be given. When unrecoverable slippage in the schedule occurs, a recovery/work around plan is developed. Various approaches to reducing impacts to the critical path will be discussed including the use of 'Schedule Margin'. To gain insight on the health of a schedule the combination of EV data and the schedule will identify areas that need additional analysis to avoid future schedule impacts. Combining control account metrics and schedule trends provide insight not previously available. The combination of SPI and total float identify will be discussed.

**Lesson D: Earned Value Cost and Schedule Performance Management** – This lesson discusses how EV is used in the management of cost and schedule by program/project managers, senior executives, and other organizational stakeholders. The lesson addresses the concept of earned schedule and its use in forecasting performance. It presents graphical techniques and their support of visualizing cost and schedule performance. It discusses various views of the cost estimate at completion and time estimate at completion and their relationship to preventive actions and corrective decisions.

**Lesson E: Schedule Analysis Techniques** – Developing a baseline schedule, measuring performance against it, and estimating when remaining activities will start and/or finish are essential elements of good schedule management. Equally important is the meaningful analysis of project schedules that provides the project team with a rational basis for decision making in order to meet project objectives. Schedule analysis is the process of assessing the magnitude, impact and significance of actual and forecast variations to the baseline schedule and/or current operating schedule. It begins with the calculation of the project's critical path and determination of any change in the completion date of the project. Schedule analysis also includes diagnosing the health of the project schedule and its direction by examining elements including schedule accuracy, integration, realism, performance, variances, trends, forecasts, "what-ifs," risk and relationship to resources. This lesson will highlight and illustrate some basic schedule analysis techniques that can help project teams better assess their project's schedule position and augment the performance and variance information provided from Earned Value Management systems. It would be especially useful for Project Schedulers/Analysts who perform schedule analysis for their project teams.

**Lesson F: Introduction to Schedule Risk Analysis** – This lesson introduces the participant to schedule risk analysis. The lesson provides the essential strategies for recognizing, reducing and/or eliminating possible risks, with the specific emphasis on schedule risks. An introduction to the General Risk Analysis Method, and the risk grid and templates, is followed by action strategies for risk mitigation and tracking. The Monte Carlo Risk Analysis process is explained, and examples are shown of a logical summary of results.

**CPM-300: Principles of Earned Value Management** – This course introduces the participant to the principles and terminology of EVM. It take the participant through general terms, defining the EVM requirement, placing the requirement on the contract, getting the requirement implemented, defining reporting requirements, and monitoring performance. Special attention will be devoted to creating and maintaining the Performance Measurement Baseline (PMB) and the analysis of EVM data. Data integrity is fundamental to effectively utilizing EVM data and one of the best ways to ensure data integrity is to design quality and discipline into the project management system. Consequently, the course will review the EVMS Guidelines and Practice Standard as they relate to designing and operating a high quality project management system. The course addresses how EVM data is used at senior levels of corporations and the federal government by key decision-makers.

**Lesson A: EVM Principles & Terminology (Part 1)** – Since, The Principles of Earned Value Management is an introductory level course that familiarizes the participant with the basic principles and terminology used in earned value management. Lesson A begins by developing a foundational understanding of the utility of earned-value to managing a project or program. The participant will learn basic terminology and concepts associated with earned value management including the development and monitoring of the performance measurement baseline. The lesson also discusses how EVM system and reporting requirements are incorporated into contractual specifications. Project control system review criteria will be introduced and reporting standards discussed.

**Lesson B: EVM Principles & Terminology (Part 2)** – This lesson begins with a discussion of how earned value management is implemented at the control account level. The lesson then defines analytical terms and reviews the various techniques used to analyze performance measurement data. Following an introduction to data analysis, calculations of performance indices are explained along with their use to forecast cost at completion. Principles of variance analysis are discussed as are methods for incorporating changes into the performance measurement baseline (PMB). Over-Target Baselines (OTBs), financial reporting, and the post acceptance review process are also presented.

**Lesson C: Control System Design (Part 1)** – This lesson focuses on part one of the ANSI EIA 748 EVMS Standard. It includes discussions on project organization, and project planning, scheduling, resource loading, and budgeting.

**Lesson D: Control System Design (Part 2)** – This lesson focuses on part two of the ANSI EIA 748 EVMS Standard. It includes discussions on project accounting, analysis, and baseline control and revision.

**Lesson E: Establishing an Earned Value Management System (Part 1)** – This is part 1 of a two parts lesson that present the practical considerations that need to be addressed and the actions required to establish and successfully operate an Earned Value management system in a commercial, governmental or defense industry environment. The approach is more oriented to governance considerations rather than the technical operation of an EVM system. It is aimed at those who are likely to be involved in managing the establishment of an Earned Value management system to enhance their existing project management process. A scaleable approach is taken showing how the methodology is applicable to projects of all sizes, industry type or management philosophy. The lessons recognize that many businesses already practice some elements of performance management. The lessons outline the use of the PMBOK® Guide principles to establish an EVM system that builds on existing processes.

**Lesson F: Establishing an Earned Value Management System (Part 2)** – This is part 2 of a two parts lesson and is a continuation of material presented in Lesson E.

**CPM-400 Principles of Earned Value Metrics and Analysis** – This course addresses the principles and terminology of EVM. It takes the participant through general terms, defining the EVM requirement, placing the requirement on the contract, getting the requirement implemented, defining reporting requirements, and monitoring performance. Special attention will be devoted to creating and maintaining the Performance Measurement Baseline (PMB) and the analysis of EVM data. This course presents advanced EV analysis and considers the impact of baseline changes on Estimate-At-Completion (EAC) computations. It addresses how a program/project manager obtains appropriated funds and how these funds are managed within the program/project office.

**Lesson A: Developing and Maintaining the Performance Measurement Baseline (Part 1)** – This lesson focuses on the process of understand how cost, schedule, and technical baselines are integrated into the PMB and how changes need to be managed.

**Lesson B: Developing and Maintaining the Performance Measurement Baseline (Part 2)** – This lesson builds on the previous lesson and focuses on the meaning of project contingency and management reserve. The lesson will cover the topics of over-target baselines, and understanding the “rubber baseline”.

**Lesson C: Integrated Master Planning and Its Impact on Integrated Master Schedules** – This lesson focuses on the significance of the integrated master plan and integrated master schedule (IMP / IMS) concepts. The lesson provides insights into the hierarchical integration of schedules from the control account to the contract master schedule.

**Lesson D: Integrated Baseline Review** – The Integrated Baseline Review (IBR) should be a joint evaluation of baseline realism by the customer and contractor. This presentation provides participants with an understanding of how and when to plan an IBR, and when it is necessary to have successive IBRs on a project. Team preparation is essential for a successful IBR, and the presentation will discuss how to train the multi-functional members of an IBR team. The presentation will also describe how to develop a joint IBR plan and approach. It will describe how to conduct the review, with special emphasis on conducting baseline discussions that keep the focus on evaluating baseline

realism, not system compliance. System level risks must also be addressed in the IBR, and the project managers must incorporate the results of the IBR into how the project is managed.

**Lesson E: Earned Value Data Analysis Techniques (Part 1)** – This lesson focuses on various earned value measurement techniques and will introduce the basics of both numerical and graphical analysis.

**Lesson F: Earned Value Data Analysis Techniques (Part 2)** – This lesson focuses on techniques for validating performance measurement data as presented in Cost Performance Reports.. It reviews the various earned value data analysis techniques and includes methods of creating and graphically analyzing performance trends. The lesson focuses on EV based methods of forecasting and validating Estimates at Completion (EACs) and considers the impact of baseline changes on EAC computations.

**CPM-500 Principles of Technical Management** – This course begins with an examination of the concept of Work Breakdown Structures (WBS). The course will examine the guidance and “best practices” that result in developing an optimizing the WBS across multiple applications including: aerospace, construction, environmental management, and R&D. Next, the course examines the role of systems engineering in the project office. The participant will learn many of the basic concepts of systems engineering with emphasis on its support role to the project planning and control function. Practitioners have learned through decades of experience that integrated product/project teams (IPT) are a critical component to improving coordination among the various project participants. Consequently, the course considers the “value-added” of the IPT to the project management process. Next the course examines the concept of technical performance measurement. Examples of how technical performance measurement in multiple applications can be implemented will be examined.

Risk management is an important aspect of all projects. Typically we think of risk in terms of cost, schedule, or technical issues. However, this course will focus primarily on the technical risk component and will give examples of how risk can be managed. Finally, the course concludes with a lesson on the importance of managing project quality. The lesson differentiates between “conformance to requirements, specifications, fitness of use, continuous improvement and statistical quality control principles.

**Lesson A: Development of the WBS** – This lesson covers a variety of technical subjects that have a direct impact on project controls. The lesson focuses on the concept of Work Breakdown Structures (WBS). It provides an understanding of the purpose and use of the WBS. The WBS is a crucial aspect of sound project management. The WBS is much like the binding on a book in that it helps to keep project information organized. This Lesson will explore the fundamentals of constructing a useful WBS for multiple applications. The Lesson will include discussions of guidance provided by multiple federal agencies that include construction, R&D, production, remediation, etc.

**Lesson B: Technical Risk Management** – This lesson addresses technical risk issues and their impact on project performance. It provides an overview of risk management for program team members. The lesson outlines the new DoD risk guide, new OMB Capital Programming Guide, NDIA Application Guide, and other updates to risk management requirements.

**Lesson C: Integrating Systems Engineering with EVM (Part 1)** – This lesson focuses on the role of systems engineering in translating technical requirements into the technical baseline. Often, project control specialists see the planning of the cost and schedule baselines as an isolated activity disassociated from the technical or engineering aspects. This type of thinking can significantly delay the development of the earned value baseline.

**Lesson D: Integrating Systems Engineering with EVM (Part 2)** – This lesson builds on the previous lesson and will help the participant recognize the technical, schedule, and cost baselines and how they relate to the Performance Measurement Baseline (PMB). The participant will learn why the role of systems engineering is so important to the project office.

**Lesson E: Material and Subcontract Issues in EVMS** – This lesson addresses the key material and subcontracts issues in an Earned Value Management System (EVMS). Gaining a solid foundation concerning how these important areas support the EVMS enables project control analysts, control account managers, and project management staff to understand, interpret, and analyze performance measurement data. The lesson addresses the use of estimated actual costs for various categories of material (and perhaps even contract labor) with examples that show how the improper treatment of accruals causes an invalidation of conclusions drawn from reports. Analysis of Earned Value (EV) data and the effects of the EV approach adopted for material and subcontracts is discussed. Other unique characteristics of the EVMS are addressed including determining price and usage variances for both labor and material, and ensuring consistency between budget and actual cost accumulation techniques. Subcontract issues include simplifying WBS integration, methods for securing key data, and integrated report development and reporting cycles.

**Lesson F: Advanced Quality and Six Sigma Metrics** – This lesson addresses quality management as a critical component of project control including the implications of conformance to requirements, specifications, fitness for use, and continual process improvement. The lesson reviews the concepts of continuous improvement, total quality management, ISO 9000, ISO 10006, Six Sigma method, and Lean Six Sigma to help ensure that organizations follow their own quality procedures. The lesson provides a basis of the statistical techniques associated with Six Sigma and quality control as well as implementation considerations to support organizational quality objectives.

**CPM-600 Principles of Project Integration** - This course begins with a lesson that addresses putting together the pieces of the project into a cohesive whole. The lesson examines technical trade-offs, project plan updates, schedule updates, revisions of cost estimates, engineering modifications, change control, quality assurance and how they impact performance measurement. Next, the course examines role and challenges of integrated master planning and its impacts on integrated schedules particularly for large highly complex projects. The participant will learn the value of vertical, horizontal, and enterprise wide schedule integration. The course examines a variety of principles and techniques for integrating scheduling and EVM metrics to include evaluating both EV schedule variance and time-based variances. Understanding how to quantify and manage project risk and understanding how to express that in planning and revising the PMB is critical to effective project control. The participant will learn

how to make risk management an integral part of the project planning and management processes. Next the participant will learn the importance of project integration through the use of case studies. Both buyer (government ) and seller (contractor) perspectives will be carefully analyzed.

**Lesson A: Integrating the Project's Technical Components** – This lesson addresses the integration (putting together the pieces) of the project into a cohesive whole. Project integration often includes technical trade-offs, project plan updates, schedule update, revised cost estimates, engineering modifications, quality assurance, change management, and performance measurement working together to ensure accomplishment of all project objectives. This lesson will provide an overview of project definition, change control, configuration management, work authorization, and information management as major components of the project integration responsibility.

**Lesson B: Integrating Scheduling and EVM Metrics** – This lesson focuses on showing how to correlate the schedule variance with a time based schedule. The lesson explains how sometimes work packages/activities that are contributing to the EV scheduling variance may not show on the physical schedules critical path. This lesson will discuss some of the pros and cons of both schedule measurement techniques and will show how an integrated analysis of both systems is critical to an accurate picture of true project status.

**Lesson C: Understanding Resource Management through EVM** – This lesson focuses on the role of resource management as a focus of EVM efforts. It emphasizes the use of EVM data and graphical tools as critical components in project resource allocation and management. It provides clear understanding of the meaning of various lines in EVM graphs as they relate to effective decision making. The lesson provides understanding of EVM charts, and includes interactive analysis of relevant data and graphics.

**Lesson D: Integrating Risk into PMB Development** – This lesson will examine the integration points between earned value management and risk management. While most project control professionals intuitively recognize there must be a linkage between variations in the parameters of a risk management metric and the expression of the project's earn value baseline, the trick is to articulate the "cross walk" between the two. The understanding of this relationship helps improve overall project integration.

**Lesson E: Project Integration: Buyer's Perspective (Case Study)** – This lesson is designed as the second to the last project integration lesson for the basic and intermediate courses (i.e. CPM-100, CPM-200...) contained in the POI. The focus of this lesson is to provide perspective of project management from the viewpoint of the buyer (i.e., government, general contractor, and end-user).

**Lesson F: Project Integration: Seller's Perspective (Case Study)** – This lesson is designed as the final project integration lesson for the basic and intermediate courses (i.e. CPM-100, CPM-200...) contained in the POI. The focus of this lesson is to provide project management perspective from the viewpoint of the seller (i.e., contractor, subcontractor, vendor, service provider).