

# **A Collaborative Effort of the Human Resource Development for the Electronic Gaming Market in Macao**

**Tse, Rita Tan Sim**  
Associate Professor  
Computing Program  
Macao Polytechnic Institute  
ritatse@ipm.edu.mo

**Peter DeRaedt**  
President  
Gaming Standards Association  
pdr@sbcglobal.net

**Martin Storm**  
Chairman, President and CEO  
BMM International  
storm@bmm.com

## *Abstract*

Enhanced governance, compliance and technical standards in the global electronic gaming market drive innovation, control and leadership for all industry participants. In regulated electronic gaming markets, the need to protect culture and citizenry is paramount. This is achieved through the establishment of appropriate technical standards and the strict adherence to them. Regulators govern to ensure compliance with their legislated standards. Compliance with enhanced, open standards underpins the framework for product development and interoperability allowing for far greater innovation, enhancing management control and player experience. Operators benefit from innovation and increased competition among manufacturers competing for market share. However, the development of the regulated electronic gaming market will demand experts who have a far greater understanding of standards, therefore, their role and management expert becomes crucial. This paper discusses the needs of standardization and the collaborative effort of the Macao Polytechnic Institute, Gaming Standard Association and BMM Compliance to train experts in electronic gaming that is essential to the market development in Macao.

在全球博彩市场裡，通過加强治理而使产品符合技术标准，是可以推动所有业界参与者的创新能力、控制能力和领导能力的。在一个规范的博彩市场中，对文化和公民的保护是至关重要的。要提供这些保护，业界就需要制订并严格遵守适当的技术标准，而管理机构则要负责监督，以确保这些法定标准被有效执行。遵守开放但严格的标准，可以为产品的开发以及不同产品间的相互操作建立一个基本框架，而该框架不但适合创新，更可以提高管理控制的能力以及丰富参与者的经验。技术创新和不同制造商间的竞争将可使得运营商从

中获益。然而，随着有规范的电子博彩市场的发展，将需求更多對这些标准有更深刻理解的专业人士。因此，专业人士的作用和如何对他们进行管理将变得至关重要。本文论述了博彩市场对于标准化的需求，并介绍了澳门理工学院、GSA 和 BMM Compliance 在培养合格的适合澳门市场发展的电子博彩专业人士方面所作的工作。

## **1. Introduction**

Today, the electronic gaming market is composed of the Electronic Gaming Machine (EGM), an industry term that includes slots, video poker, video keno, etc. and accounts for significant revenues to the casinos. In Macao, the electronic gaming market market share was only 5% in 2008. [1] Compared to three-quarters of total revenues in all American casinos, there is a big room for the growth of electronic gaming market in Macao.

However, the development of the electronic gaming market requires capabilities to stand in the gap between the manufacturer, the operator and the Government such that 1) the power of networked gaming can be unlocked and revolutionized the way information is exchanged between electronic gaming machines and back-of-house systems. 2) either party is satisfied their respective expectations and found to be consistent with the respective party's requirements. Therefore, open protocol standards [2] and certification services [3][4] are needed.

Open protocol standards provides a common interface between devices and systems, as well as supporting essential networked gaming functions, such as software download, remote configuration, and advanced features. Certification services, based on a set of standards that provides a basis for the regulator and the operator in reassuring the public that they can have confidence in the operation, are highly recommended.

In addition, human resources are crucial to the development of the electronic gaming market, which requires experience and skillful manpower in different areas such as gaming technology, information systems, networking systems, etc. In a new electronic gaming market like Macao, human resources in the electronic gaming field become one of the key resources to the success of the market. Related education or training courses are highly recommended.

In this paper, since slot machines are working collaboratively in a casino floor, we will discuss the protocol standards that connect EGMs in harmony for the manufacturers and the operators. We also will discuss the certification services that benefit the operator and the regulator in the electronic gaming market. After the discussion on protocol standards and certification services, we will discuss the stimulating collaborative effort to provide training of expertise for the development of the electronic gaming market in Macao. This effort, between Macao Polytechnic Institute (MPI), the Gaming Standards Association (GSA) and BMM Compliance (BMM),

targets the provision of expertise for the growth of electronic gaming market that will strengthen the marketplace and fulfill the market needs.

## **2. Protocol standards**

Protocol standards bring the concept of common protocols to the rapidly expanding gaming industry. It allows for the increased expansion of gaming, unencumbered by the pitfalls of communication protocol failures. When the goal, the question and the answer are considered simultaneously, it makes perfect sense that the organization's membership is comprised of a cross-section of the industry's leaders, and includes operators and manufacturers alike, as well as representatives from virtually every aspect of the gaming industry.

Imagine a casino floor where communications are established between games and backend systems, such that the ticketing systems work together with the accounting system, regardless of manufacturer origin. Managers are informed instantly when a bill validator stops accepting currency, when a game malfunctions, or when an anonymous player has an exceptionally high expected value of play. In additions, managers are informed that absolutely every machine on the floor is running the software approved and implemented by management, bill validators are instantly updated to accommodate newly released treasury bills, and upgrades are implemented with the simple touch of a button.

Protocol standards make financial sense. Imagine if every piece of electrical equipment in your office environment had a unique electrical plug, and each piece required specific wiring and outlet. It simply would not be fiscally responsible to accommodate for such a wide range of demands. Fortunately, this does not happen in most countries as guidelines or rules exist. However, the gaming industry operated without such guidelines, resulting in frequent collapse of communication between gaming machines and systems, which ultimately resulted in lost revenues.

As casino marketers became increasingly sophisticated, casino management systems followed suit, increasing the capacity to track and reward players. This built loyalty, and increased revenue for the casino, both in terms of repeat visitors, and in a reduction in the cost of seeking new customers. However, as these systems grew technologically, so did the demand for the systems. At the same time, the technological capabilities of individual gaming devices grew. The result was an influx of technologically superior games and systems, each operating separately. The consequence, as any operator will attest, was an increase in the communication failure rate between machines and devices. This failure prevented operators from consistently and efficiently tracking their customers' play, resulting again in lost revenues.

Some in the industry have taken a position against standards, arguing that standardization will decrease competition, resulting in a lack of innovation, in games, systems and peripheral devices. However, the gaming industry can look to countless other industries to see this argument simply does not make sense. Consider again the example of office equipment illustrated above. With countless protocols guiding the industry, computer and software manufacturers have not suffered with a lack of competition or innovation. To the contrary, they have flourished.

As standards become adopted, the operator can configure the gaming floor as they choose, in a manner that best suits the player, the revenue source. By increasing available options to players and by supplying games that perform within the casino environment, operators can expect to increase revenue and gain competitive position. Further, by insisting upon standardization of communication protocol between games and systems, operators can invest capital expense money more wisely, basing their expenditure decisions on which systems have the best features that maximize the casino's return on investment from players, instead of continually chasing systems expenditures with additional money to fix communication protocol problems that should not exist.

The goal of protocol standards is to fit perfectly with operators' objectives of expanding revenues, by maintaining dollars and lessening expenditures. It also blends with manufacturers' aspirations of increasing sales. When casino operators eliminate recurring expenses, such as systems protocols, that revenue can be invested into existing casinos, or of even more value to manufacturers, to expanding operations with new casinos. The manufacturers are then free to fill the new space with machines and systems they are confident will perform and communicate, thereby increasing market share and revenue.

Protocol standards will benefit the gaming industry by allowing greater freedom of choice, providing a forum for increased innovation and increasing competition, all of which will ultimately result in shared increased revenues. Besides, protocol standards can change the gaming market in some ways: 1) discontinuation of proprietary languages; 2) real time data access; 3) networked updates; 4) labor cost savings; 5) real time floor management.

### *2.1. Discontinuation of proprietary languages*

The key to the convenience, value, and ultimately the return on investment provided by the implementation of open standards is found in the discontinuation of proprietary languages. The contemporary casino floor works because operators have had no choice but to make it work. Player demand for diverse gaming product requires the competitive operator to provide games from several different manufacturers. In turn, this requires operators to mitigate the proprietary language of each manufacturer in several areas that could be more efficiently managed if all systems interfaced through one protocol.

Specialized applications cost more to develop than can be recovered through their sale, hence very few specialized applications are available to operators for more efficient data analysis. In order to apply specialized applications property wide, an operator would have to buy the same application from each vendor represented on his floor.

There is clear demand for specialized application software. Such applications would not only drive more efficient player tracking, but translate into greater revenues through more efficient marketing. In essence operators are trapped by the proprietary languages on their floor, but manufacturers are also trapped, being unable to achieve potential revenues to be gained through

application software. The proprietary language keeps the potential market of the specific application too small to merit research and development. Without proprietary languages, one or several manufacturers can develop competitive applications that will work on any interface due to the protocol standards.

## *2.2. Real time data access*

Currently, operators do not have direct access to the data recorded on the floor by each game. This data is provided through an operator's slot floor management company. While this system of operation has been the industry standard to date, with the implementation of open standards, operators will have direct access to their own data at a significantly increased level of granularity.

Several industries, including retail and insurance, make use of specialized econometric regression analysis in order to learn about consumers. While several casinos currently employ player tracking and data analysis, through the implementation of protocol standards, truly unified player tracking and data analysis with respect to the whole casino floor is possible in real time.

While open standards will drive innovation for application software, they will also facilitate more efficient slot floor management through real time access to operations and raw data, as well as event notification. Through event notification the operator will be sent a message every time a specific event occurs. For example, the operator can subscribe to any event of interest that may take place on the gaming floor. If a high value player is not a member of the player's club, the manager now has the ability to send guest services to invite the player to join.

## *2.3. Downloadable game updates*

High speed networks and downloadable games are the future of the gaming market. The move towards more advanced gaming systems and interfaces will see the obsolescence of current game systems. In a competitive industry, if the operator is not enabled with download function or the existing games are not compatible with new games and applications, it will be difficult to remain a competitive property with antiquated offerings.

Through high-speed networks and open standards, player interfaces will change dramatically with access to additional things like sports betting, special offer marketing and linked online competitive play. The first operators to implement broadband and open standards will have the advantage of being the first to offer these exciting experiences to players.

In the recent decade, the gaming industry has expanded significantly, especially with respect to visibility. This expansion, however, has stopped short with regard to the attraction of new players. While casinos in Macao continue to attract new patrons, the customer base in the United States has remained statistically unchanged since 2002. Therefore while revenues are increasing, it is due to the loyalty of the same players, not the attraction of new ones.

#### 2.4. *Labor cost savings*

While it is important to note that implementation of protocol standards will solve several problems that would otherwise require significant investment in labor, the development of the standards was not focused on saving labor costs, but on increased efficiency and return on investment. It is through the value of real time floor management that the true significance and value of these standards can be analyzed. In the future, however, the value of real time floor management will be significantly increased by the innovation of specialized software that will enable applications and analysis that are not currently possible.

#### 2.5. *Real time floor management*

Real time floor management encompasses the large portion of value represented by the implementation of protocol standards. Until the development of standards and high speed networks capability, the efficiency of real time floor management was nothing more than an operator's dream.

Current operations depend upon the watchful eye of personnel, but regardless of employee efficiency it is hardly possible to achieve the accuracy or instant information that is accomplished through online real time computer monitoring. One of the largest areas of loss is game malfunction. If a game or internal system ceases to operate correctly, there is rarely a visual indicator of such, and therefore a significant lag can occur between the actual malfunction and personnel recognition of that problem.

Due to the success of ticket-in ticket-out (TITO) technology, games no longer accept coin and are therefore dependent upon the bill validator in order to accept currency. When a bill validator malfunctions, there is no visual indication or notification sent to management, the game sits on the floor unable to accept currency until detected through preventative maintenance rounds or player notification at the cage.

If a game malfunctions, there is no electronic notification to management. When the error is determined, the machine is tagged out of order and a technician is called to repair the problem. For all malfunctions of floor systems there are at least two lag times.

1. Time between moment of malfunction and "out of order" sign posting
2. Time between "out of order" sign posting and actual repair by technician

Therefore there is no way to know on average the actual lag time between malfunction, recognition of malfunction, and actual correction of malfunction. What can be estimated, however, is the lost revenue for every amount of time that machine remains inaccessible to players.

The lost revenue depends upon the average bet, and it becomes clear that the cost of a malfunctioning bill validator can mount up quickly. Not only is there a lag time between the

operator being notified of malfunction and actual moment of malfunction, but then there is the time it takes the technician to actually schedule and complete the repair.

Not only are malfunctions costly, but upgrades are as well. Every time a new currency format is released by the National Treasury, bill validators need to be upgraded in order to accept the new currency. Current bill acceptor upgrades are extremely labor intensive and make machines unavailable to players. With the implementation of protocol standards the new currency information can be transferred instantly to the bill validators on the casino floor with the touch of a button. Further, through protocol standards implementations, not only will operators get real time electronic notification of malfunction, but the validator can be corrected and/or upgraded electronically without ever having to schedule a maintenance technician to the floor.

Not only are high speed networks necessary for the very latest in game technology, but it will allow for the instant upgrade of systems, switching of games, specific player interfaces and enhanced player experience. Applications that were too large to pass through current slow infrastructure will easily be implemented and profited from due to broadband capabilities and open standards.

With high speed network infrastructure in place, several issues that used to cost time and money are solved simply with the touch of a button. The implementation of protocol standards will not only eliminate the source of headaches caused by the non-interface of proprietary languages, but it also opens the door to more efficient data analysis and player tracking.

Protocol standards open the door for rapidly expanding electronic gaming industry. However, the expansion of electronic gaming market needs governance by regulators to ensure satisfactory of respective expectation. This requires open technical standards and certification services for compliance to the standards as needed.

### **3. Certification services**

Certification services assist the regulator and the operator in reassuring the public that they can have confidence in the operation, based on Technical standards [5]. The standards will relate to consistency with the Rules, operation of the system, design of the system, functionality of the system and security of the system. The standards are provided as a guidelines for certification services that ensures:

- the EGM operates in accordance with the rules of the competition;
- the EGM is fair to players and is consistent with harm minimization policies;
- the EGM operates in a manner that is auditable, reliable and secure; and,
- the revenue is verifiable and accountable.

Technical standards are a set of standards that dictates the technical requirements for the EGM and how the requirements should be met. Technical standards specifies that the EGM is about to determine prizes, be activated to initiate the selection process, and deliver the determined result, but it does not set rules of play of the game. The standards are not intended to mandate a particular solution or method as the means to realize the requirement. Instead, they establish the

minimum standards of functionality so that all compliant EGMs are secure, reliable, auditable and operable according to requirements. Hence, certification services can eliminate subjective criteria in analyzing and certifying EGM operation and aims at those impacting the credibility and integrity of EGM. In addition, the standards are designed to accommodate new technology, no particular testing method or algorithm is mandated to be used in certification services. It makes certification more flexible and more productive.

To provide certification services, the regulators can operate a testing laboratory of its own, or, it can utilize the services of an experienced, independent testing facility (ITF). It is a common practice that ITFs are formally recognized or licensed by the regulators seeking to utilize the ITF's services.

In the regulated electronic gaming market, an ITF is utilized to conduct testing of systems, equipment and games software for compliance with the technical standards. An ITF will evaluate the EGM software and hardware configuration for reliability, recovery, auditability, redundancy, and security. This is beneficial to the growth of electronic gaming market, which gains Government certainty, maintains operator integrity, meets technical & operational expectations and builds customer confidence.

### *3.1. Government certainty*

The Government issuing licenses to operators to run lottery games, whether those operators are private companies or Government corporations, will require certainty in regard to operation of the lottery game in accordance with technical standards, the calculation and payment of taxes, existence and application of harm minimization processes and the integrity of the operation.

A certification service gives the regulator certainty in regard to the operation of the game and its interface to, and impact on, the public, because the regulator is satisfied that the operation and the system have been subjected to an independent assessment and found to be able to meet the regulator's own expectations as set down in the technical Standards and confirms it operates in a manner consistent with the Government's published harm minimization policies.

### *3.2. Operator integrity*

The operator who has been granted a license to operate a lottery game will need to satisfy the respective Government expectations in a manner that (1) the company has integrity and is appropriate to operate the game, (2) the people running the company are of good-standing, (3) the system the company uses to operate the game is fully functional, is designed to be consistent with the Technical standards, has integrity in an unforeseen or unexpected event, and its infrastructure and operations are secure. The company and personal probity aspects of this integrity activity are typically conducted by the authorizing Government body.

Certification services are required to deal with the systems and operations aspect of this integrity requirement. This includes equipment and software; host and remote servers; terminal devices

and, if permitted, internet services, as well as internal control manuals and change control procedures. Whilst an operator may carry out the design and development of the operating system, an ITF is required to assure the integrity of what has been delivered and is to be commissioned. The ITF may also be required to ensure the operator has harm minimization practices and procedures either in place through electronic control or built in to the system operation.

### *3.3. Technical & operational expectations*

The technical standards will include technical and operational expectations for an operator's system or procedures to meet specific requirements relating to:

- System resilience – the system is able to recover in a timely fashion and with no loss of integrity if an unexpected event were to occur;
- System recovery – the system is proven to be able to recover from an inherent defect, externally influenced failure or a disaster event with all functionality resuming normal performance and no loss of data;
- System performance – the system is able to meet peak performance expectations;
- System functionality – the system performs in a manner consistent with the requirements of the internal control manual(s), audit requirements, etc.
- Interoperability – the host system and the remote devices are consistent with the technical standards and work effectively when connected together without impairment to the operation of the system, operational control by the operator, etc.

### *3.4. Customer confidence*

Whilst an electronic game is a risk activity based on randomness, a customer still expects certainty in regard to the EGM operation. The customer wants confidence that the game is appropriately designed, operates in a manner consistent with the technical standards, and recoverable from unforeseen or unexpected events. Any malfunction or defect that is evident to the customer can create a perception of inappropriate, incompetent or even corrupt behavior in the operation. Such a perception will undermine confidence in the operation.

Certification services ensure satisfactory expectations from the regulator, the operator and the customer in compliance of the Technical standards. However, the development of electronic gaming market needs experts of great knowledge related to both the protocol and technical standards. Thus, human resources would be crucial.

## **4. Collaborative effort**

Observing the significant growth of the global gaming industry in rapidly emerging markets and the advancement of technology and new open GSA developed industry standards, it is obvious that the development of an educational program to support the new technologies becomes crucial.

Globally accepted open standards for communication have been established and are available online. These open standards allow for the creation of products that allow the richer content experiences that today's generation expect. A highly effective and well-respected solution is required that will be of internationally recognized global significance. The collaborative effort, spearheaded by MPI, will provide the human resources with the required expertise to support the global electronic gaming markets. The graduates will be able to support the government, operators and vendors communities.

This program would allow the younger generation to take advantage of new innovations and product solutions that in turn would support operators and expand the entertainment opportunities for everyone fueling growth in the global gaming industry.

GSA's open standards are ready to be used and incorporated in new products. Player demographics have changed significantly over the last 5 years and the technology functionality players are used to has grown exponentially – social networking and games such as Facebook, Twitter, World of War Craft, Second Life. The gaming experiences the younger generations are being exposed to in combination with advances in technology create a level of expectation that casinos have to be aware of and adjust to. GSA's open standards are the foundation to be able to create and offer these kinds of experiences.

The creation of a world-class education program in gaming technology will have a significant impact on gaming in general as it will train students to exploit the benefits communication standards offer thereby creating new market specific products and services never seen before. As a result of this training, young entrepreneurs will be able to develop new and innovative products and services for the gaming industry. This in turn will fuel innovation; operators will expand product offerings, targeting all demographics and driving revenue even more.

The Macao Polytechnic Institute, with its vision in gaming education, is proud to announce the debut of a unique global degree program, the Bachelor of Science in Computing. The program features a specialization in EGM technology. To enhance the program with higher industry standards, MPI is in the process of entering a partnership with GSA and BMM to develop gaming technology courses for the program. With a strong industry partnership, MPI aims at producing graduates with good fundamental computing concepts, sound intellectual and practical skills, and ability to creatively apply computing and related technologies in the gaming industry.

#### *4.1 Background of GSA and BMM*

GSA is an international trade association that creates benefits for gaming manufacturers, suppliers, operators and regulators. It facilitates the identification, definition, development, promotion, and implementation of open standards to enable innovation, education, and communication for the benefit of the entire industry. Open standards will impact the future of the gaming industry enabling it to driving innovation and increase market growth. BMM is a global professional services and product testing firm that provides testing, assurance, certification and compliance management, and advisory services to help its clients meet and

manage the technical product requirements of regulated gaming markets. It has been establishing test labs around the globe including the MPI/BMM Test lab in Macao. The MPI/BMM test lab would enable both educational and commercial capabilities allowing students to work, under supervision, on real commercial testing.

#### *4.2 Program General Information*

This program is aimed at producing graduates with good fundamental computing concepts, sound intellectual and practical skills, and ability to creatively apply computing and related technologies to business, industry and public sectors. Students in the Bachelor of Science in Computing will complete the program in four years on a full-time basis. Students need to take 38 credits each year from Year 1 to Year 3 and 36 credits in their Year 4 and they need a total of 150 credits in order to obtain their Bachelor Degree. To broaden the participation of students in their communication with the global IT community, the program promotes internship, joint student projects with organizations, student activities, and overseas exchanges. Regular seminars, competitions, social gatherings are also held to enhance peer learning among students and further study opportunities.

The first year is the basic or fundamental year for the computing discipline, in which students will learn the fundamental knowledge in the area of problem solving and programming skills, as well as in the relevant supporting disciplines, such as mathematics, business and English. The second year is the broadening year, in which students will accumulate more knowledge in computing, at an intermediate level. The program is designed to build up students' knowledgebase in system design, database design, object oriented design and technique, networking skills, and their language skills. The third year is designed to strengthen students' skills in system development on a larger scale and on more advanced technology. The final year is designed to enhance students' theoretical thinking and to cover more advanced computing topics. During their third and fourth year, students will be able to choose electives that he/she likes most that will give him/her more in-depth knowledge in the Gaming Technology.

The study areas include:

##### **Core Subjects**

- Computer Systems
- Data Management
- Gaming and Multimedia
- IS planning, Design and Control
- Mathematics
- Networking
- Programming and Information System Development
- Graduation Projects
- English

### **Elective Subjects**

- Advanced Computing courses
- General Studies courses

#### *4.3 Specialization courses in the Gaming Technology area*

There are several gaming technology courses that are under development (see Appendix A for details), which include:

- Introduction to Gaming Technology
- Gaming Technology I
- Gaming Technology II
- Mathematics for Gaming Technology
- Final Year Project (Gaming Technology)

The objective is to provide the general knowledge of the current technologies, gaming mathematics, and historical background of gaming, classification of the games, the compliance of slot machines and other peripherals used in table games that applied to the gaming industry. Students acquire experience and hands-on knowledge of components, systems and sub-systems, firmware, chip sets, manufacturers' documentation, set-up routines, diagnostics and maintenance. They can also gain in-depth technical training in the structure, features, implementation and testing of the GSA protocols. In their 4<sup>th</sup> year of study, students are required to solve practical problems or conduct research work in Gaming Technology related topics under the supervision of the teaching staff.

### **5. Conclusion**

The collaborative effort, between Macao Polytechnic Institute (MPI), the Gaming Standards Association (GSA) and BMM Compliance (BMM), provides a strong foundation for the development of an educational program specifically designed to supply the expertise necessary to meet the world market needs. The Bachelor of Science in Computing with its specialization in the Gaming Technology is the first such program of its kind. It offers not only the general technology requirements necessary to be successful in a technology filled world, but also a targeted skill that is instantly marketable in the fast paced and growing world gaming market. Because of the innovative two pronged approach, this educational program will attract the young technology minded students that will drive innovation in the gaming market. The program will benefit regulators, operators and vendors worldwide by providing the fresh new talented professionals necessary to move gaming to the forefront of technology from all aspects. Regulators will be able to acquire the talent necessary to develop the technical standards necessary to ensure the integrity of gaming while allowing for advancement in technology. Operators will gain access to highly trained graduates who can deploy the advanced technology

on the casino floor. Vendors will be able to obtain competent developers that already have the understanding of gaming and computer technology necessary to be instantly productive and ready to provide the new applications that will keep gaming exciting, and responsible. The result is that through the efforts of the three principle entities: MPI, GSA and BMM, the gaming industry will be assured of having the level of talent needed to ensure that the gaming industry and technology remain partners for the foreseeable future.

## References

- [1] 曾忠祿, “全球賭場掃描：現狀與趨勢”, 中國經濟出版社, 2010.
- [2] GSA, <http://www.gamingstandards.com>
- [3] P. Turner, "*How Certification Services can assist the healthy development of the Chinese Lottery*", Gaming Industry and Public Welfare, 2009, Beijing, China.
- [4] *BMM Compliance*, <http://www.bmm.com.au>
- [5] *Technical standards for Electronic Gaming Machines v1.1*, Casino Regulatory Authority (Singapore), <http://app.cra.gov.sg/public/www/home.aspx>

## **Appendix A – Tentative descriptions and objectives for the gaming technology courses**

### **Introduction to Gaming Technology**

This course covers the general knowledge of the current technologies applied to the gaming industry. The purpose of this course is to enable students to gain a full picture of the overall gaming environment worldwide with regard to technologies and the basic concepts of the technologies being employed in the gaming industry now and in future. In particular, the students will be introduced to historical background of gaming, classification of the games, the compliance of slot machines and other peripherals used in table games.

On successful completion of this course, the students should be able to:

1. have preliminary recognition of the business environment of gaming industry
2. know some operational management information systems
3. have knowledge of the various types of table games and electronic games
4. describe the general structure of gaming machines and their network systems
5. recognize the compliance of gaming machines and the role of the regulators.

### **Gaming Technology I**

This course aims to assist the gaming industry in satisfying the national and international shortage of formerly trained slot engineers and technicians. In this course, students gain practical, experimental tuition using AWP, SWPs, and video and gaming machines etc. Practically orientated, students acquire experience and hands-on knowledge of components, systems and sub-systems, firmware, chip sets, manufacturers' documentation, set-up routines, diagnostics and maintenance. It is anticipated that graduates will be capable of undertaking lower management and high-level technician positions of responsibility, with the skills to pass their knowledge to others within their chosen environment.

On successful completion of this course, the students should be able to:

1. use equipment that is current within traditional amusement and gaming establishments;
2. implement simple and complex service, maintenance and repair schemes to high standards as recommended by manufacturers;
3. use test and calibration equipment to ensure the ongoing viability of the machine.
4. use advancements in technology to make an evaluation of the future changes to gaming machine platforms;
5. install, configure, and troubleshoot networked EGMs along with the skills to ensure the system is available at all times;
6. create a secure environment, understand how hardware is used within security and surveillance systems, maintain systems and determine security breaches and controls;
7. analyze machines data with key performance indicators developed;
8. perform analysis and decision making.

### **Gaming Technology II**

This course offers in-depth technical training in the structure, features, implementation and testing of the GSA protocols. It allows students to demonstrate the level of knowledge and competence achieved on the GSA Protocols.

On successful completion of this course, the students should be able to:

1. understand the communication between EGMs and one or more host systems;
2. understand the G2S Model for an EGM, what it is all about, why it was developed and what it accomplishes.
3. understand how to use the machine, connection and communication models to implement new and innovative gaming applications.
4. understand the S2S Model, what it is all about, why it was developed and what it accomplishes.
5. understand how to use the S2S models to implement new and innovative gaming applications.
6. understand of the basic concepts and functionality required to provide minimum functionality in GDS.
7. understand the basic concepts common for both the Point-to-point Transport Protocol and the Multicast Transport Protocol
8. understand the more advanced functionality of the Point-to-point Transport and Security Protocol

### **Mathematics for Gaming Technology**

This course introduces gaming mathematics, also referred as the mathematics of gambling. Topics cover probability theory basics, Bayes' Theorem, discrete random variables and probability distribution, and combinatorics. A thorough examination about odds versus probability, learning how to convert from probability to odds or vice-versa, and calculating the expectation and house edge. This course details the history, the rules, the different bets available, the payoffs, the odds, the winning strategies and the etiquette for classic casino games like roulette, blackjack, craps, baccarat, and slot machines. This course also explores different betting systems.

Upon completion of this course, the students should be able to:

1. equip with all the supporting mathematics needed for gambling applications;
2. convert odds to probability (and vice-versa);
3. compute expectation and house edge;
4. understand the rules, odds, strategies and etiquette for each respective game;
5. learn about the different types of betting systems.

### **Final Year Project (Gaming Technology)**

This course aims to measure students' ability in integrating what they have learned in previous courses, self-study of new concepts and problem solving. Students are required to solve practical problems or conduct research work in Gaming Technology -related topics under the supervision of the teaching staff.

Upon completion of this course, the students are required to perform satisfactorily the following activities:

1. Writing project proposal;
2. Self-learning and problem solving;
3. (Development) Performing system analysis and design, and implementing a non-trivial software system
4. (Research) Carrying out research work;
5. Project management;
6. Formal presentation;
7. Writing project report.